Catalog

Electrochemistry accessories.

BioLogic.

Your one-stop-shop for accessories and add-ons.

As one of the world's first designers and manufacturers of high-performance electrochemical measurement instruments, BioLogic has forged its place in the international market.

Our comprehensive product portfolio includes cutting-edge scientific products in such diverse applications as electrochemistry, battery testing and fuel cell/material testing.

And supporting these high-precision measurement instruments is an extensive line of product accessories, ranging from sophisticated quartz crystal microbalances to electrodes.

So whatever your field of research, we can provide you with high-quality, hard-wearing equipment.

BioLogic accessories: a one-stop-shop to suit your every need.

BioLogic Add-on instruments.

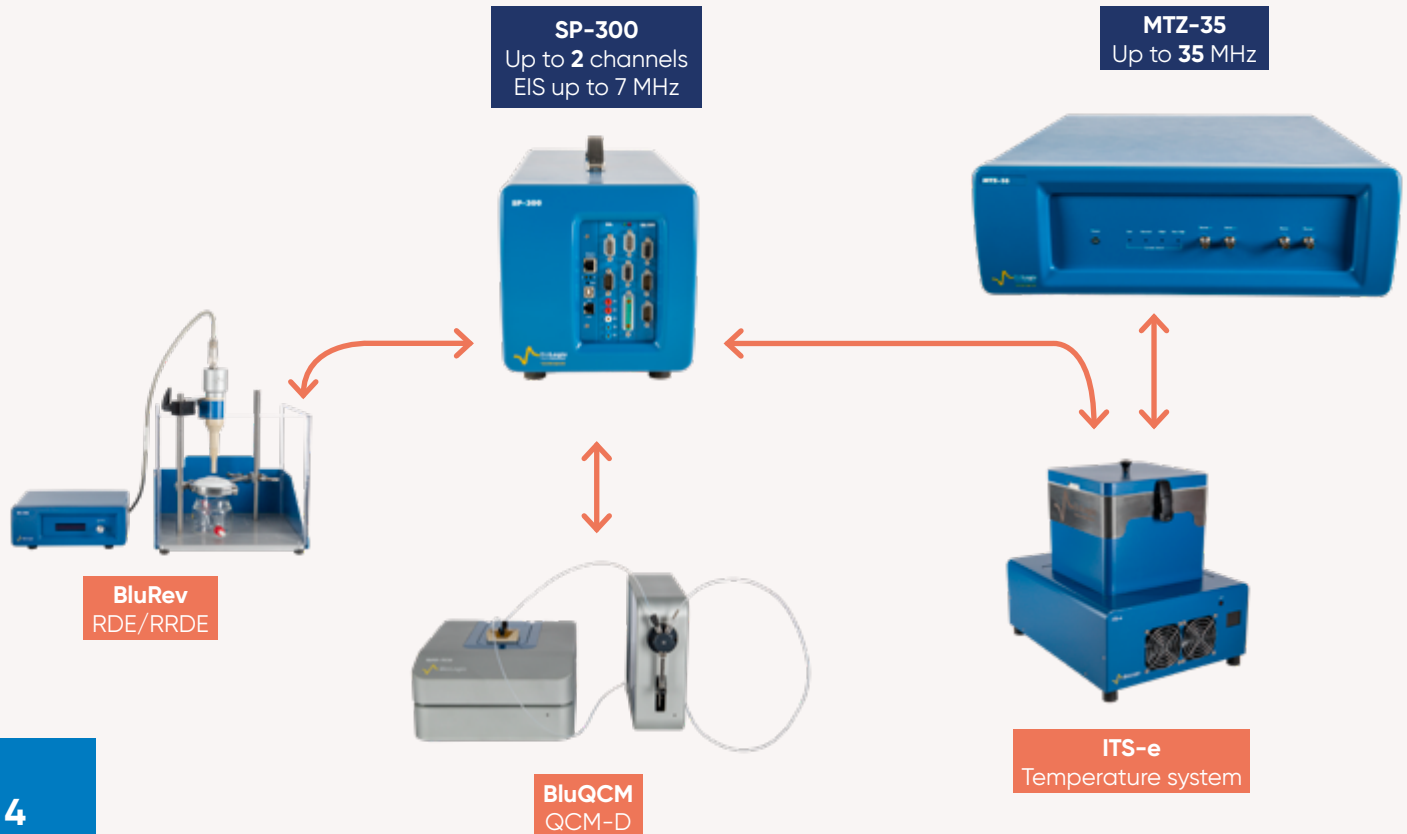
Accessories.

Your partner from A to Z.
Turnkey solutions provider

Master the **full measurement chain** using high quality instruments and accessories.
The quality, reliability and innovation that lies behind BioLogic's product portfolio helps shape the future of research and industry around the world. Take advantage of the **unique specs** of your instruments.

Master the full measurement chain

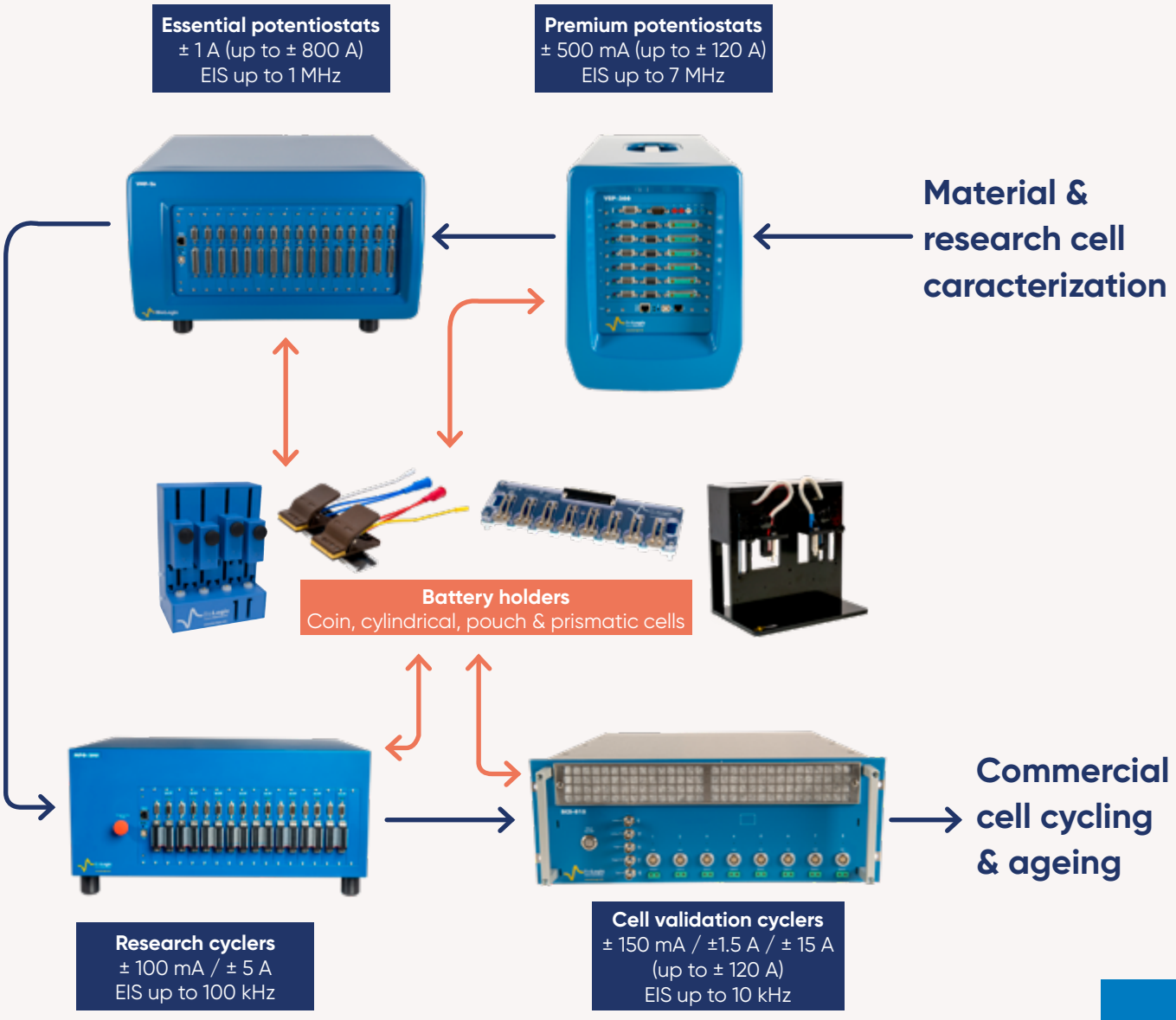
Our range of add-on instruments and accessories are designed to increase the scope of your electrochemical experiments, without compromise: corrosion, material study, electrochemical reactions and much more can be easily and fully addressed.



Battery: from research to industry

Throughout the full battery value chain every single component must be thoroughly tested. This includes anode, cathode, binder, separator, electrolyte all the way to the commercial cell, and there are unique challenges at every step:

- Materials & components research
- Research cell performance & characterization
- Manufacturing process optimization
- Commercial cell validation & ageing
- Screening & benchmarking for modules
- Integration & second life evaluation

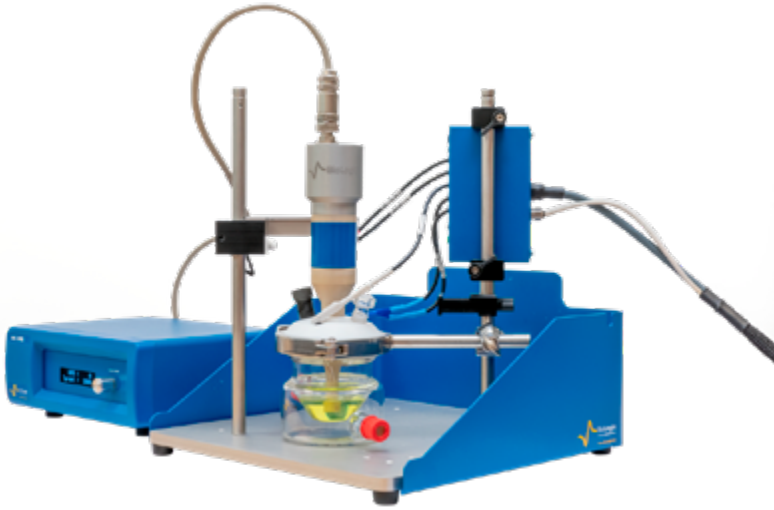


BluRev. Rotating disk/ring disk electrodes

Steady state efficiency

Exploit the power of EC-Lab® with BluRev rotating electrodes

BluRev is a range of robust, versatile rotating disk (RDE) and rotating ring disk (RRDE) electrodes ideal for use with BioLogic potentiostats. A range of quick-fit exchangeable electrode tips (multiple materials/diameters) can be easily added to the body. Driven by EC-Lab® software, an industry standard for potentiostat control software, BluRev instruments can be used independently, or as part of an integrated setup.



A fully integrated solution

The BluRev's custom designed enclosure has been specifically designed to facilitate the operation and set-up of the BluRev RRDE. This makes it easy to hold the RRDE body as well as the BioLogic potentiostat cables. The result is a fully integrated, purpose-built rotating electrode system.

Which one do I need? An RDE or RRDE?

What are the advantages of the extra "R" ?

Click or scan

BluRev Systems

±1 RPM constant accuracy over the whole rotational range

These modular research instruments demonstrate excellent levels of accuracy, particularly at high rotation rates. The RC-10k control unit offers an accuracy of ±1 rpm over the whole rotational range for precise and fully reproducible experimental conditions.

Access the true rotation rate even in very demanding media

BluRev systems are the only devices on the market to display both target and true rates of rotation thanks to the embed optical encoder. Accessing this data can greatly assist users during experiments by enabling them to monitor rotation rates in real-time. Viscous medias will not affect the rotation speed as the system will adapt it accordingly.

Robust, even in highly corrosive conditions

Protect the rotating electrode by connecting it to inert gases. The gas will flow through the shaft inner parts to protect them from corrosion.

Highly compatible

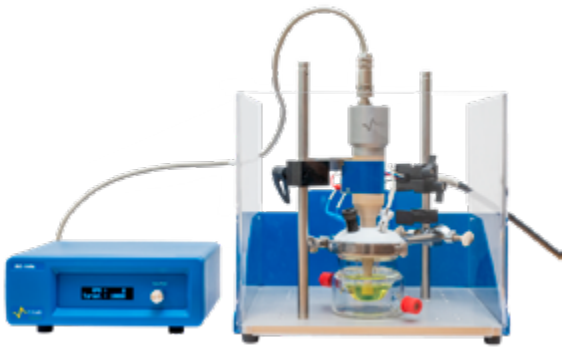
The speed can be set manually or remotely by using the analog output of a BioLogic instrument.

094-RDE without tip

Specifications

	Information
Rotational range/rpm	100 - 10,000 (9000 for RRDE)
Accuracy/rpm	1 typical over the whole rotational range
Runout/mm	<0.1
Setting resolution/rpm	10 (Manual control) or 25 (Remote control)
Materials of RRDE/RDE	PEEK, Al alloy
Inert gas inlet for shaft corrosion protection/mm	Ø 2
Operating temperature/°C	10 - 40
Power	24 Vdc, 1 A max
Max consumption/W	24
Dimensions/mm	RC-10k: 95x227x178 (HxWxD), RDE/RRDE: 233.6 (length with tip)
Weight/kg	RC-10k: 1.00 RDE/RRDE: 0.36 (without tip)

	094-RC/RDE	094-RC/RRDE
Content		
RC-10k Rotation controller	094-RC	
Electrode rotator (motor, shaft, electrode body, Ag/C brushes)	094-RDE	094-RRDE
DB9 to BNC connector for external control of RC-10k	092-22/1	
1 m BNC/BNC cable	Included	
Replacement Ag/C brush	094-RDE-BRUSH	
1 transport case	Included	



BluRev Tips

All standard tip bodies (M6 thread) are made of PEEK, but for experiments requiring a high chemical resistance, PTFE versions are also available.

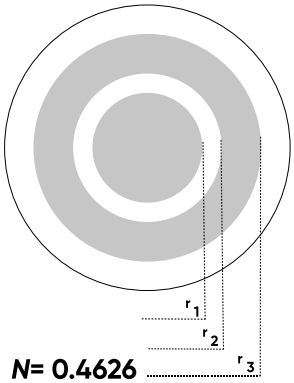
All tips are polished to obtain a final roughness Ra of 50 µm (*Ra = 10 nm for the Boron Doped Diamond tip).

RDE Tips

	Catalog n°
Glassy Carbon (3 mm)	094-GC/3
Glassy Carbon (5 mm)	094-GC/5
Glassy Carbon, PTFE body (3 mm)	094-PTFE-GC/3
Glassy Carbon, PTFE body (5 mm)	094-PTFE-GC/5
Platinum (2 mm), 99.9 %	094-Pt/2
Platinum, PTFE body (3 mm), 99.9 %	094-PTFE-Pt/3
Gold (2 mm), 99.9 %	094-Au/2
Gold, PTFE body (3 mm), 99.9 %	094-PTFE-Au/3
Boron Doped Diamond (3 mm), 500-1000 ppm 500 µm diamond layer	094-BDD/3
Titanium (3 mm), 99.9 %	094-Ti/3
Silver (3mm), 99.9 %	094-Ag/3
Aluminum (3 mm), 99.9 %	094-Al/3
Copper (3 mm), 99.9 %	094-Cu/3
Nickel (3 mm), 99.9 %	094-Ni/3
Stainless steel (3 mm), 99.9 %	094-316L/3

RRDE Tips

	Catalog n°
Glassy Carbon Ring & Disk (Nmax = 0.4626)	094-GC-GC
Pt Ring (99.9 %) - Glassy Carbon Disk (Nmax = 0.4626)	094-Pt-GC



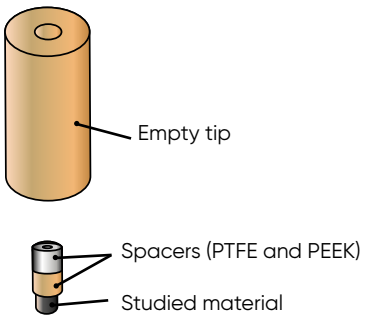
Dimensions/mm: r1 = 1.5 ; r2 = 2 ; r3 = 3.
N = maximum theoretical collection factor using Albery formula.
[1] W. J. Albery and S. Bruckenstein, Trans. Faraday Soc. 62 (1966) 1920.

