



Fuel Cell and Electrolysis test stations

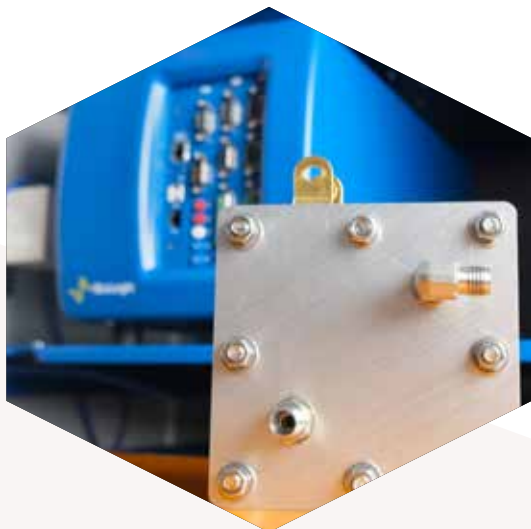
BluPEM.

BluPEM-EL.



BluPEM: Unleash Your PEM Potential

From Single Cells up to Stacks



Fuel Cell & Electrolyzer Research is Demanding.

It requires precision, reliability and control at every stage. BioLogic meets that challenge with BluPEM – a fully integrated workstation, built on decades of electrochemical expertise and proven engineering.

Our workstations for Fuel Cell and Electrolyzer research start with our industry-leading potentiostat technology, trusted worldwide for accurate, high-resolution measurements and for our flexibility and modularity. This is paired with a fluidics platform based on a well-established and proven design, ensuring robust, repeatable control of temperature, pressure, and humidity – all managed through intuitive, automation-ready software.

With support for real-time diagnostics, long-duration testing, and electrochemical impedance spectroscopy with EIS Quality Indicators (EIS QI™), our platforms deliver reliable results – even in the most complex testing setups.

Whether you're in academic research, industrial development, or scaling toward production, our systems can be customized to meet your needs.



BioLogic Potentiostats

At the heart of each system lies a BioLogic potentiostat. With two ranges of potentiostats (Premium and Essential), as well as a internal and external boosters. There is a right configuration for your single cell and stack measurements. And with BioLogic our potentiostats deliver:

- Exceptional accuracy across wide current and voltage ranges
- High-frequency EIS from μHz to MHz
- Seamless booster integration for scalable power
- Advanced Software with built in user defined safety limits

Our EC-Lab® software offers unmatched control and insight. With the Electrochemical Impedance Quality Indicators, you can assess measurement quality in real time – ensuring that your data is both accurate and actionable.

Why Choose BioLogic Solutions

Engineered for Precision. Designed for Confidence.

At the core of every BioLogic fuel cell and electrolyzer workstation is a commitment to precise control – of every variable that affects electrochemical performance. Our systems combine world-class potentiostats with a high-performance fluidics architecture, ensuring reproducible conditions and reliable data from day one.



Humidity Control

Accurate humidity control is essential for membrane integrity. BluPEM ensures optimal hydration through a high-performance humidifier system that regulates both temperature and gas humidity.

- Dew point precision: ± 1 °C from 60 to 90 °C (extendable to 10–120 °C)
- Ultra fast transitions: 80 °C to 20 °C in 20 minutes without overshoot (forced cooling)



Temperature Control

Integrated temperature control allows for consistent operating conditions and real-time monitoring:

- Control range: Room temperature to 100 °C
- Analog output regulation with K-type thermocouple feedback
- Multiple temperature control points between humidifier, cell and condenser to enhance performance



Pressure Control

Backpressure regulation is essential for membrane integrity and system performance. Our platform supports independent pressure control on the anode and cathode, with flexible manual or software-based operation.

- Range: 0.2 to 2 bar
- Precision: ± 0.02 bar
- Ideal for simulating real-world operating conditions



State of the Art Electrochemical Characterization

Electrochemical performance lies at the heart of every fuel cell and electrolyzer evaluation. BioLogic workstations deliver high-resolution measurements with low-noise design and precision control across a wide range of techniques.