Disk Replaceable Tip

This solution allows users to put custom designed materials as working electrodes (disks) to perform RDE experiments.

A PEEK empty tip is available to perform experiments on 3 mm OD disks. The material is placed inside the empty tip by using a mounting tool kit and spacers: leak free solution.

	Catalog n°
Mounting tool kit	094-DRE-KIT
3 mm PEEK empty tip	094-DRE/3
Spacer kit (1x PEEK, 3x PTFE)	094-SPACER-KIT
Polishing tip	094-DRE-POLISH



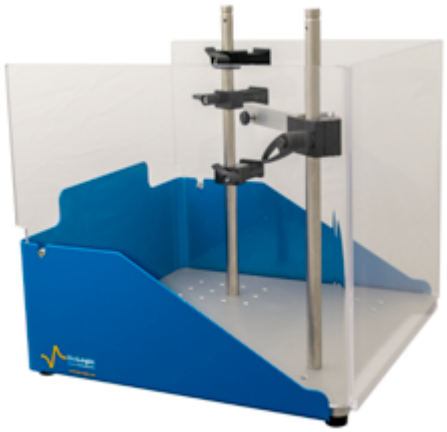
BluRev Cells

The BluRev RDE/RRDE range is compatible with a wide range of cells, in particular the **EL-ELECTRO-80, EL-ELECTRO-80DJ** or **EL-ELECTRO-150DJ** kits.

	Catalog n°
PTFE 5 holes cap compatible with BluRev RDE (needed if you already have an EL-ELECTRO cell)	094-A-CAP

Note: if you already possess one of these cells, you will need a special adaptor cap: **094-A-CAP**.

BluRev Enclosure



	Catalog n°
Protective housing and stand kit for the BluRev	094-ENCL
Contents	
1x stainless steel plate with M6 threaded holes to fix support poles 2x support poles to hold BluRev RDE and the cell 1x clamping flange for the BluRev 3x half-clamps for the potentiostat cables (all BioLogic cables are supported) 1x plexiglas protective housing	
Specifications	
Dimensions with protective housing (HxWxD)/mm	287x318x308
Weight (with protective housing)/kg	5.3

BluRev Background information and theory

RDE

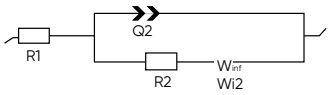
Commonly used techniques...

Levich and Koutecký-Levich are powerful analysis tools used to obtain kinetic electrochemical parameters such as the diffusion coefficient of a redox species in a given medium and the reaction constant *(Application Note #56)*

...advanced EIS based techniques

Fitting impedance measurements made on a redox reaction occurring at a rotating electrode at only one rotation speed also enables the direct measurement of the diffusion coefficient.

By Using ZFit and W_{inf} (BioLogic unique element), it is possible to directly obtain the diffusion coefficient of the species of interest.



For more detailed information please see the EC-Lab application note #66.

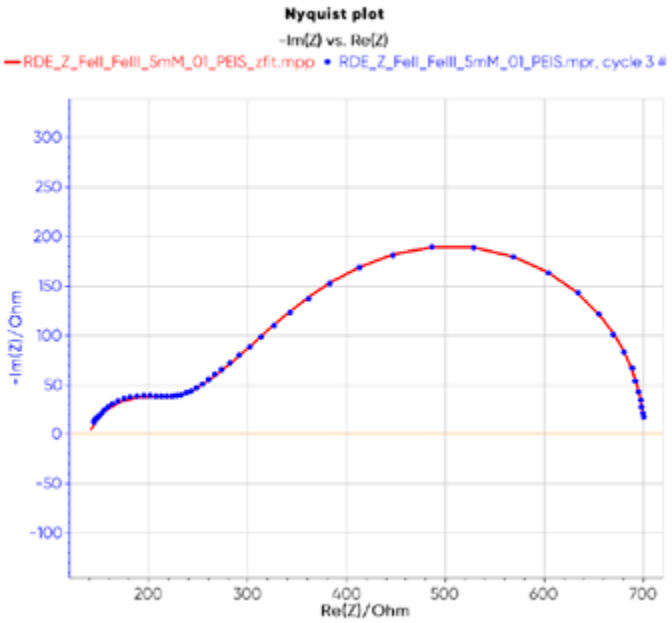


Figure 1: PEIS measurement using an equimolar solution of 5 mM $K_3Fe(CN)_6$ and $K_4Fe(CN)_6$ in 0.1 M KCl and a BluRev RDE at 2000 rpm.

RRDE

BioLogic bipotentiostats

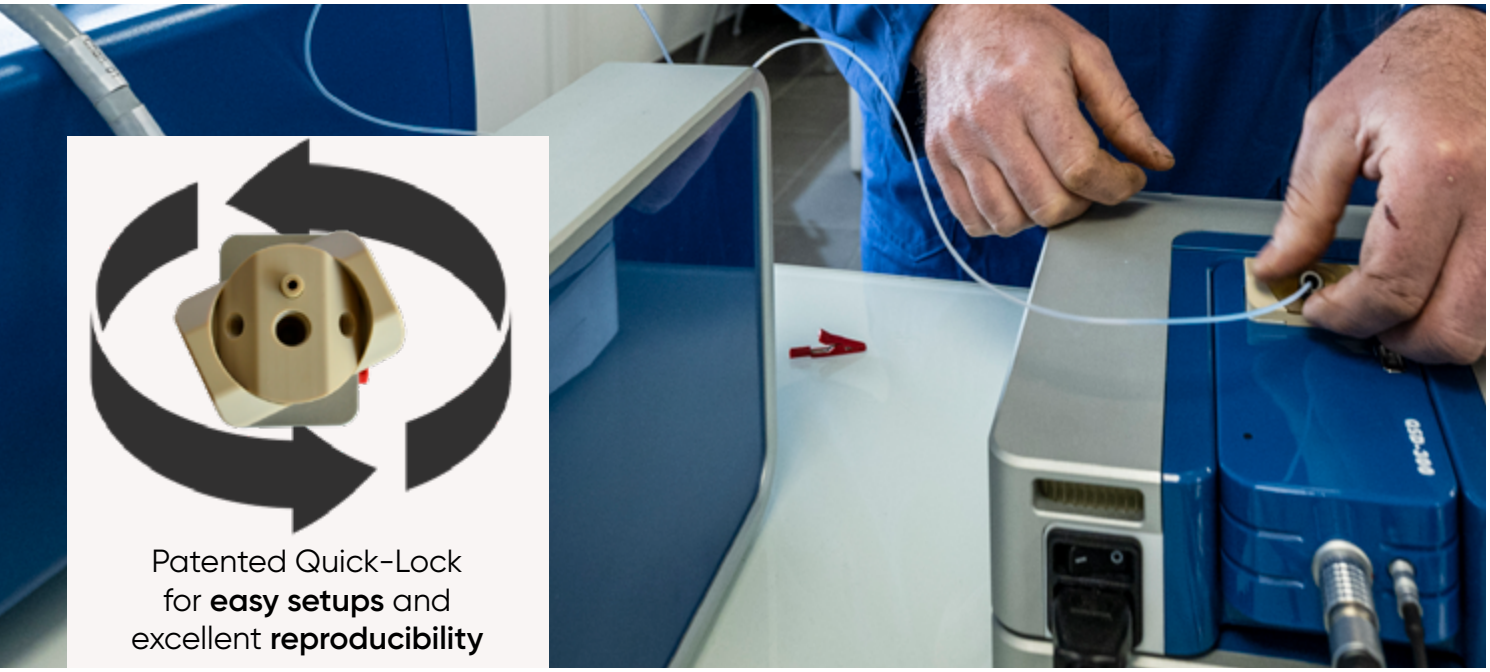
At the disk electrode, the electroactive species are generated depending on the applied potential and detected at the ring. In a typical experiment, a CV is performed on the disk electrode and a constant voltage is applied on the ring electrode. EC-Lab® software embed a CV-CA technique that is dedicated for this purpose ("bipotentiostat" techniques folder).
For RRDE measurements, a bipotentiostat is needed to control both working electrodes. Because of the presence of two working electrodes, a specific connection mode is needed to avoid ground loops: the "CE to Ground" connection mode.

Unique "CE to Ground" connection mode for accurate measurements

The "CE to Ground" connection mode is recommended as it highly reduces risks of current leakage that leads to measurement errors. All BioLogic multichannel potentiostats offer this feature.

BluQCM. Quartz Crystal Microbalance

Small footprint. High-sensitivity/reproducibility.



Patented Quick-Lock for **easy setups** and excellent **reproducibility**

A small footprint and modular QCM-D

The BluQCM is a single channel Quartz Crystal Microbalance. Composed of a base unit and a cell holder, the system can be completed with a temperature control unit that can be directly stacked on top of it. A flow control unit is also available for flow experiments.

The BluQCM is relevant to both electrochemically driven mass weighing applications (electroplating, corrosion, electrode modifications) and the more advanced studies of solid/liquid interfaces.

Benefits of Dissipation measurements (QCM-D)

Measuring dissipation allows to establish the applicability of the Sauerbrey relationship to the interpretation of the frequency shift data in terms of the layer mass: dissipation values can be considered as quality indicators.
Dissipation measurements are also mandatory for quantitative analysis of data from non-Sauerbrey systems such as viscoelastic films and liquids.

160 MHz capabilities, for multiple overtone measurements

Up to 7 overtones, from the fundamental to the 13th one, can be simultaneously measured, enabling a complete determination of the layers' properties. Measurements in air, gas, and liquid are possible.

Articles available on BioLogic Learning Center.
History and measurement principles...

Click or scan

BluQCM Systems

Easy to use cells, for reliable and reproducible measurements

Patented quick-lock sensor cells facilitate setups as well as increase the reproducibility of experiments. Simply turn the head of the cell a quarter turn to obtain a constant and homogeneous pressure on the quartz.

Coupled measurements made possible (eQCM-D)

Using AWS Suite, it is possible to directly control all coupled instruments, including premium potentiostat/galvanostats and the BluQCM with its modules within the same software for eQCM experiments. Mass calculations can be done "on the fly" while measuring. Additional analysis tools are also available.

QSD-300: Quartz Crystal Microbalance

	Information
Sensor	
Frequency range/MHz	4 - 160
Best frequency resolution/Hz	0,1
Best frequency accuracy/Hz	± 0.5
Best mass sensitivity in liquid/pg/cm^2	50
Best dissipation sensitivity	10^{-7}
System	
Simultaneous overtones measurements	Up to 7 (up to 13th)
Max. acquisition rate/points/s	250
Measurement in air	Yes
Coupled measurement compatibility	BioLogic premium potentiostats/galvanostats
Operation modes	Tracking and high resolution at single and multiple overtones
Dimensions (HxWxD)/mm	90x220x260
Weight/kg	3
Catalog n°	
BluQCM QSD-300	**AW-QSD-300**

FCU: Flow Control Unit

	Information
General function	
Syringe volume/µL	250 (default)*
Flow rate range for a 250 µL syringe/µL/min**	12.5-14500 (Standard) 0.625-1062.5 (Smooth)
Dimensions (H x W x D)/mm	195x70x250
Weight/kg	0.75
Catalog n°	
Standard flow control unit	**AW-QSD-FCU**
Smooth flow control unit	**AW-QSD-FCUS**

*Other syringe volumes are available upon request, from 12.5 µL to 5000 µL

** Flow rates depend on the syringe volume. For the standard flow unit, the flow rate change is 0.6250 - 290000 µL/min. For the smooth flow unit, it is 0.0313-21250 µL/min.

TCU: Temperature Control Unit

	Information
General function	
Temperature control range/°C	15-45
Temperature stability/°C	±0.05
Dimensions (H x W x D)/mm	60x220x260
Weight/kg	4.5
Catalog n°	
BluQCM QSD-TCU	**AW-QSD-TCU**

BluQCM Cells

eQCM

In-batch eQCM	Flow eQCM	Hermetic Li research in batch
		
AW-BEQ01Q (14 mm sensor) **AW-BEQATQ** (Air-tight type) **AW-BEQ02Q** (1" sensor)	**AW-FEQ01Q** (14 mm sensor)	**AW-BEQLIQ** (14 mm sensor)

Reference and counter electrodes have to be purchased separately (except for eQCM flow cells where the Pt plate counter electrode is integrated in the lid of the cell).

	Reference electrode		Counter electrode
	Aqueous	Non-aqueous	
In-batch eQCM cells	RE-1B **A-012167**	RE-7N **A-013848**	Pt wire 23 cm coiled **A-002234**
Flow eQCM cells	RE-1S **A-012168**	RE-7SN **A-013849**	Pt disk integrated in the cell lid

QCM

In-batch	Flow	In-batch probe
		
AW-BQ01Q (14 mm sensor) **AW-BQ02Q** (1" sensor) **AW-BQ01HQ** (HFF sensor)	**AW-FQ01Q** (14 mm sensor) **AW-FQ01HQ** (HFF sensor)	**AW-PEQ11Q** (14 mm sensor)

BluQCM Sensors

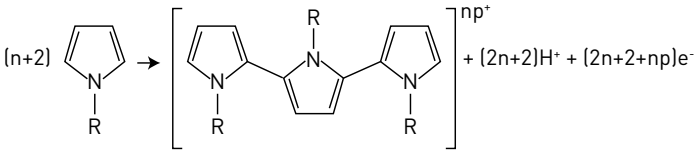
Sensor type	Substrate	Material	Resonant freq./MHz	Finish	Quantity	Catalog N°
14 mm WRAPPED	Ti	Au	5	Polished	10	**AW-R5AU11P**
	Ti	Au	5	Rough	10	**AW-R5AU11**
	Cr	Au	5	Polished	10	**AW-R5AU10P**
	Cr	SiO_2 over Au	5	Polished	10	**AW-R5SIO2P**
	-	Al	5	Polished	10	**AW-R5ALP**
	-	Cu	5	Polished	10	**AW-R5CUP**
	Ti	Au	10	Polished	10	**AW-R10AU11P**
	-	Pt	10	Polished	10	**AW-R10PT10P**
	-	C	10	Polished	10	**AW-R10C10P**

Sensor type	Substrate	Material	Resonant freq./MHz	Finish	Quantity	Catalog N°
1 INCH	Ti	Au	5	Polished	5	AW-R5AU21P
	Cr	Au	5	Polished	5	AW-R5AU20P
	-	Pt	5	Polished	5	AW-R5PT20P
	Ti	Au	9	Polished	5	AW-R9AU21P
	Ti	Au	9	Rough	5	AW-R9AU21
HFF-QCM	Cr	Au	50	-	5	AW-R50AU01H
	Cr	Au	100	-	5	AW-R100AU01H
	Cr	Au	150	-	5	AW-R150AU01H

BluQCM Background information and theory

Electropolymerization of pyrrol

The polypyrrol film was deposited on an Au-coated quartz using cyclic voltammetry (twenty cycles).



The quartz electrode was immersed in an acetonitrile solution (Bu_4NPF_6 0.2 mol/L) containing a solution of 1 methylpyrrol monomer (0.01 mol/L).

(1): G. Sauerbrey, Phys. Verh., 1957, 8, 113-114.
(2): G. Sauerbrey, Z. Phys., 1959, 155, 206-222.
(3): Application note #13. Section "Apps & literature of EC-Lab division".

Polypyrrol film growth on the quartz working electrode

Fig. 1 represents polypyrrol film growth on the quartz electrode during successive cycles of cyclic voltammetry. The reversibility of the charge transfer in such a polymer film is often dependent on the deposition mode (quasi-reversible in this example). This growth is very regular but tends to slow down during the last cycles. This can be due to an interfacial depletion of the solution in methyl pyrrol species in the layer close to the electrode surface and to a saturation of the working electrode surface area.

QCM measurements during the film growth

Fig. 1 shows the resonant frequency decrease and the resonant resistance increase while the polymer film is growing. Moreover, the variation is dependent on the potential sweep resulting in a pseudo oscillation of frequency and resistance related to successive cycles. This plot can also be made versus potential (see Fig. 1).

Fig. 1: overlaid frequency and current vs. E_{we} of the polymer film growth. Scanning at 100mV/s between 0 and 1.018V.
Fig. 2: graphic zoom on one cycle showing the renant frequency and the current density versus elapsed time[3].

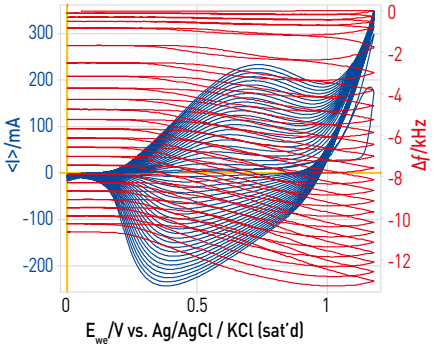
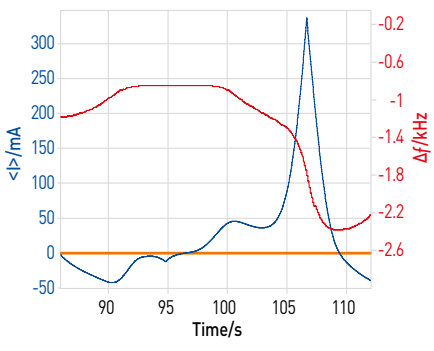


Fig. 1



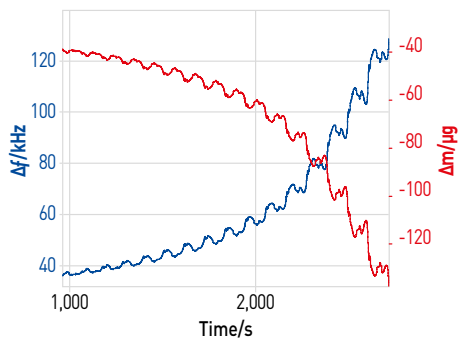
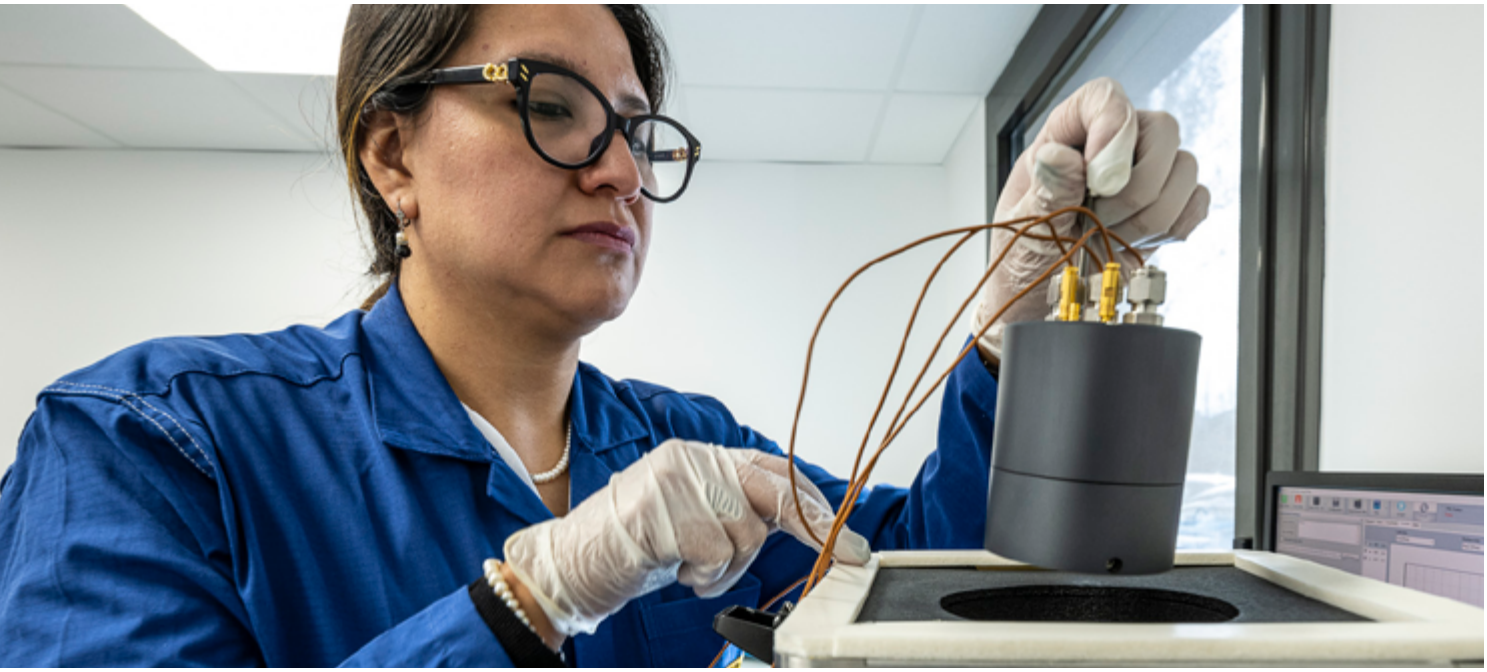


Fig. 2

Temperature Control Unit.

Mastering the samples' temperature for electrical characterization of materials.



ITS-e

A small-footprint benchtop temperature chamber

The intermediate temperature system allows accurate temperature control between -35°C and +150°C. This is a good alternative to the larger conventional climatic chambers available on the market. Thanks to its small chamber, the temperature homogeneity is much better than in conventional chambers and leads to more reproducible measurements.

Application oriented

The ITS-e is dedicated to control the material's temperature for its electrical characterization.
It can also be used for thermal curing and aging and for the determination of some kinetic or thermodynamic parameters like activation energy, phase transformation or glass transition temperatures.

Fully integrated and compatible with BioLogic products

The ITS-e is compatible with the MTZ-35 impedance analyzer and with BioLogic potentiostats. It allows users to easily set up their electrical and electrochemical experiments thanks to EC-Lab® or MT-Lab® software.

Specifications

	Information
Temperature range /°C	-35 to +150
Temperature accuracy /°C	± 0.3
Input voltage	115 V / 230 V, 50/60 Hz
Computer Interface	USB or Ethernet
Power consumption /W	250
Dimension /mm	400 x 313 x 385 (HxWxD)
Weight /kg	8
Catalog n°	
ITS-e	**097-140e**

CESH-e

A leak-tight sample holder for controlled atmosphere study

The Controlled Environment Sample Holder is a leak-tight (up to 2 bar relative) sample holder for the electrical characterization of hard, powdered, pasty and soft materials. Oxygen and moisture sensitive samples can be prepared in a glove box and then placed inside the CESH-e.
The CESH-e can be used as standalone, or inside an ITS-e or a climate chamber.

Constant contact pressure and thickness measurement

A thickness measurement kit including a micrometer head with a calibrated ratchet is provided as an option to ensure the accurate measurement of the thickness of the sample (ASTM D374). This also enables reproducible pressure (100 N or 6 N respectively) to study flexible and compressible materials.

	Information
Operating temperature /°C	–40 to 150
Max sample diameter /mm	30
Max sample thickness /mm	4
Core material	Anodized aluminum
Electrode material	Gold plated copper
Dimension /mm D 79 x H 94 mm	79x94 (Diameter x Height) 121.90 clearance
Residual capacitance with 20 mm diameter /pF	8
Weight /kg	0.9
To be used	Standalone or with ITS-e or climate chamber
Catalog n°	
CESH-e	**097-150e**
Thickness measurement kit	**097-150e/10**
Cable kit for CESH-e and MTZ-35	**097-150e/01**
Cable kit for CESH-e and Potentiostat	**097-150e/02**

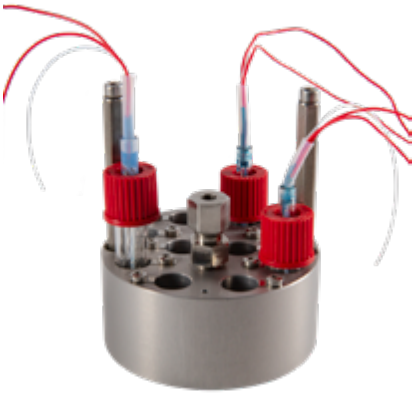
Electrodes

Thanks to its modular electrodes setup, the CESH-e allows Through-plane and In-plane electrical measurements using interchangeable electrodes.

(Left) In-plane / (Right) Trough-plane

In-plane	Trough plane
	
097-150/IPSD (standard) (10 mm) **097-150/IP250** (250 µm) **097-150/IP100** (100 µm)	**097-150/TP20** (20 mm diameter) **097-150/TP12** (1/2" diameter) **097-150/TP06** (1/4" diameter)

HTCC



High Temperature Conductivity cell (up to 180°C)

The HTCC is a sealed 2-pole conductivity cell composed of two parallel platinum electrodes. Its design allows measurements from -50°C up to 180°C. With a nominal constant of 1.0 cm^{-1}, conductivities from 2 $\mu S \cdot cm^{-1}$ to 0.2 $S \cdot cm^{-1}$ can be measured.

Platinized and non-platinized electrodes

The platinized electrodes are coated with a black platinum layer in order to increase the effective surface area of the electrode. 0.5 mL of liquid/gel is only required, reducing the cost of experiments and their environmental impact. The cells are compatible with the ITS-e.

	Information
Cell type	Platinum parallel plates on glass holder
Connections	2-wire (l = 70 cm each)
Nominal constant /cm-1	1 ± 10 %
Minimal sample volume /mL	0.5
Conductivity range /µS.cm	2 to 200 000
Temperature range /°C	−50 to +180
Maximum temperature ramp for platinized cell /°C/min	1 (to avoid platinum detachment)
Compatible with	Potentiostat, MTZ-35, ITS-e
Catalog n°	
Platinized (x1)	**098-010/10**
Non-platinized (x1)	**098-010/11**

HTF-1100

High Temperature Furnace (up to 1100°C)

The HTF-1100 is a horizontal laboratory tube furnace dedicated to the electrical characterization of materials and for heat treatment in the range between ambient temperature and 1100°C.

Manual and remote control

The HTF-1100 can be controlled by using the Watlow controller or MT-Lab® software. Its controller facilitates the set-up and consequent monitoring of the temperature during tests. The controlled temperature can be based on a k-type thermocouple placed in the bottom of the furnace or one placed inside the sample holder (HTSH-1100): accurate control and measurement of the temperature close to the sample.

	Information
Temperature range /°C	Ambient up to 1100°C
Temperature control accuracy /°C	< ± 1
Temperature ramp /°C/min	Adjustable from 0.1 to 20
Insulation material	Alumina Fiber
Temperature sensors	K-Type Thermocouple
Safety Features	Emergency stop button Buzzer sound alarm Temperature safety limit
Catalog n°	
HTF-1100	**097-111**

HTSH-1100

The furnace accommodates multiple tubular High Temperature Sample Holders (HTSH-1100). It can operate under controlled environment conditions with inert or active gas (Ar, N_2, O_2, etc) and with variable pressures up to 2 bar relative thanks to its gas inlet/outlet and quartz tube and safety valve.

	Information
Temperature range /°C	Ambient up to 1100
Quartz tube dimension /mm	45.5x270.5 (Diameter x Height)
Electrodes diameters /mm	3 / 12 / 25
Electrodes material	High purity Platinum disc (1 mm thickness)
Maximum sample diameter /mm	27
Maximum sample thickness /mm	5
Temperature probe	K-Type thermocouple (inconel shielded)
Water cooling	Tube included for water cooling when using T > 800°C
Dimension (including quartz tube) /mm	80x310.5 (Diameter x Height)
Weight /kg	1.2
Catalog n°	
HSTF-1100, 3 mm diameter electrode	**097-130/S**
HSTF-1100, 12 mm diameter electrode	**097-132/S**
HSTF-1100, 25 mm diameter electrode	**097-133/S**

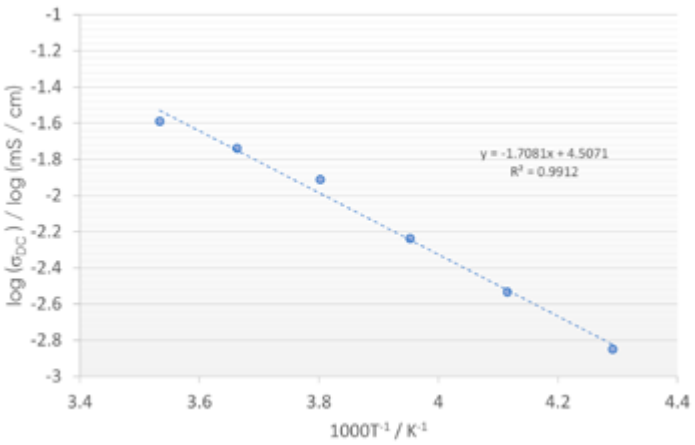
TCU Background information and theory

Battery component researches

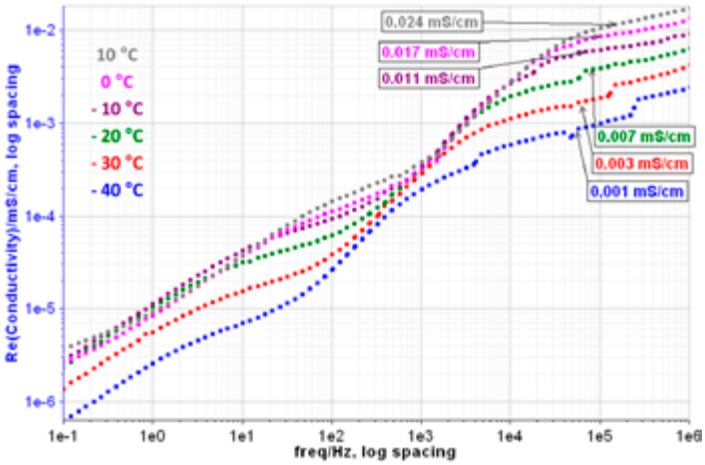
Researching components for batteries often requires precise data over a large temperature range to determine how temperature affects ionic conductivity. With precise electric conductivity measurements collected over a range of temperatures, EC-Lab® is able to calculate the material's activation energy, and thus determine the temperature stability of a material.

Advanced temperature control

A solid electrolyte sample is loaded inside a CESH-e and put inside an ITS-e to collect multiple impedance measurements at various temperatures. EC-Lab® software is used to control both VMP-300 potentiostat and ITS-e by using the TCU server.