- Polarization Curves
- LSV
- Cyclic Voltammetry (CV)



Fully Integrated EIS

Electrochemical Impedance Spectroscopy is a critical tool for diagnosing and optimizing fuel cell and electrolyzer performance. Integrated EIS capability enables detailed analysis without external modules, fully synchronized with gas, temperature, and pressure control.

- Up to 2 kW
- EIS Quality Indicators™: real-time validation of EIS data quality to ensure trustworthy interpretation
- Integrated Control: seamlessly linked with operating parameters (humidity, temperature, pressure) for in-situ diagnostics

Fuel Cells

BluPEM: Reliable, Accurate, Single Cell Testing System

The BluPEM is a complete PEM fuel cell solution. In its standard configuration, it supports fuel cells up to 100 W, and can be customized for systems up to 2 kW, covering nearly all single-cell formats and small stacks. Whether you're testing at low or high power, BluPEM delivers unmatched control and flexibility.

Integrated Potentiostat with EIS

Unlike external load-based setups, BluPEM's built-in potentiostat enables precise voltage and current control with synchronized Electrochemical Impedance Spectroscopy – for cleaner, more reliable data.



Precision Fluidics

Accurate control of gas flow, humidity, pressure, and temperature ensures reproducible test conditions – even during rapid transitions.

Flexible, Customizable Platform

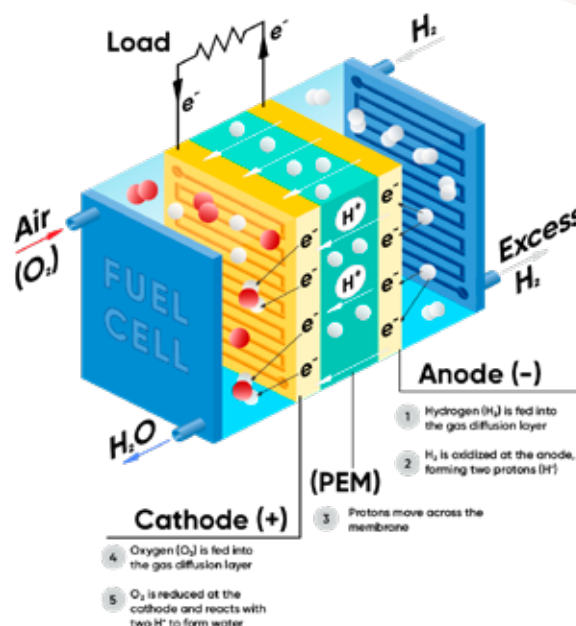
Fully compatible with all BiLogic potentiostats and adaptable to a wide range of cell formats.

Smart, Intuitive Software

Set up complex protocols quickly, run diagnostics, or automate long-term durability tests with ease – all within an integrated software environment.

Built-In Safety

Hardware and software safeguards (including alarms and automated shutdown) support worry-free operation during extended or unattended testing.



Electrolyzers

BluPEM-EL: Precision Control for Demanding Electrolyzer Testing

BluPEM-EL is a modular test station designed for rigorous electrolyzer studies, including PEM, AEM, and alkaline technologies. With fluidic components built to handle corrosive chemistries, and a software-controlled pressure system up to 10 bar, it's ready for demanding lab environments.

Ultra-Flexible Fluidics

Precise temperature control (20°C to 100 °C) is maintained across all water flow rates. Rapid thermal stabilization – e.g., 20 to 90 °C in under 8 minutes at 0.03 L/min – keeps your experiments efficient and repeatable.

High-Purity Compatibility

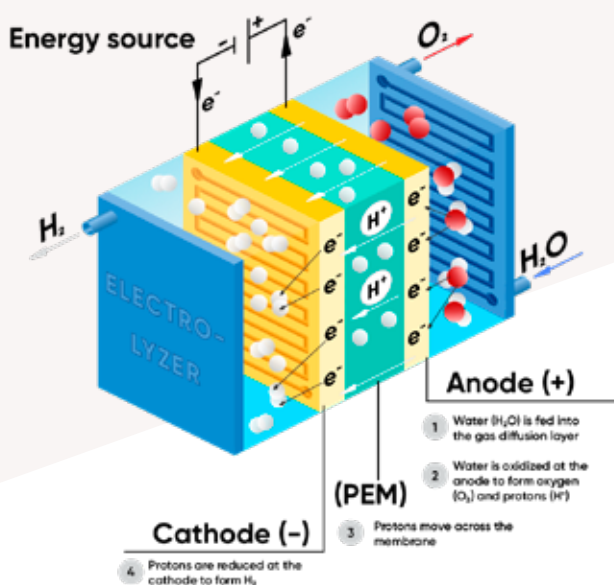
Supports ultra-pure water or alkaline feedstock, with corrosion-resistant fluidic design.