Arrhenius plot for the bulk conductivity of solid electrode: Temperature intervals of 10°C from -40°C to 10°C



AC conductivity obtained from EIS data: Temperature intervals of 10°C from -40°C to 10°C

Determine the activation energy (Arrhenius plot)

By setting the sample's thickness and diameter, EC-Lab® can calculate the sample cell constant (k) and directly use it to plot the electrical conductivity as a function of frequency: DC conductivities can then be extracted from the pseudo-plateau found in the high frequency domain (shown above). By using this information, the activation energy for the materials conductivity can be determined from an Arrhenius plot, shown on the left (0.14 eV).

A low activation energy indicates that the material's ionic conductivity will remain stable when exposed to temperature extreams and the material can be used for applications in a wider range of temperature environments.

BioLogic

Premium.

When only the best will do

VMP-300 16 channels,
± 150 A down to 100 fA

SP-200
1 Channel, ± 500 mA
down to 100 fA

SP-240
1 Channel, ± 4 A
down to 100 fA

SP-300
2 Channels, ± 10 A
down to 100 fA

VSP-300
6 Channels, ± 40
A down to 100 fA

BioLogic Premium is a range of state-of-the-art potentiostats designed for researchers who need the fastest, most precise, potentiostats available.

Premium potentiostats boast some of the most powerful specifications available: 100 fA to 150 A, 7 MHz EIS measurements and a sampling rate that can reach 1 data point every µs.

Premium by name. Premium by nature.

Click or scan

Shaping the future. Together.

Essential.

Tools for Electrochemists

BioLogic

VMP-3e, 16 channels,
± 1 A down to 20 nA

SP-50e
1 channel, ± 1 A
down to 20 nA

SP-150e
2 channels, ± 1 A
down to 20 nA

VSP-3e
8 channels, ± 1 A
down to 20 nA

A range of powerful, modular, high-precision, research-grade potentiostats built to handle almost any academic or industrial application imaginable.

From 1 to 16 channels. 1 A (native), up to 800 A with boosters, EIS and Quality Indicators.

Essential measurement tools. Whatever your area of specialisation.

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www.biologic.net

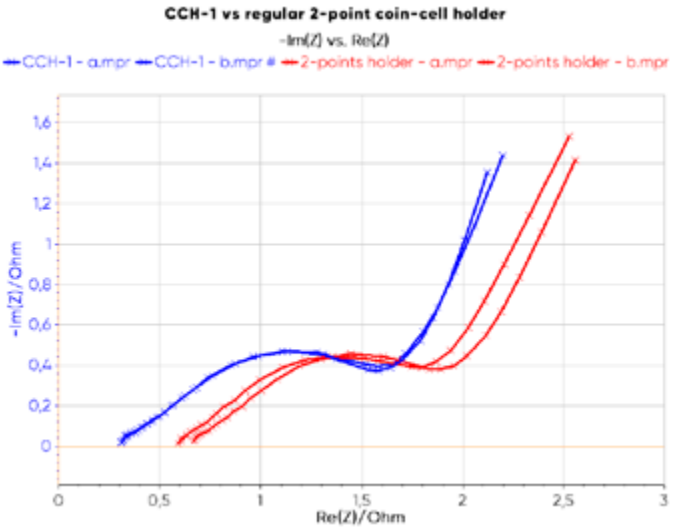
Battery Accessories. Four point cell holders

More reliable measurements, higher repeatability levels.

Four points are better than two

By measuring only the impedance of the cell, a 4-point connection battery holder enables reliable and repeatable measurements. Its design negates measurements of connector and holder-related impedances.

All of our battery holders, with the exception of the CCH model, are built around the 4-point connection design.



Coin Cell Holders

CCH-1

4-point measurement

CCH

	CCH-1	CCH-8	CCH
Cell max diameter/mm	24		
Cell height/mm	1.6 - 3.2		3
Number of channels	1	8	4
Measurement type 4/2 point	4 point		2 point
To be used with	Any instruments		MPG2
			VMP3, VMP-3e
Climatic chamber compatibility	Yes (-30 to 80°C)	Yes (-30 to 80°C)	No
Catalog n°	**096-126**	**096-128/H** Cables must be purchased separately	**092-22/14**

CCH-8 Cables

CCH-8

4-point measurement

Compatible with	Length	Catalog n°
BCS-805 BCS-810	2.5 m	**096-128/C25**
	5 m	**096-128/C50**
VSP / VSP-3e VMP-3e VSP-300 VMP-300 MPG2	75 cm	**092-22/24a**
	2.5 m	**092-22/24b**

Why four point measurements?

What are the benefits of using our battery holders?

Click or scan

Cylindrical Cell Holders

4-point measurement

BH-1i

2 and 4 mm receptacles are available for the current (power) cables. For voltage (sense) cables, only 2 mm receptacles are available.

4-point measurement

CBH-8

4 mm receptacles are available for the current (power) and voltage (sense) cables.

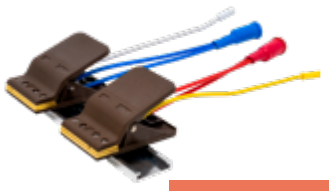
4-point measurement

CBH-4

	BH-1i	CBH-4	CBH-8
Cell max diameter/mm	26	60	
Cell min height/mm	0	30	
Cell max height/mm	76	100	
Number of channels	4	4	8
Max current/A	12	32	
Measurement type	4 point	4 point	
Receptacles diameter/mm	2 and 4	4	
To be used with	All instruments		
Max operating T/°C	60	80	
Size : HxWxD/mm	205x150x95	335x260x150	335x520x150
Weight/kg	0.6	1.9	3.8
Catalog n°	**092-22/15**	**092-C32/4**	**092-C32/8**

More reliable measurements, higher repeatability levels.

Pouch Cell Holders



4-point measurement

PBH-125

	PBH-125	PBH-150	PBH-4	PBH-8
Min leads separation distance/mm	0		12	
Max leads separation distance/mm	110*		44	
Number of channels	1		4	8
Max current/A	25	50	32	
Measurement type	4 point			
Receptacles diameter/mm	4 (power) 2 (voltage)	6 (power)** 4 (voltage)	4	
To be used with	All instruments			
Max operating T/°C	80	100	80	
Size : HxWxD/mm	40x50x210***		135x325x180	135x650x180
Weight/kg	0.2***		1.9	3.8
Catalog n°	092-P25/1	092-P50/1	092-P32/4	092-P32/8

*Measured using the guide rail and the middle of the clamp.
Eyelet ring (connection kit **094-110/CNT can be used for an easier connection to 6 mm diameter cables).
***Measured with the two clamps mounted on the guide rail.

PBH-4

4-point measurement

PBH-4 & PBH-8 holders

4 mm receptacles are available for the current (power) and voltage (sense) cables.

Prismatic and Pouch Cell Holders

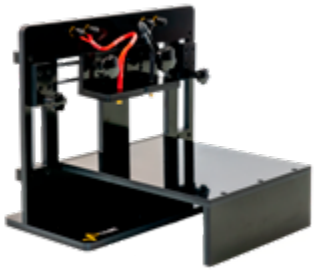
PPBH-1100

4-point measurement

	PPBH-132	PPBH-1100
Cell min height/mm	0	
Cell max height/mm	139	
Min leads separation distance/mm	66	
Max leads separation distance/mm	155	
Number of channels	1	
Max current/A	32	100
Measurement type	4 point	
Receptacles diameter/mm	4 (power and sense)	4 (power and sense) and 6 (power)
To be used with	All instruments	
Max operating T/°C	80	
Size : HxWxD/mm	265x320x300	320x320x360
Weight/kg	3	5.1
Catalog n°	092-PC32/1	092-PC100/1

Pouch cell and prismatic holder

4 mm receptacles can be used for currents up to 32 A. For higher currents, the 6 mm flush mounting plugs should be used. These are compatible with FlexP 0160, HCV-3048, CC4-60A and CC8 cables.



4-point measurement

PPBH-132

Pouch cell and prismatic holder

4 mm receptacles are available for the current (power) and voltage (sense) cables.

Current Collectors

BioLogic's current collectors offer the possibility to connect several channels in parallel and increase the maximum current that can be passed through the cell, in order to simplify and reduce the footprint of your setup.

CC8

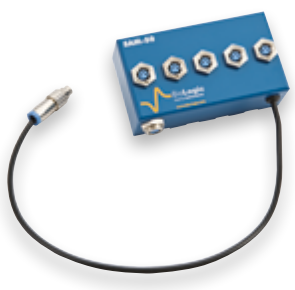
CC4-60A

CC4-200A

	CC4-60A	CC8	CC4-200A
Connection details			
Input			
Power cables/receptacles diameter/mm	4		6 (IP2x)
Voltage sense receptacles diameter/mm	2		4
Number of input channels	4	8	4
Max current/channel/A	15		50
Output			
Power receptacles diameter/mm	6 (IP2x)		8 (Amphenol, IP2x)
Voltage sense receptacles diameter/mm	2 (IP2x)		4 (IP2x)
Max output current/A	60	120	200
Cables details			
Output power cables	1 pair of 2 m power cables with 6 mm receptacles		1 pair of 2.5 m power cables with 8 mm receptacles and M8 threads
Output voltage cables	1 pair of 2 m sense cables with 2 mm banana plugs		1 pair of 2.5 m sense cables with 4 mm banana plugs
Instrument compatibility	BCS-815* VSP-300 VMP-300		FlexP0160 FlexP0060 HCV-3048
Included connection kit	**094-110/CNT**		**093-200/CNT**
Measurement type	4 point		
Max operating T/°C	80		
Size (with feet) : HxWxD /mm	70x170x88	70x300x88	120x248x169
Weight/kg	3.8		
Catalog n°	**096-022**	**096-015**	**093-100/CC4**

*The CC8 comes with BCS tablets and cables. It is also compatible with the VSP-300 and VMP-300 and can be provided without cables and tablets using the following part number: **096-015/1.**

Sense Adapter Module (SAM-50)



This can be added to a multi-channel system to perform stack measurements up to 60 V for 5 channel boards and a 10-element measurement. 3 SAM-50s can be linked to track up to 30 elements.

Sense Adapter Module	Catalog n°
SAM-50	**092-26**

SAM-50

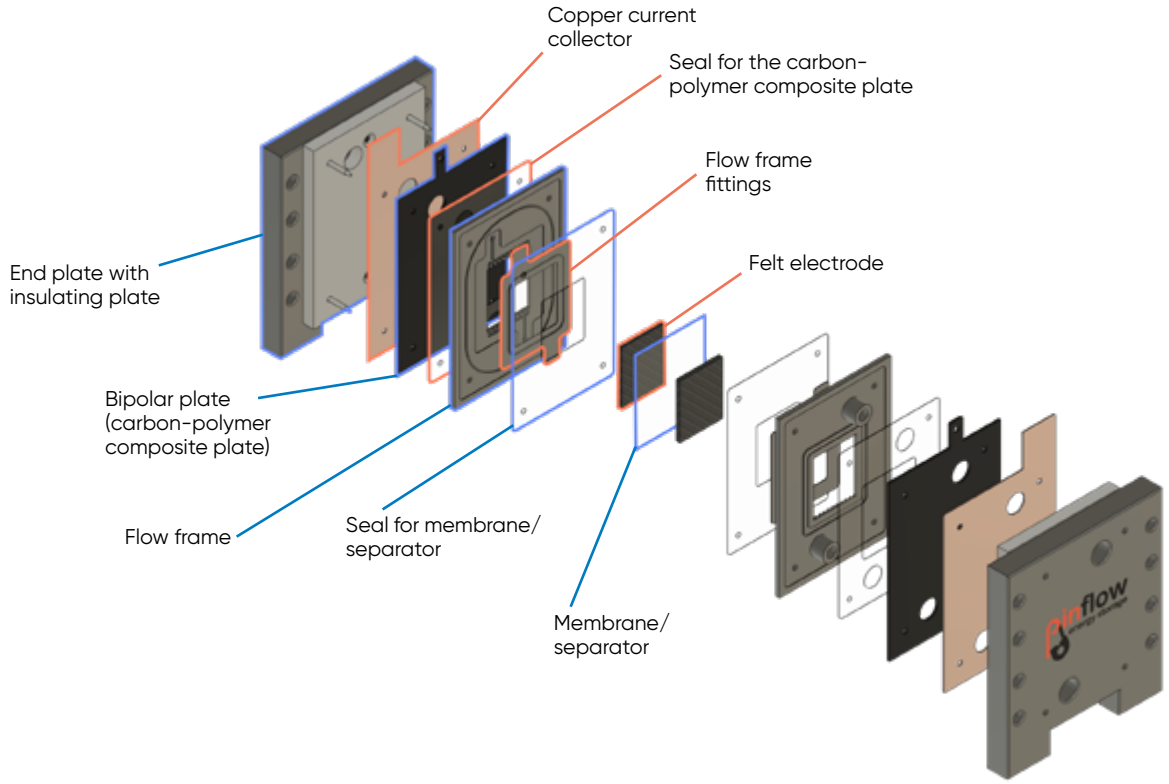
Redox Flow Battery Cells

This range of redox flow battery cells are manufactured by **Pinflow energy storage**.

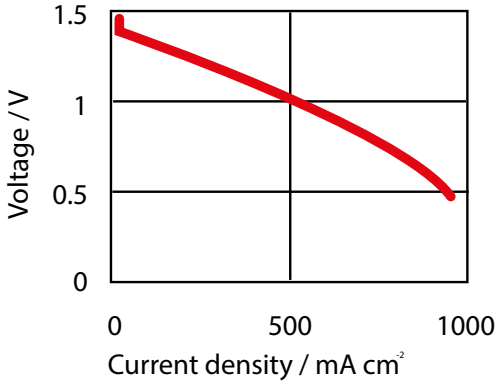
BioLogic provides two types of redox flow batteries with two different active surface areas: 5 cm^2 and 20 cm^2. This package allows you to work with both aqueous or organic electrolytes depending on your research needs or studies. Ready to use out of the box, we have different testing packages available that consist of 8 felts and 4 membranes. You can choose between Fumasep F-1850, mutliple Nafion types or VANADion membranes.

Sealings and bipolar plates can also be purchased separately as spare parts.

Complete turnkey setups with climatic chambers and flow control are also available. Please ask your local reseller for more information or see the table below.



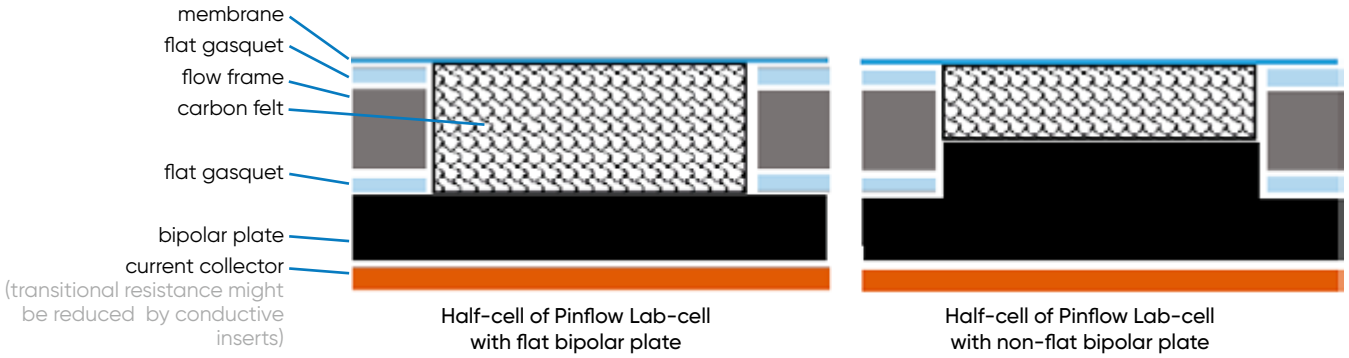
Pinflow RFB cells exhibit low internal resistance as can be seen on the following curve. Typical values of internal resistance are lower than 2 Ω·cm^2.