Integrated Gas Management

Optional hydrogen production monitoring and H₂ detection on the O₂ line enhance safety and data completeness.

Potentiostat-Driven Performance

Power your electrolyzer and run advanced diagnostics with any BioLogic potentiostat. Combine DC control with built-in EIS for full impedance characterization – ideal for studying degradation, kinetics, or membrane optimization.



Smart Software for Powerful Electrochemical Insights



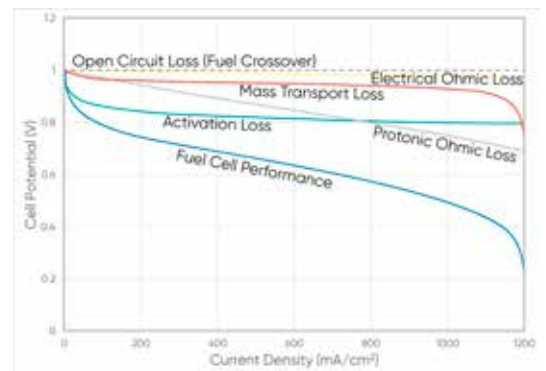
Understanding fuel cell and electrolyzer performance starts with precise electrochemical control – and that’s exactly what our EC-Lab® software delivers. EC-Lab® is BioLogic control and analysis software for our potentiostats which integrates fully with BluPEM workstations. With EC-Lab® you can run advanced protocols with confidence and precision.

EC-Lab® also includes a powerful technique builder, which allows users to create more complex experimental sequences in up to 100 linkable sequences (including wait and loop tasks). With a Modify-on-the-Fly feature, if you need to adapt your parameters during an experiment, you can without having to stop your tests.

From DC Characterization....

Our software empowers you to run core electrochemical tests – like polarization curves and open-circuit voltage (OCV) – with precision and ease. These tools go beyond raw measurement: they help you identify performance losses, optimize test conditions, and evaluate system health in real time.

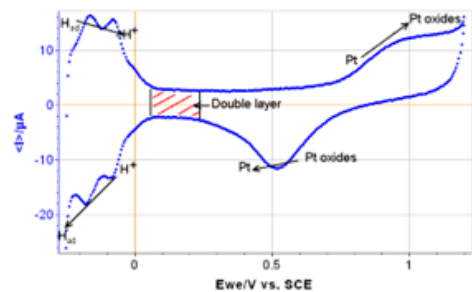
- Polarization curves reveal load-dependent losses and pinpoint the most efficient operating regions under controlled temperature, humidity, gas flow, and pressure.
- OCV measurements provide a fast, non-invasive assessment of membrane integrity and catalyst condition – ideal for baseline checks and quality control.



...to Advanced Technique

When your research demands more than surface-level answers, EC-Lab® delivers pre-configured techniques for BluPEM, so you can launch advanced protocols without scripting or guesswork including:

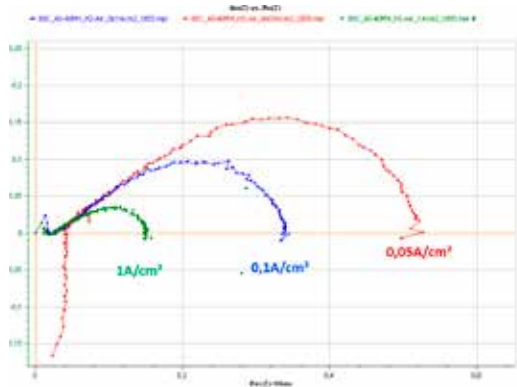
- Cyclic Voltammetry (CV) – reveals the electrochemical active surface area (ECSA) of your catalyst, making it easy to monitor degradation or compare formulations.
- Linear Sweep Voltammetry (LSV) – detects hydrogen crossover – a critical parameter for improving membrane design and fuel cell efficiency.



These techniques are built in and fully customizable, with real-time feedback and intuitive visualizations.

EIS More than an Option

Electrochemical Impedance Spectroscopy (EIS) is one of the most powerful tools available for understanding what's really happening inside a fuel cell or electrolyzer. With BioLogic, you can run high-quality EIS confidently – every time.



Diagnose Performance at Every Level

While DC techniques provide a snapshot of overall behavior, EIS reveals the inner workings. By applying a small AC signal over a range of frequencies, you can separate and identify the contributions of key components – from membrane resistance to charge transfer and mass transport.

- Detect performance losses early
- Isolate degradation mechanisms
- Evaluate membrane and catalyst efficiency
- Optimize cell design with real-time feedback

Whether you're in fuel cell mode (current drawn from the cell) or electrolyzer mode (current applied to the cell), EIS gives you a precise, frequency-based breakdown of your system's behavior.

Fast, Powerful Analysis with ZFit

BioLogic EC-Lab® includes ZFit, which is a reference analysis tool for EIS circuit fitting. The user-friendly interface allows user to:

- Fit data using standard or custom equivalent circuits
- Extract parameters like membrane resistance, double-layer capacitance, charge transfer resistance, and more – in seconds
- Visualize and compare datasets with confidence

ZFit's intuitive interface lets you go from raw data to actionable insight without needing to be an EIS expert.



Typical equivalent circuit for analyzing of fuel cells



BioLogic is the only provider to offer a **fully quantitative** Electrochemical Impedance Spectroscopy Quality Indicator – **EIS QI™** – giving researchers a reliable, objective way to validate EIS data in real time.

Indicators for Total Harmonic Distortion (THD), Non-stationarity distortion, and Signal-to-noise ratio are built directly into the potentiostat's firmware and displayed in the software interface – providing transparent, measurable quality checks for every impedance measurement.

Scalable Power

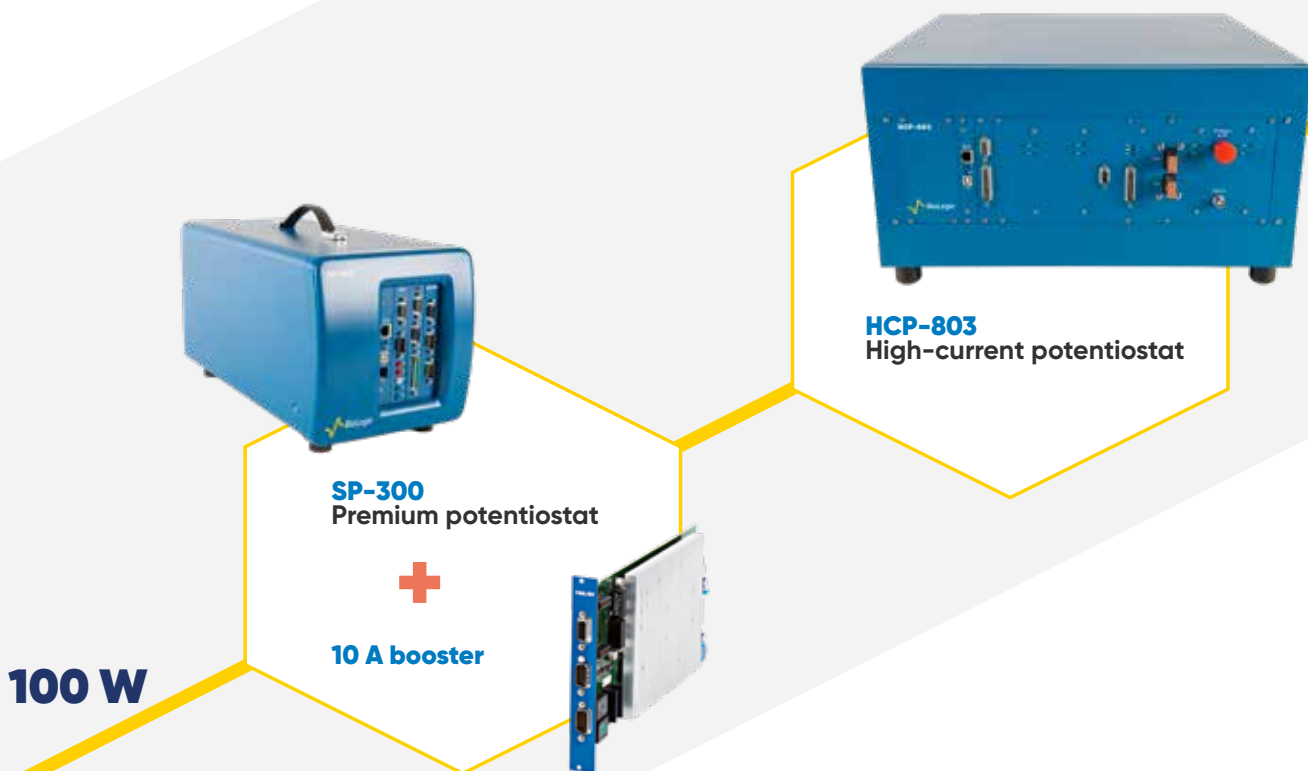
Power Options That Fit Your Fuel Cell and Electrolyzer Requirements