Pinflow cells were used and characterized in the following papers:
https://doi.org/10.1016/j.memsci.2018.02.011
https://doi.org/10.1016/j.jpowsour.2018.01.079

The Lab-cells from Pinflow are specially designed to control the pressure applied on the carbon felts that are used as electrodes. Using rigid components and non-flat bipolar plates, one can not only perform reproducible experiments, but also, it is possible to use various electrode thicknesses.

The schematic below shows, that by providing non-flat carbon polymer composite plates, one can control the compression and the thickness of the carbon felt electrode being used. The thickness of the electrode compartment can be easily set up using carbon-polymer composite plates with a defined stump or pit.



Half-cell of Pinflow Lab-cell with flat bipolar plate

Half-cell of Pinflow Lab-cell with non-flat bipolar plate

			5 cm²	20 cm²
Lab Cells		Standard	P-LABCELL/5	P-LABCELL/20
		For organic media	P-LABCELL/5F	P-LABCELL/20F
Consumables	Testing packages (8x felts, 4x membranes)	Fumasep F-1850	P-TEST-PACK/5-11	P-TEST-PACK/20-11
		Nafion N115	P-TEST-PACK/5-13	P-TEST-PACK/20-13
		Nafion N117	P-TEST-PACK/5-14	P-TEST-PACK/20-14
		Nafion N212	P-TEST-PACK/5-15	P-TEST-PACK/20-15
		Vanadion	P-TEST-PACK/5-16	P-TEST-PACK/20-16
	Membranes (x1)	Fumasep F-1850	P-MEMB/5-11	P-MEMB/20-11
		Nafion N115	P-MEMB/5-13	P-MEMB/20-13
		Nafion N117	P-MEMB/5-14	P-MEMB/20-14
		Nafion N212	P-MEMB/5-15	P-MEMB/20-15
		Vanadion	P-MEMB/5-16	P-MEMB/20-16
Spare parts	Pack of sealings (x10)	Standard	P-PSEAL/5	P-PSEAL/20
		For organic media	P-PSEAL/5F	P-PSEAL/20F
	Sealings	Standard	P-SSEAL/5	P-SSEAL/20
		For organic media	P-SSEAL/5F	P-SSEAL/20F
	Bipolar plates (1x set of 2)	-	P-SBIPOL/5	P-SBIPOL/20
	Tubing and vessels	-	P-TUBINGS	
	Fittings	-	P-FPM	
Accessories	Felt cutter	-	P-CUTTER/5	P-CUTTER/20
	Wrench	-	P-WRENCH	
	Stand	-	P-STAND	
	Peristaltic pump	-	P-LABCELLPUMP/2	
	Climate chamber	-	P-CCHAMBER	
	Data acquisition module	-	P-DATAMOD	

Application Note: Need More Information?

In this application note, a Vanadium Redox Flow Battery (VRFB) was characterized using typical DC and AC techniques: galvanostatic charge and discharge cycling and Electrochemical Impedance Spectroscopy (EIS).

Click/or scan

Analytical Cells.

Small Volume Cells

Each voltammetry cell is designed for a specific application (specific working electrode, volume of solution, oxygen-free condition, etc.). As an example, for voltammetry investigations using standard working electrodes with an outer diameter (OD) of 6 mm, the fixed configuration of the SVC-3 kit is recommended. For applications requiring other working electrode shapes, the SVC-2 is more suitable.

The SVC-2 in microvolume mode was designed for those cases where only a small amount of electroactive compound is available.
Here is a list of the available cells:

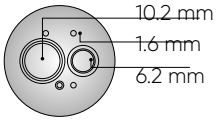
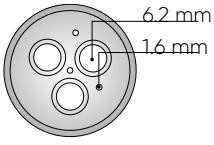
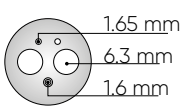
- SVC-2, modular
- SVC-3, for a volume of 5 to 20 mL, only for working electrode with OD of 6 mm
- VC-4, for a volume of 1 to 3 mL, only for working electrode with OD of 6 mm
- Bulk electrolysis cell, for a volume of 100 mL

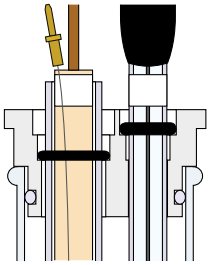
SVC-2

SVC-3

VC-4

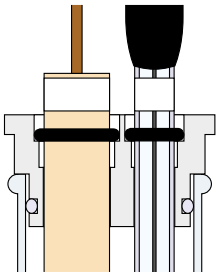
Bulk electrolysis cell

		Catalog n°		Catalog n°		Catalog n°		Catalog n°
Products	SVC-2	A-012668	SVC-3	A-012669	VC-4	A-011224	Bulk electrolysis cell	A-001197
Content								
Sample vial/mL	20 (7 pieces)	A-001056	20 (7 pieces)	A-001056	5 (7 pieces)	A-011504	100 (1 piece)	A-012632
Counter electrode (CE)/ mm	57	A-002222	50	A-002233	57	A-002222	230	A-002234
PTFE cap		A-012670		A-012671		A-011226		A-012551
Purge tube (ETFE), 100 mm		Included		Included		Included		Included
Additional items	Adapter 10 to 6 mm	Included			Cell holder	A-011227	Porous carbon electrode	A-010530
							Lid for CE	A-001198
							Chamber for CE	A-001196
							O-ring	A-001236
							Port plug	A-009131
							Stirrer bar	A-000178
Options								
Sample holder/mm	9.0 (2 pieces)	A-012177	6.0 (2 pieces)	A-012176				
Cell holder	for 20 mL	A-001209	for 20 mL	A-001209				
Purge tube (ETFE)/m	1	A-010537	1	A-010537	1	A-010537	1	A-010537
Working electrodes	See page 26							
Reference electrodes	See page 28							
PTFE cap								

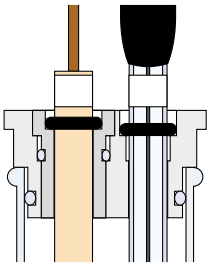


Small amount of solution
(200 µL in the sample holder)

SVC-2 modularity:
microvolume mode

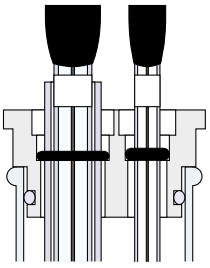


For electrode
with OD of 10 mm

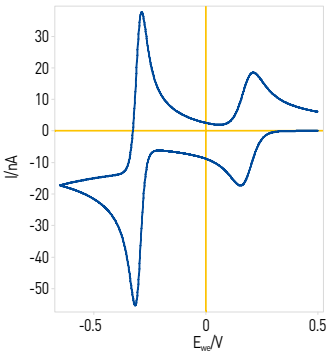


For electrode
with OD of 6 mm

SVC-2 modularity:
oxygen free mode



For microelectrode
with OD of 4 mm

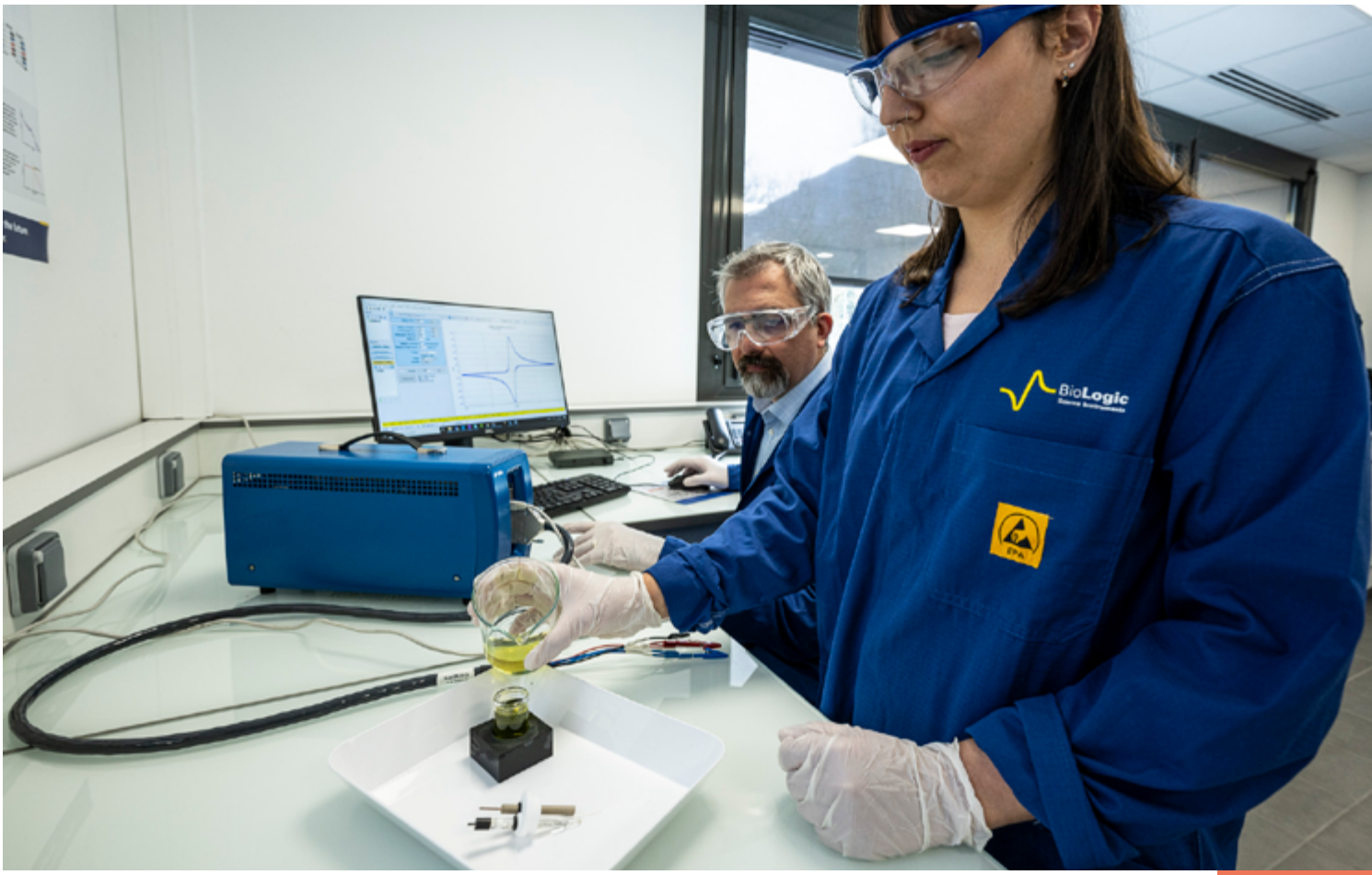


Please note that a full, purpose-built, analytical kit is also available SK-2 (A-012763) but the reference electrode must be purchased separately.
This kit includes:

- SVC-3 kit (A-012669)
- PK-3 polishing kit (A-011975) see page 26
- one glassy carbon electrode, OD 6.0 mm, ID 3.0 mm (A-002012) see page 26
- one platinum electrode, OD 6.0 mm, ID 1.6 mm (A-002013) see page 26

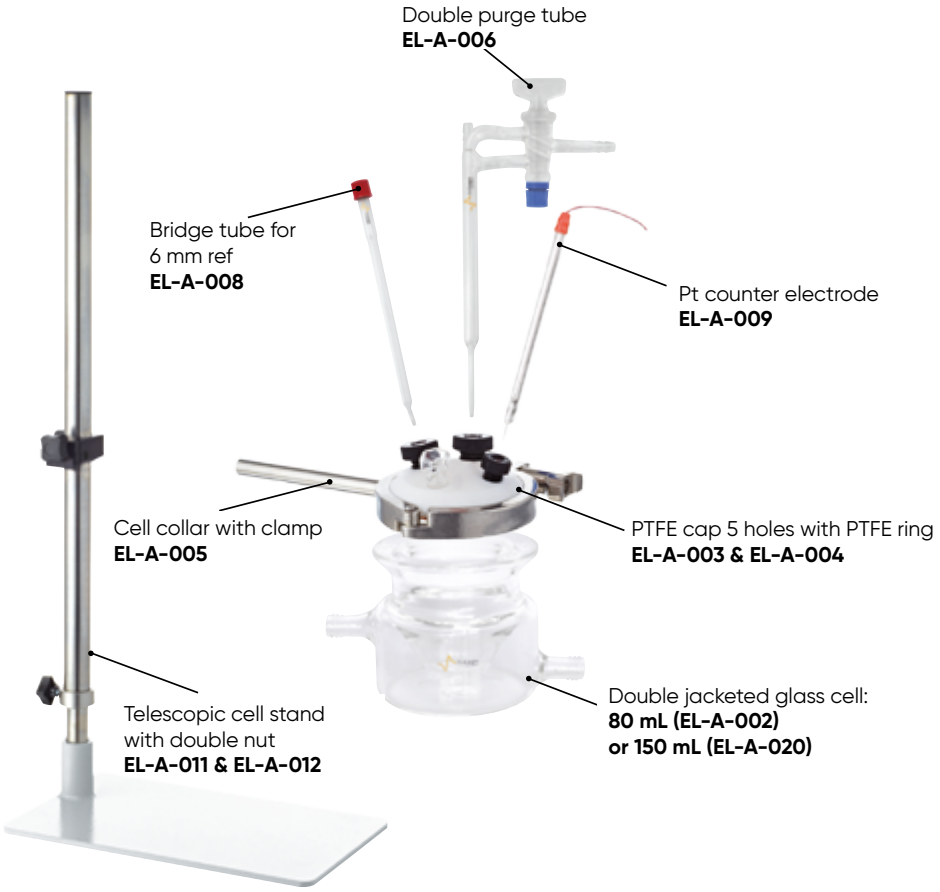
Cell Geometry

The geometry of the cell should be optimized to reduce the ohmic drop. Working and reference electrodes must be positioned close to one another. The counter electrode should not limit the transfer of electrons, so its contact surface should be larger than the contact surface of the working electrode.



Large Volume Cells

This cell is perfect for standard analytical electrochemistry experiments with electrolyte volumes of several tens of mL. It is also compatible with the BluRev product range, *i.e.* electrode rotators.



	EL-ELECTRO-80	EL-ELECTRO-80DJ	EL-ELECTRO-150DJ
Glass cell	EL-A-001 (80 mL)	EL-A-002 (80 mL double jacketed)	EL-A-020 (150 mL double jacketed)
PTFE cap 5 holes	EL-A-003		
PTFE ring, silicon encapsulated, OD 102 mm	EL-A-004		
Cell collar with clamp	EL-A-005		
Bridge tube for reference electrode, OD 6 mm	EL-A-008		
Platinum counter electrode	EL-A-009		
Purge tube	EL-A-016	-	
Double purge tube	-	EL-A-006	
Double nut 25 mm and 12 mm diameter	-	EL-A-011	
Telescopic cell stand	-	EL-A-012	
Options			
Electrode bridge extension for electroanalytical cell	EL-A-022		
Bridge tube for reference electrode of OD 8 mm	EL-A-017		
PT100 probe	EL-C-014		
220 V - Magnetic stirrer & header, without PT100	EL-C-015A		
110 V - Magnetic stirrer & header, without PT100	EL-C-015B		
Aluminum base holder for magnetic stirrer	EL-C-018		
Set of 10 porous 4 mm glass frits (CoralPor) with PTFE heat shrink (200 mm)	092-VYC4		

Multi Purpose Cells

FlexCell®

These cells, manufactured by Gaskatel, are ideal for corrosion experiments in aggressive media, as well as studies on Gas Diffusion Electrodes (GDE) and membranes. Their unique design and a specific choice of materials allow repeatability and avoid common pitfalls in other cells: heterogeneous electric field, variable ohmic drop, crevice corrosion, degradation of the cell. Used in combination with the robust HydroFlex® or MiniHydroFlex® hydrogen reference electrode, this is the perfect cell for corrosion, membrane and GDE studies. Two versions are available: PTFE and PP.