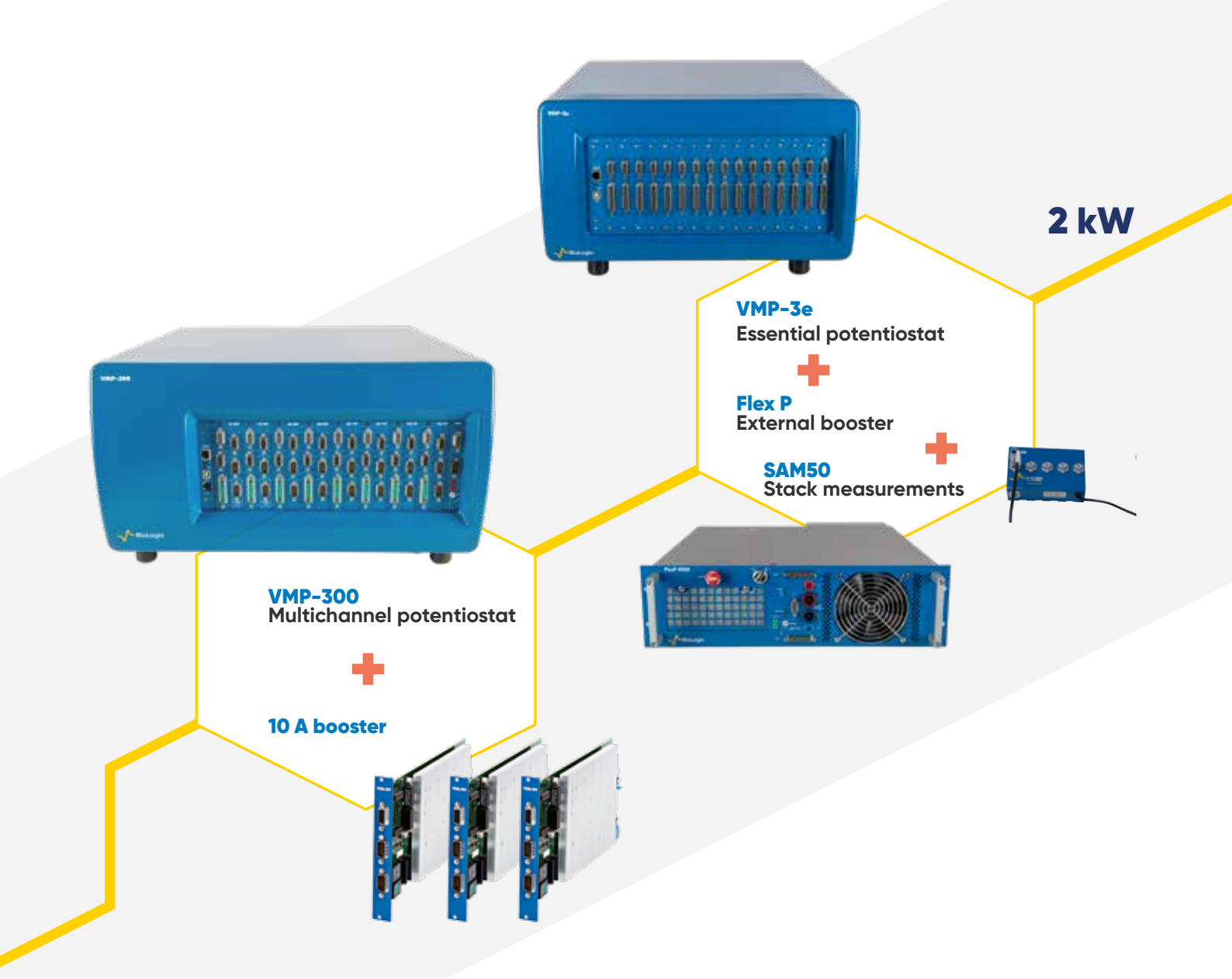


BioLogic offers an extensive selection of potentiostats and boosters to match the scale and complexity of your experiments:

- Single-channel potentiostats for precision studies on individual cells
- Multi-channel solutions for short stack analysis – up to 30 cells in parallel
- DC-only or DC+EIS configurations to match your characterization depth
- Integration with external loads and floating EIS for high-current fuel cell testing
- All configurations benefit from seamless EC-Lab® control, with the BluPEM test bench communicating directly via OLE-COM protocol for synchronized operation

Whether you're testing at 100 W or 2 kW, your power and measurement tools scale can with your needs.





Custom Configurations

Tailored for Your Application

Each BluPEM system is configured at the time of order to match your application and testing requirements. While the fluidics are not modular in the field, the architecture is designed to accommodate a wide range of options during manufacturing:

- Gas flow control: Choose MFCs sized for your gases and desired flow rates
- Environmental control: Temperature, humidity, and pressure systems are scaled to your performance range
- Integrated sensors: Pressure probes, thermocouples, or gas detectors can be included for enhanced monitoring or safety compliance
- Power scalability: Built-to-order configurations support systems up to 2 kW, with compatible potentiostats, boosters, or external loads
- Extended applications: Systems can be adapted for alternative technologies – including SOEC/SOFC – with furnace integration and software control
- Gas mixing capabilities for poisoning studies

BluPEM and BluPEM-EL are purpose-built for your work from the start.

Want to discuss your customization needs?
Our sales network is here to help design the right solution for you.

Detailed Specification

100 W Fuel Cell Test Station

Gas Flow	
Gas anode	H ₂ : mass flow control from 0.04 to 3 L/min*
Gas cathode	Air: mass flow control from 0.05 Up to 5 L/min*
Mass flow accuracy	(+/-) 1% FS
Purge	N ₂ (anode + cathode), max flow 2 L/min
Gas control	Full software control
Gas mixing	Optional
Gas connection	Swagelock fittings
Gas pipes material	Stainless steel SUS316LBA
*For flow >2.5 L/min, water cooling heat exchanger option is required	
Pressure	
Pressure range	0.2 to 2 bars
Pressure precision	(+/-) 0.02 Bars
Pressure control	Manual or software
Humidifier	
Gas Humifier System	Bubbler, automatic refilling
Humidifier Volume	2.1 L (anode and cathode)
Humidifier Temperature Range	Room temperature to 90°C
Humidifier Bypass	Yes
Dew Point Temperature Range	60°C to 80°C
Dew Point Extended Temperature Range	Optional: 20°C to 120°C
Dew Point Control	Software
Dew Point Accuracy	+/-1°C between 60 and 80°C
Dew Point Temperature Drift	<1°C/hour
Current Generator	
Load Current	Defined by potentiostat / booster used
EIS	Yes, defined by potentiostat / booster used
Cell Temperature Control	
Temperature Control	Software control
Temperature Control Range	10°C to 100°C
Control Method	AC heater type
Temperature Fuel Cell Jacket	User provided
Heating Capacity	Around 500W
Condenser	
Operating Ambient Temperature	10°C to 30°C
Heat Exchanger	Water cooled
Condenser Volume	500 mL
Drain Method	Automatic
General Specifications	
Size (W, D, H)	70 cm x 80 cm x 184 cm
Weight	350 kg
Safety Features	Alarms and automatic shutdown
Hydrogen Detectors	Optional