FlexCell® PTFE

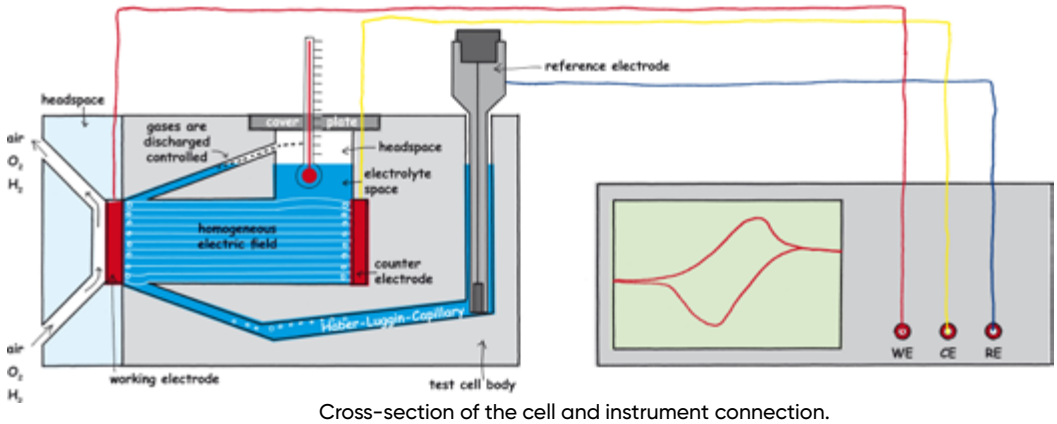
FlexCell® PP

	Catalog n°
FlexCell® PP – Electrochemical Test Cell made of PP	G-FLEXCELL/PP
FlexCell® Analyte Compartment in PP for membrane studies	G-COMP/PP
FlexCell® PTFE – Electrochemical Test Cell made of PTFE	G-FLEXCELL/PTFE
FlexCell® Analyte Compartment in PTFE for membrane studies	G-COMP/PTFE
Options to be ordered separately (see p.31)	
HydroFlex® Hydrogen Reference Electrode	G-HYDROFLEX
HydroFlex® Hydrogen Reference Electrode Starter Kit	G-HYDROFLEX-KIT
MiniHydroFlex® Hydrogen Reference Electrode	G-MINIHYDROFLEX

PTFE analyte compartment

PP analyte compartment

	Operating conditions
Max. exposure time/h	24
Temperature/°C	-20 to 120
pH range	-2 to 16
Max. current/A	3



Cross-section of the cell and instrument connection.

	Max. sample size /cm	Max. sample thickness /mm*	Active area /cm²	Electrolyte volume /ml	Dimensions (w/o screw adapters) (HxWxD)/mm
FlexCell®	3 x 5	10	3	30	75 x 100 x 132
Analyte Compartment	3 x 5	10	3	12	75 x 100 x 30

*Longer wing screws can be supplied

	Materials
Main	PP or PTFE
Gasket	Silicon
O-rings	EPDM
Cover plate	PSU
Gas compartments	PMMA or PSU
Counter electrode	Pt-Ir

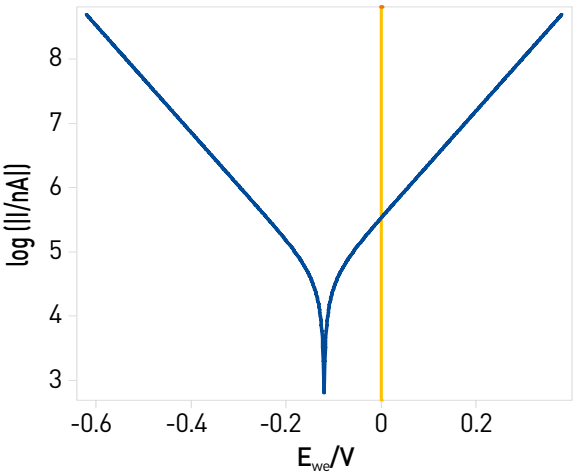
PP	Polypropylene
PTFE	Polytetrafluoroethylene
PSU	Polysulfone
PMMA	Polymethylmethacrylate
EPDM	Ethylene propylene diene monomer
Pt	Platinum
Ir	Iridium

Corrosion Cells.

Standard Corrosion Cells

The standard corrosion cell is available with as single or double jacket glass cell for temperature control. It is provided with two graphite rods to be used as counter electrodes, a bridge tube, to ensure the minimum distance between the reference and the working electrode, and purge tubes, to maintain a controlled gaseous environment.

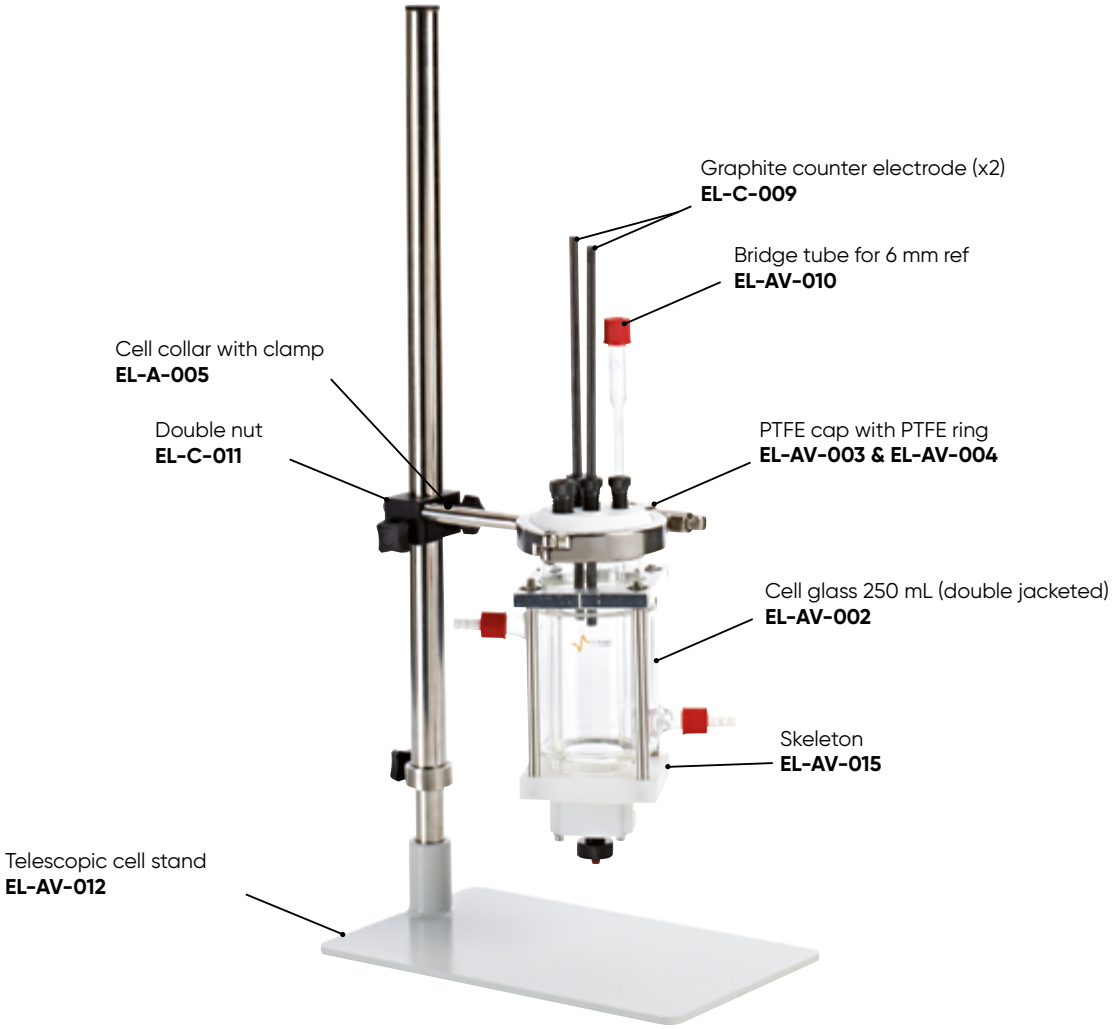
Two kits are available: a standard one and an advanced kit with telescopic cell stand, sample holder and double purge tubes.



	Basic corrosion cell kit EL-CORR-1	Complete corrosion cell kit EL-CORR-1DJ
Glass cell 1 L	EL-C-001	EL-C-002 (double jacketed)
PTFE cap	EL-C-003	
PTFE ring, silicon encapsulated, OD 102 mm	EL-C-004	
Cell collar with clamp	EL-C-005	
Graphite counter electrode rod (2 pieces) ρ = 1.070 µΩ cm	EL-C-009	
Bridge tube for 6 mm diameter reference electrode	EL-C-008	
Purge tube	EL-C-016	-
Double purge tube	-	EL-C-006
Double nut 25 mm and 12 mm diameter	-	EL-C-011
Telescopic cell stand	-	EL-C-012
Sample holder 1 cm² (max sample thickness 3.4 mm and max diameter 14.6 mm)	-	092-C-016
Options		
Bridge tube for 8 mm diameter reference electrode	EL-C-017	
PT100 probe (indicate connector type)	EL-C-014	
Magnetic stirrer & heater, without PT100 probe, 220 V	EL-C-015A	
Magnetic stirrer & heater, without PT100 probe, 110 V	EL-C-015B	
Aluminum base holder for magnetic stirrer and 1 L cell vial	EL-C-018	
Set of 10 porous frits (4 mm CoralPor™) with PTFE heat shrink (200 mm)	092-VYC4	

Avesta Cell

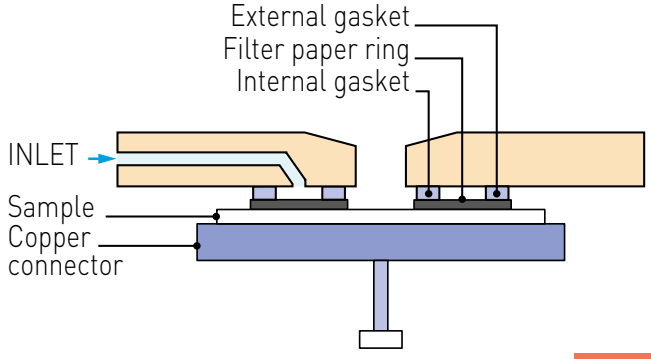
The Avesta Cell is an electrochemical cell developed for pitting corrosion testing (ASTM G150).
It is designed to avoid microcrevice corrosion formed between the working electrode and the gasket at the bottom aperture of the cell.



	Catalog n°
Avesta cell kit	EL-AVESTA
Content	
Double jacketed cell glass 250 mL	EL-AV-002
PTFE cap 5 holes	EL-AV-003
O-ring PTFE silicone encapsulated	EL-AV-004
Cell collar with clamp	EL-A-005
Double purge tube	EL-AV-006
Filter paper ring (100 pieces)	EL-AV-007
Graphite counter electrode rods (2 pieces) ρ = 1.070 µΩ cm	EL-C-009
Bridge tube for RE 6 mm	EL-AV-010
Double nut	EL-C-011
Telescopic cell stand	EL-AV-012
Skeleton	EL-AV-015
Options	
Peristaltic pump for low flow	EL-AV-008
Bridge tube for reference electrode with OD of 8 mm	EL-AV-013
Single purge tube	EL-AV-014
Temperature probe PT100	EL-C-014
Set of 10 porous frits (4 mm CoralPor™) with PTFE heat shrink (200 mm)	092-VYC4

A filter paper ring placed between the sample and the gasket is flooded by distilled water in order to eliminate crevice corrosion.

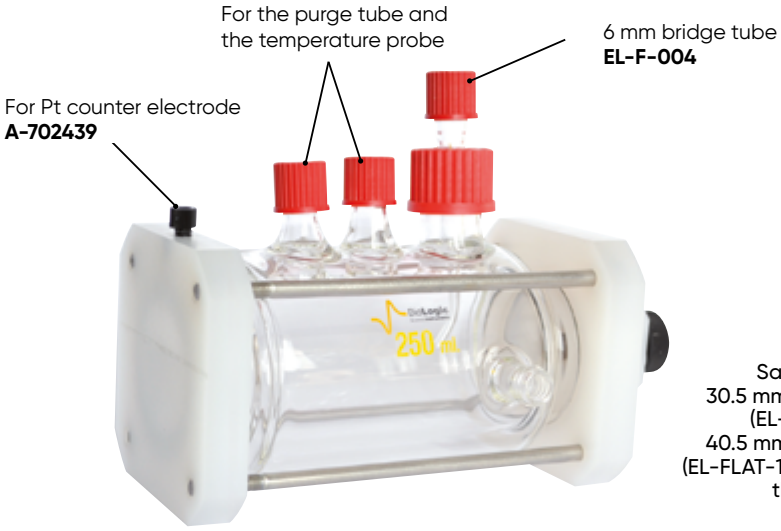
The water flow is controlled by a peristaltic pump (EL-AV-008).



Flat Cells
1 to 10 cm² sample area

The Flat cell with a volume of 250 mL is perfect for experiments on flat specimens of 1 or 10 cm² surface area.

This cell has a double jacket for temperature control and three holes for reference electrodes, purge tubes and temperature probes with an inner diameter of 17.6 mm and the two others of 8.3 mm.



Sample size:
30.5 mm min. diameter (EL-FLAT-1CM)
40.5 mm min. diameter (EL-FLAT-10CM) 6 mm max. thickness

	Glass kits (double jacket)		PVDF kits (single jacket)	
	1 cm² EL-FLAT-1CM	10 cm² EL-FLAT-10CM	1 cm² EL-FLAT-1CM-PVDF	10 cm² EL-FLAT-10CM-PVDF
Platinum mesh counter electrode (54 mm wire/ 80 mesh), 25 x 35 mm	A-702439			
Bridge tube for 6 mm diameter reference electrode	EL-F-004		-	
Glass cell (250 mL) for flat cell	EL-F-002		EL-F-PVDF	
Mechanical parts	EL-FLAT-3H	EL-FLAT-4H	EL-FLAT-3H	EL-FLAT-4H
Option				
Bridge tube for 8 mm diameter reference electrode	EL-F-004B		-	

Investigations In Agressive Media

If the experiment is performed in more agressive media such as hydrofluoric acid, it is possible to obtain the body of the flat cell in PVDF* instead of glass (Polyvinylidenefluoride).

	Hydrofluoric acid 48%		Sulfuric acid 98%		Phosphoric acid 85%		Hydrochloric acid 35%		Nitric acid 70%		Perchloric acid		Sodium hydroxide 50%		Potassium hydroxide concentr.	
Temperature	20° C	50° C	20° C	50° C	20° C	50° C	20° C	50° C	20° C	50° C	20° C	50° C	20° C	50° C	20° C	50° C
PTFE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PVDF*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Borosilicate glass	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ excellent
■ good
■ not recommended
■ not compatible

Options	Catalog n°
PVDF body (single-jacketed)	EL-F-PVDF
EPDM O-rings for 1 cm² with PEEK ferrule for CE*	EL-SEAL-1B
EPDM O-rings for 10 cm² with PEEK ferrule for CE*	EL-SEAL-10B
PTFE O-rings for 1 cm² with PEEK ferrule for CE*	EL-SEAL-T1B
PTFE O-rings for 10 cm² with PEEK ferrule for CE*	EL-SEAL-T10B
EPDM O-rings for 1 cm²*	EL-SEAL-1
EPDM O-rings for 10 cm²*	EL-SEAL-10
PTFE O-rings for 1 cm²*	EL-SEAL-T1
PTFE O-rings for 10 cm²*	EL-SEAL-T10
Set of 10 porous frits (4 mm CoralPor™) with PTFE heat shrink (200 mm)	092-VYC4

* The O-ring kits include 4 O-rings for the glassware side and 10 O-rings for the sample side

Galvanic Cells
1 to 10 cm² sample area

Thanks to the modular design of the flat cell, it is possible to place two different materials at each end of the cell. The surface area can be 1 or 10 cm². This cell is provided with a double jacket by default.