Electrolyze Test Station

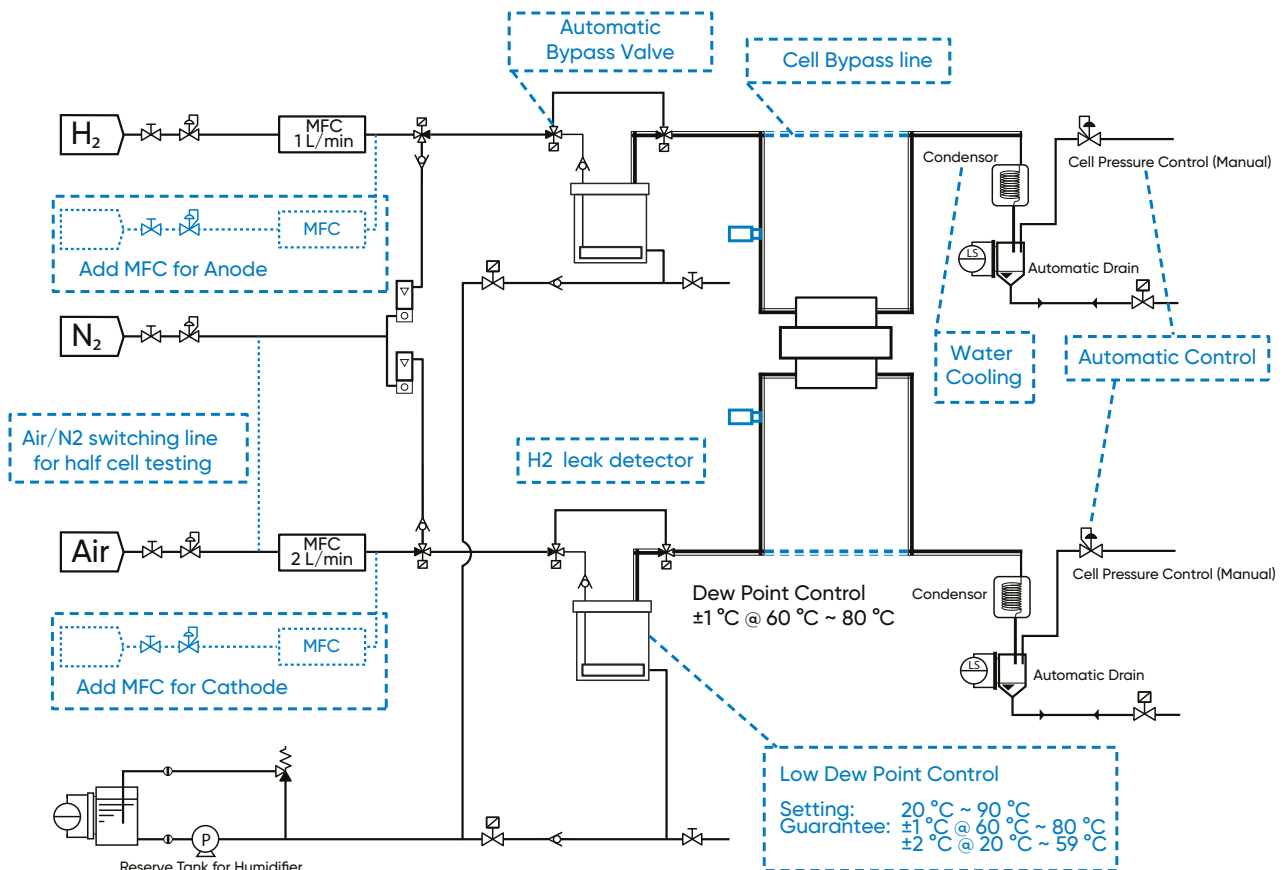
Liquid Flow	
Liquid flow range	0.005 to 0.1 L/min
Flow rate control accuracy	5% of setting
Fluidics control	Fully automated - TFT Software
Gas Flow	
Generated gas flow measurement	Optional
Conductimetry measurements	Optional
Current Generator	
Load current	Defined by potentiostat / booster used
EIS	Yes, defined by potentiostat / booster used
Cell Temperature Control	
Temperature control	Software control
Temperature control range	10 to 90°C
Control method	TC-100
General Specifications	
Size (W, D, H)	70 cm x 80 cm x 184 cm
Weight	350 kg
Safety features	Alarms and automatic shutdown
Hydrogen detectors	Optional

Potentiostats

		Premium	Essential
General			
EIS capability		10 μHz to 7 MHz	10 μHz to 1 MHz
EIS Quality Indicators		Yes	Yes (with "e" type channel board)
Analog Ramp Generator		Yes (1 MV/s), sampling rate 1 μs	n.a.
Floating option		Floating, WE to Ground, CE to Ground	CE to Ground
Permeation (WE to Ground)		Yes	No
Multi-electrode (CE to Ground)		Yes	Yes
Filters		Hardware/software	Software
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 for VSP ±1A for "e" series chassis
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	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	N.A
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	N.A
Current booster	internal	1 A, 2 A, 4 A, 10 A, Up to 150 A	4 A for VSP only
	external	Premium External: HCV-3048 (30A/48 V)	2, 5, 10, 20, 80, 100 A, FlexPO060, FlexPO012 *
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)	±10 V adjustable between [-20 ; +20] V *
Resolution		1 μV on 60 mV	5 μV on 300 mV
Accuracy		< ±1 mV	< 20 mV
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

Fluidic Scheme Configuration

BluPEM Standard Configuration BluPEM Custom Configuration

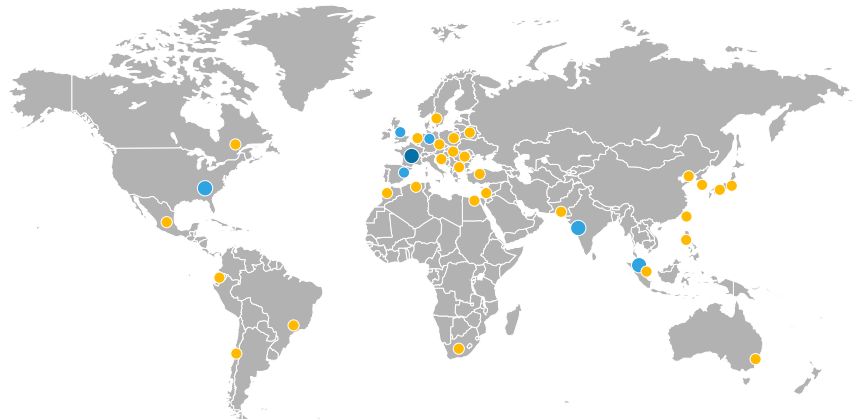


We serve our customers worldwide through our subsidiary offices and our extensive distribution network.

Headquarters

BioLogic SAS

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



● Headquarters ● Subsidiaries ● Distributors

Subsidiary offices

BioLogic USA, LLC

USA
Phone: +1 865 769 3800

BioLogic Spain

Spain
Phone: +34 681 357 873

BioLogic Science Instruments GmbH

Germany
Phone: +49 551 38266900

BioLogic Pvt Ltd

India
Phone: +91 022 46055588

BioLogic Science Instruments Ltd

United Kingdom
Phone: +44 333 012 4056

BioLogic Singapore

Singapore
Phone: +65 92335838

Always by your side. Wherever you are.

We here at BioLogic pride ourselves on the quality and robustness of our instruments. However if you, for whatever reason, encounter a problem with your system, our global support network will help find you a solution quickly and effectively.

If you need more information, or perhaps a little inspiration, you can browse our ever-growing support database with hundreds of Learning Center articles, application/technical notes and support videos at www.biologic.net.



Application notes



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