	1 cm² EL-GAL-1CM	10 cm² EL-GAL-10CM
Content		
Flat cell kit 1 cm²	EL-FLAT-1CM	EL-FLAT-10CM
Galvanic kit 1 cm²	092-FLAT/1	092-FLAT/10

Sample size:
30.5 mm min. diameter (EL-GAL-1CM)
40.5 mm min. diameter (EL-GAL-10CM)
6 mm max. of thickness

Plate Material Evaluating Cell
up to 1 cm² sample area

This cell was developed to evaluate plate material such as metals, semi-conducting plates, etc.
The sample plate is sandwiched between the two cell blocks. The required volume of solution is about 1 mL.

	Catalog n°
Plate material evaluating cell	A-011951
Content	
PTFE cell [body & base] (1 piece)	Included
O-ring (1 piece)	Included
Screw 20 mm (2 piece)	Included
Purging tube, 100 mm	Included
Platinum counter electrode (1 piece)	A-002222
Options	
O-ring (10 pieces)	A-012022

Coating Cell

The "Coating cell" is an affordable cell especially dedicated for testing flat coated material samples. Masks with different areas are available for corrosion testing.

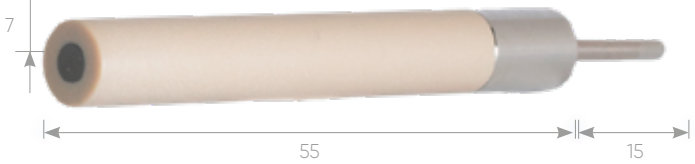
	Catalog n°
Coating cell kit	EL-COAT
Content	
Glass for coating cell	EL-P-002
Nylon base with three feet	EL-P-003
Rubber cup with two holes	EL-P-004
Metallic clamp	EL-P-005
O-ring for coating cell	EL-P-006
Graphite rod counter electrode (L: 145 mm, OD: 6 mm, ρ = 1.070 µΩ cm)	EL-P-009
Options	
Bridge tube for 6 mm reference electrode	EL-P-008
Mask for 1 cm² (20 pieces)	EL-P-011
Mask for 3 cm² (20 pieces)	EL-P-012
Mask for 10 cm² (20 pieces)	EL-P-013

Electrodes.

Working Electrodes

To address every application, a wide range of working electrodes (WE) is available with diameters ranging from 7 µm up to 6 mm and made of different materials.

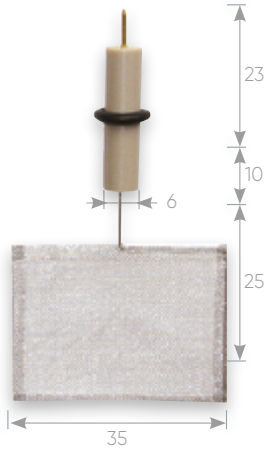
BioLogic exclusive



M-BDD-3: Boron-doped diamond 3 mm diameter disk

Standard type

Gauze type

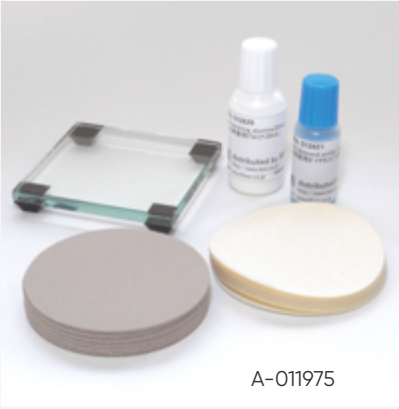


Dimensions in mm

			Isolation	OD/mm	Disk Ø/mm	Catalog n°
Carbon	Standard glassy carbon electrode		PEEK	10	5	A-002417
			PEEK	6	3	A-002012
			PEEK	6	1.6	A-012297
			PEEK	6	1	A-002411
	Small glassy carbon electrode		PEEK	3	1.6	A-012298
			PEEK	3	1	A-002412
	Standard pyrolytic graphite electrode	Basal plane	PEEK	6	3	A-002252
		Edge plane	PEEK	6	3	A-002253
	Standard plastic formed carbon electrode		PEEK	6	3	A-002408
			PEEK	6	1	A-002409
	Small plastic formed carbon electrode		PEEK	3	1	A-011854
Platinum (99.95% purity)	Standard platinum electrode		PEEK	10	5	A-002420
			PEEK	6	3	A-002422
			PEEK	6	1.6	A-002013
	Small platinum electrode		PEEK	3	1.6	A-002313
Gold	Standard gold electrode		PEEK	10	5	A-002418
			PEEK	6	3	A-002421
			PEEK	6	1.6	A-002014
	Small gold electrode		PEEK	3	1.6	A-002314
Silver	Standard silver electrode		PEEK	10	5	A-002416
			PEEK	6	3	A-002419
			PEEK	6	1.6	A-002011
	Small silver electrode		PEEK	3	1.6	A-002315
Palladium	Standard palladium electrode		PEEK	6	1.6	A-002019
	Small palladium electrode		PEEK	3	1.6	A-002319
Nickel	Standard nickel electrode		PEEK	6	1.5	A-002016
Copper	Standard copper electrode		PEEK	6	1.6	A-002017
			PEEK	6	3	A-012584
Iron (99.65% purity)	Standard iron electrode		PEEK	6	1.5	A-002018
			PEEK	6	3	A-012585
Carbon paste	Standard carbon paste electrode hole depth 4 mm		PEEK	6	3	A-002210
	Small carbon paste electrode hole depth 4 mm		PEEK	3	1.6	A-002223
	Carbon paste oil base 1 g					A-001010
Boron-doped diamond	Doping level between 500 and 1000 ppm. The electrode is a 500 µm thick disk attached to a conductive rod in brass. It is polished with an Ra < 10 nm.		PEEK	7	3	M-BDD-3

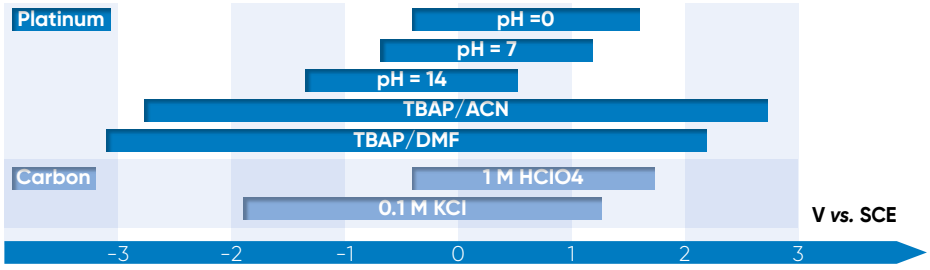
Electrode Polishing Kit

	Purpose	Catalog n°
PK-3 electrode polishing kit*		**A-011975**
Content		
0.05 µm polishing alumina (20 mL)	**For final polishing**	**A-001050**
1 µm polishing diamond (10 mL)	**For intermediate polishing**	**A-002054**
Glass plate (1 piece)		**A-002249**
Alumina polishing pad (10 pieces)	**For final polishing**	**-**
Diamond polishing pad (10 pieces)	**For intermediate polishing**	**-**
Spare parts		
Alumina polishing pad (20 pieces)	**For final polishing**	**A-001040**
Diamond polishing pad (20 pieces)	**For intermediate polishing**	**A-001041**
Emery paper UF800 (20 pieces)	**For PG and PFCE electrodes**	**A-012611**
Coarse polishing pad (20 pieces)	**Rough hewn**	**A-001042**
6 µm polishing diamond (10 mL)	**For intermediate polishing**	**A-002053**



A-011975

**To refresh the working electrode surface, we recommend polishing before each measurement.*



Window of electroactivity for working electrodes in different media

Counter Electrodes

Wire type

A-002222

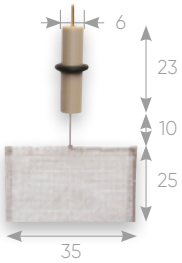
A-002233

Coil type

A-002234

Gauze type

A-002250



Gauze cylinder type

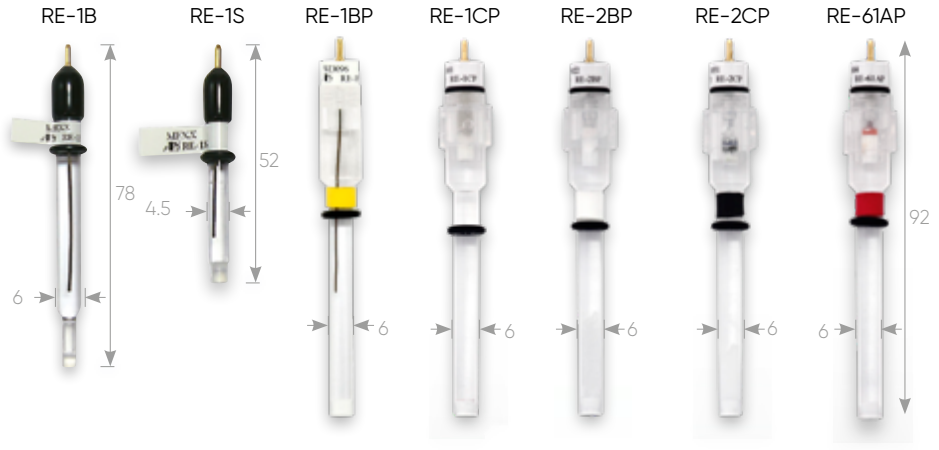
A-013612

Dimensions in mm

	Size/mm	Wire Ø/mm	Surf. area/cm²	Purpose	Catalog n°
Platinum (99.95 % purity)	57	0.5	~ 0.7	SVC-2, VC-4, plate material evaluating cell	**A-002222**
	50	0.5	~ 0.7	SVC-3	**A-002233**
	230	0.5	~ 3.6	RRDE, bulk electrolysis cell, SVC-3	**A-002234**
Gold	230	0.5	~ 3.6	RRDE, bulk electrolysis cell, SVC-3	**A-012638**
Nickel	230	0.5	~ 3.6	RRDE, bulk electrolysis cell, SVC-3	**A-012639**
Platinum gauze electrode, PEEK body 80 mesh (99.95 % purity)	25x35	0.08	~ 22.9	Bulk electrolysis cell	**A-002250**
Platinum gauze electrode, 54 mm wire 80 mesh (99.95 % purity)	25x35	0.08	~ 22.9	Flat cell	**A-702439**
Platinum electrode, 80 mesh (99.95 % purity)	40x50	0.12	~ 47.4	Bulk electrolysis cell	**A-013612**
Gold gauze electrode, PEEK body 100 mesh	25x35	0.07	~ 29	Bulk electrolysis cell	**A-002251**

Small-Size Reference Electrodes
for aqueous media

Reference electrodes are divided into two groups according to the media in which the electrode is immersed (aqueous or organic media).



	Junction	Electrolyte	Purpose	Catalog n°
RE-1B Ag/AgCl reference electrode	IPPG*	3 M NaCl	SVC-2, SVC-3, VC-4, bulk electrolysis cell, RDE/RRDE, flat cell	**A-012167**
RE-1S Ag/AgCl reference electrode	IPPG*	3 M NaCl	SECM	**A-012168**
RE-1BP reference electrode (Ag/AgCl)	Ceramic	3 M NaCl	SVC-2, SVC-3, VC-4, bulk electrolysis cell, RDE/RRDE, EQCM, flat cell	**A-013613**
RE-1CP Ag/AgCl reference electrode	Ceramic	Saturated KCl	SVC-2, SVC-3, VC-4, bulk electrolysis cell, RDE/RRDE, flat cell	**A-013429**
RE-2BP Hg/Hg_2Cl_2 reference electrode	Ceramic	Saturated KCl	SVC-2, SVC-3, VC-4, bulk electrolysis cell, RDE/RRDE, flat cell	**A-013430**
RE-2CP Hg/Hg_2SO_4 reference electrode, free from chloride	Ceramic	Saturated K_2SO_4	SVC-2, SVC-3, VC-4, bulk electrolysis cell, RDE/RRDE, flat cell	**A-013431**
RE-61AP Hg/HgO reference electrode main body in polyacetal resin	Ceramic	1 M NaOH	For alkaline media	**A-013395**
Spare parts				
Porous glass frits (CoralPor)				**See p.30**
Options				
RE-PV preservative vial for reference electrode, 10 mL				**A-012108**
Bridge tube Ø 9.0 mm (2 pieces) - Picture available next page				**A-012177**
Bridge tube Ø 9.0 mm (22 pieces) - Picture available next page				**A-012307**

* Ion Permable Porous Glass

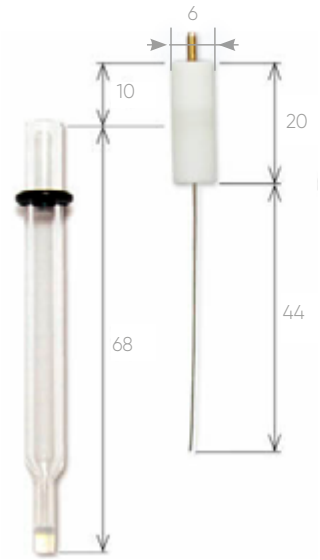
Support: How to Check Your Reference Electrode

Click or scan

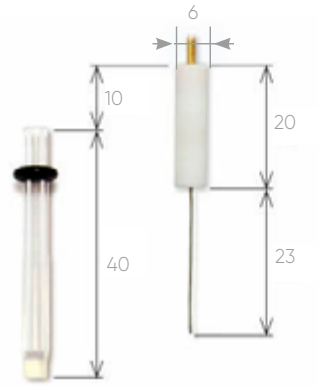
BioLogic's Learning Center is a great source of information for tech-tips, theory and product information. Visit our Learning Center to find out why reference electrode maintenance is so important.

Small-Size Reference Electrodes
for non aqueous media

RE-7N



RE-7SN



A-012177

A-012108

	Junction	Electrolyte	Purpose	Catalog n°
RE-7N reference electrode (Ag/Ag$^+$)	IPPG*	Ag/Ag$^+$/ACN** TBAP*** (not provided)	SVC-2, SVC-3, VC-4, bulk electrolysis cell, RDE/RRDE, eQCM	**A-013848**
RE-7SN reference electrode (Ag/Ag$^+$)	IPPG*	Ag/Ag$^+$/ACN** TBAP*** (not provided)	SECM	**A-013849**
Spare parts				
PTFE cap with Ag wire (for RE-7N)				**A-012057**
Sample holder 6 mm diameter (for RE-7N) (2 pieces)				**A-012176**
Porous glass frits (CoralPor)				**See p.30**
Options				
RE-PV preservative vial for reference electrode, 10 mL				**A-012108**
Bridge tube Ø 9.0 mm (2 pieces)				**A-012177**
Bridge tube Ø 9.0 mm (22 pieces)				**A-012307**

* Ion Permable Porous Glass
** Acetonitrile
*** Tetrabutylammonium perchlorate

Don't forget!

There is a huge amount of supporting information on www.biologic.net.
The BioLogic Learning Center has over 130 articles and if you want a deeper understanding, there are over 80 application notes and 50 technical notes on the field of electrochemistry alone.

www.biologic.net

Maintenance of Reference Electrodes

Store your reference electrode immersed in the electrolyte

When not in use, we recommend that you keep reference electrodes in sealed, air-tight vials in order to prolong their life. The storage solution should be identical to the filling solution of the reference electrode. Preferably a cold and dark place.

Prevent contamination

To prevent contamination of the reference electrode, a bridge tube can be used.

Potentials of common reference electrodes

E/V vs. NHE at 25°C

0.930	Hg/HgO / NaOH (0.1 M)
0.650	Hg/Hg_2SO_4 / K_2SO_4 (sat)
0.624	Fc/Fc^+ / TBAP (0.1 M) ACN
0.542	Ag/Ag^+ / TBAP (0.1 M) ACN
0.241	Hg/Hg_2Cl_2 / KCl (sat)*
0.236	Hg/Hg_2Cl_2 / NaCl (sat)*
0.205	Ag/AgCl / KCl (3.5 M)
0.197	Ag/AgCl / KCl (sat)
0.194	Ag/AgCl / NaCl (sat)
0.000	NHE Normal Hydrogen Electrode

* Hg/Hg_2Cl_2 : Calomel

Replace the junction when needed

If you are using IPPG junctions, yellowish discoloration indicates contamination. This is caused by the absorption of organic compounds into the pores. The average pore diameter of IPPG is about 40 - 200 Å.

If you are using CoralPor™ junctions, you might want to use one of the available replacement kits.

The average pore diameter of CoralPor™ is about 4 - 10 nm.

	Compatible reference electrodes	Compatible bridge tubes	Content
092-VYC3	**A-012167**	**A-012176** **A-012306** **A-012177** **A-012307**	10 glass frits (Ø 2.8 mm Coralpor™) 200 mm long heat shrink tube (Ø 3.2 mm)
092-VYC4	-	**EL-C-005** **EL-C-017** **EL-F-004B** **EL-F-004** **EL-A-017** **EL-A-008**	10 glass frits (Ø 4 mm CoralPor™) 200 mm long heat shink tube (Ø 4.8 mm)
092-VYC5	**A-012168**	-	10 glass frits (Ø 2.8 mm CoralPor™) 200 mm long heat shrink tube (Ø 4.8 mm)

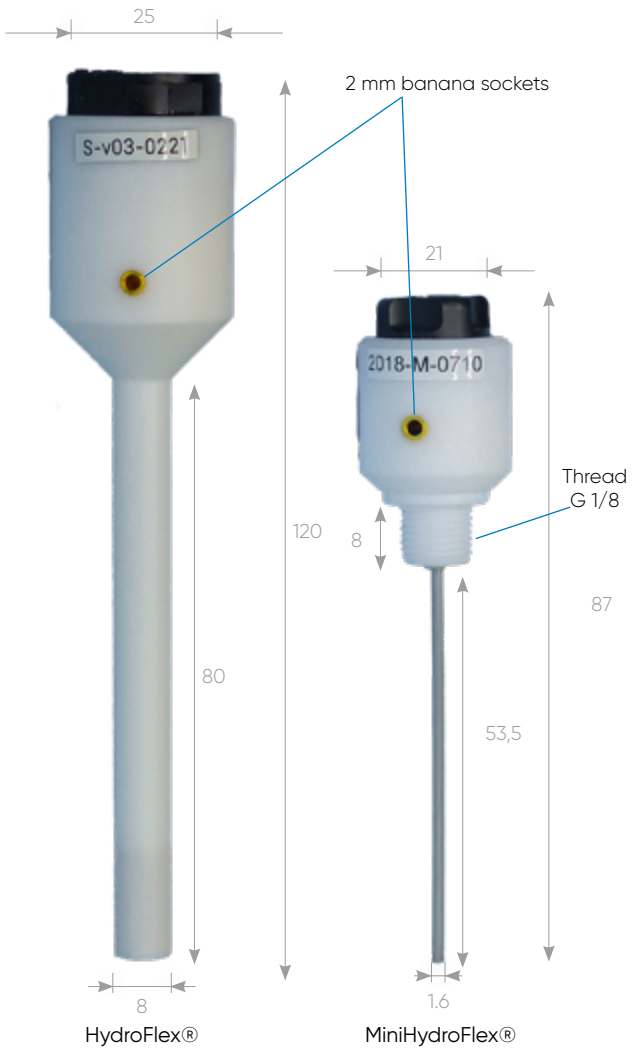
Hydrogen Reference Electrodes

These hydrogen reference electrodes, manufactured by Gaskatel, are beneficial in that they are Hg-free and not made of glass, which extends their range of operating conditions. These reference electrodes are easy to use and robust. The hydrogen source is contained within a cartridge that is easily replaceable.

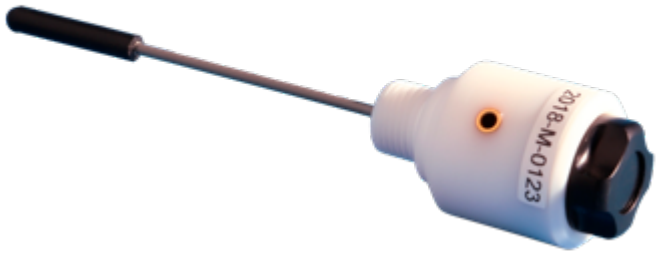
	Catalog n°
HydroFlex® Hydrogen Reference Electrode	G-HYDROFLEX
HydroFlex® Starter Kit*	G-HYDROFLEX-KIT
MiniHydroFlex® Hydrogen Reference Electrode	G-MINIHYDROFLEX
Options	
HydroFlex® Hydrogen Cartridge (x4)	G-HYDROFLEX-CARTRIDGE
MiniHydroFlex® Hydrogen Cell (x2)	G-MINIHYDRO-CELL
Bridge tube for use of HydroFlex® with EL-ELECTRO	EL-A-017
Bridge tube for use of HydroFlex® with EL-CORR	EL-C-017
Bridge tube for use of HydroFlex® with EL-FLAT	EL-F-004B

	Operating conditions
Cartridge lifetime/months	12 (MiniHydroFlex®), 6 (HydroFlex®)
Temperature/°C	-20 to 120 (PTFE body)
pH range	-2 to 16

The HydroFlex® electrode is compatible with BioLogic's electrochemical cells. The MiniHydroFlex® is dedicated to the FlexCell®.



Dimensions in mm



HydroFlex® Starter Kit Content
1x HydroFlex® hydrogen reference electrode (incl. 1 hydrogen cartridge)
1x connector lead
1x hydrogen cartridge
1x cartridge wrench
1x operating time wrench

Part	Materials
Body	PTFE, PP
Shaft	PEEK, PTFE
Cap and cartridge	PC or PVC
Measuring electrode	Pt, Pd
PP	Polypropylene
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl chloride
PC	Polycarbonate
PEEK	Polyether ether ketone
Pt	Platinum
Pd	Palladium

Connection Accessories.

High-Temperature Extension Cables

These extension cables are intended to be connected between the instrument's cell cable and the cell.

Available in two different sizes, 1.3 m and 2.5 m long, and with a maximum temperature of 150°C, these cables are compatible with:

- SP-50e, SP-150e, VSP, VSP-3e, VMP-3e and boosters for Essential range instruments
- SP-200, SP-240, SP-300, VSP-300, VMP-300, and boosters for Premium range instruments
- BCS-805, BCS-810 and BCS-815

	1.3 m	2.5 m
Temperature /°C	-40 to 150	
Max current /A (2 mm connectors)	2	
Max current /A (4 mm connectors)	20	
Cable diameter /mm	12.7	
Catalog n°	**092-25/1**	**092-25/2**

Glove Box Cables

Hermetic cell cable for glove boxes

As standard, the potentiostat and the booster are provided with a 1.5 m long cell cable. The cable connected from the booster to the potentiostat is 0.8 m long for VMP-3e based instruments.

For some applications, the user may need different cable lengths. For this reason, longer cables are available (for more information, contact your sales representative).

For applications carried out in glove boxes, special glove box cell cables are also available.

Setup Connection

Bad connections can affect measurements (stability of potentiostat, artefacts etc).

In order to optimise your setup, we recommend you use the accessories described in this section.

	Essential	Premium
Catalog n°	**092-23/5**	**094-101/6** (standard cable)
		094-101/8 (low current cable)
Content		
Feedthrough type	12 pins	25 pins*
Inside glovebox (length: 1 m)	Cable with 2 mm connectors on one side and 12-pin Jaeger connector on the other side	Cable with electrometer on one side and 25-pin connector on the other side
Outside glovebox (length: 1.5 m)	Cable with Sub-D 25 connector on one side and 12 pin Jaeger connector on the other side (length 1.5 m)	Cable with Sub-D 25 connector on one side and 12 pin Jaeger connector on the other side (length 1.5 m)
Requirement		
Hole diameter needed in glovebox /mm	27	45

*Two feedthrough seals : one installed in the glove box wall, the other dedicated to the channel board.

Multi-Electrode Investigation Cables

For the Essential product range, we offer several options to facilitate the use of connection cables when multi-electrode experiments are performed: for example, RRDE experiments or corrosion experiments on several samples using the same reference and the same counter electrode.

Nstat box (8 channels)

Bipot cable: dedicated to RRDE applications

	N° of channels	Length	Catalog n°
Bipot cable (for SP-150e, VSP, VSP-3e and VMP-3e)	2	1.5 m	092-22/12
Nstat box (for VSP, VSP-3e and VMP-3e). External power supply required.	4	1.5 m	092-16
	4	1.5 m	092-22/3
External power supply for the Nstat box			092-16/1

Connectors

	Picture	Size	Colors	Catalog n°
Aligator clips		2 mm	8x Red, 8x Blue, 8x White, 4x Black	092-1001/40
		4 mm	3x Red, 3x Blue, 3x Black	092-1001/41
Receptacles		2 mm	20x Red, 20x Blue, 20x White, 15x Black	092-1001/42
		4 mm	12x Red, 12x Blue, 12x Black	092-1001/43
Banana plugs		2 mm	10x Red, 10x Blue, 10x White, 10x Black	092-1001/44
		4 mm	8x Red, 8x Blue, 8x White	092-1001/45
Adaptors		2 mm receptacle to 4 mm plug adapter	6x Red, 6x Blue, 4x White, 4x Black	092-1001/46
		2 mm receptacles to 4 mm banana plugs	16x Red, 16x Blue	092-1001/47
		4 mm receptacles to 2 mm banana plugs	20x Black	092-1001/48

Connection Kits

	Content	Colors	Catalog n°
For standard board	4 alligator clips of 2 mm 3 receptacles of 2 mm	red, blue, white, black red, blue, white	092-1001/30
For booster board	3 alligator clips of 2 mm 2 alligator clips of 4 mm 3 receptacles of 2 mm 2 receptacles of 4 mm	red, blue, white red, black red, blue, white blue, white	092-1001/31
For HCV-3048, FlexP 0060, 0160, CC4-60A and CC8	Contains: 2x6 mm receptacles 4 lugs with 4 mm receptacles	red, blue red, blue	094-110/CNT
For FlexP0012 and CC4-200A	Contains: 2 Amphenol 8 mm receptacles, 4 lugs with 4 mm receptacles	red, black red, blue	093-200/CNT

094-110/CNT

093-200/CNT

External Device Connection

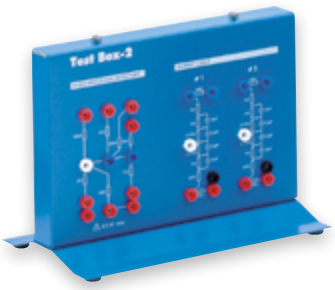
IS1

DB9-8 BNC

	Catalog n°
DB9-8 BNC connector for auxiliary I/O	092-22/1
IS1 isolation module for auxiliary I/O for Premium based instruments	094-081/5
PT100 temperature probe, to be connected to the auxiliary I/O, temperature range: -50°C to 250°C, Dimensions: 3 x 20 mm, Length of cable: 2.5 m, Accuracy: ±1°C For temperature measurement in air	092-22/13
PT100 temperature probe for temperature measurement in solution with Sub-D 9 connector	EL-C-014
PT100 temperature probe for temperature measurement in solution with triad connector	EL-C-014/1

Test Boxes

	Description	Catalog n°
Test Box 2	Several circuits with high precision resistors for calibration and validation	092-22/6
Test Box 3	Three circuits: linear, two non-linear systems (Tafel & passivating) for teaching and demonstration	092-22/7



Test Box 2

Test Box 3

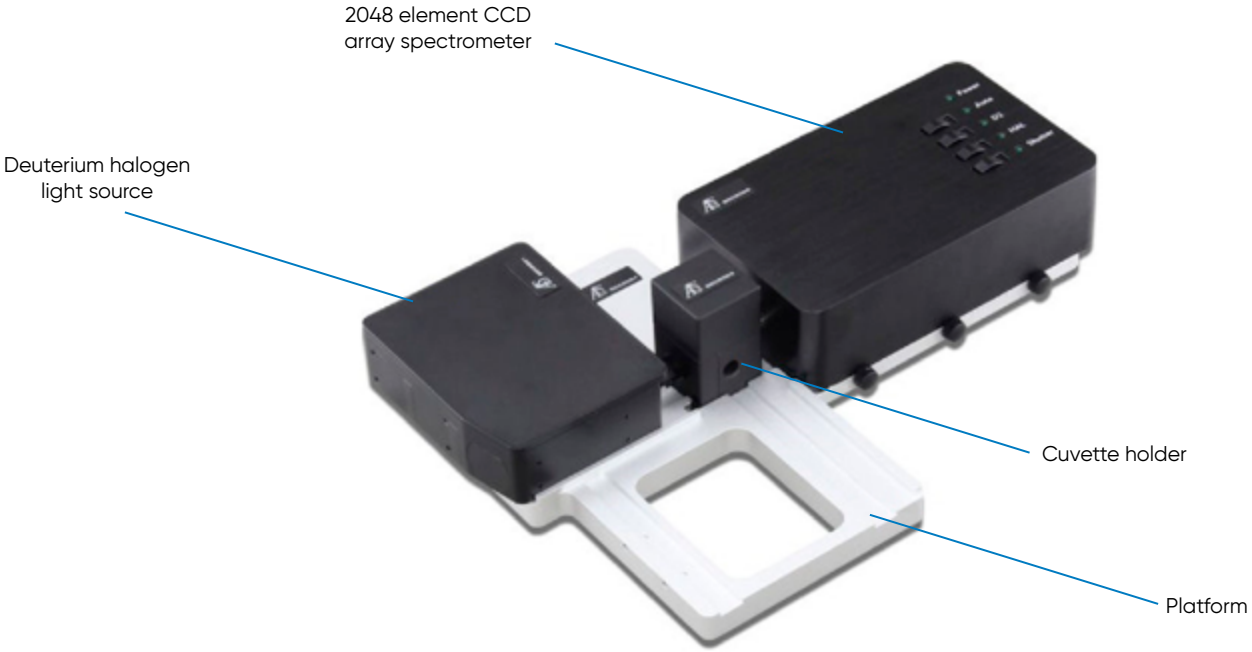
Faraday Cage

To avoid any external perturbations, especially for low current applications, we recommend using a Faraday cage.

Please note that in order to ensure that the cage is fully functional, it must be earthed by connecting it to the ground (this is done via a green plug on the instrument's rear panel).

	Catalog n°
FC-45 Faraday cage, 450x450x450 mm	094-084/1
Cell stand for FC-45	094-084/2

Spectroelectrochemistry.

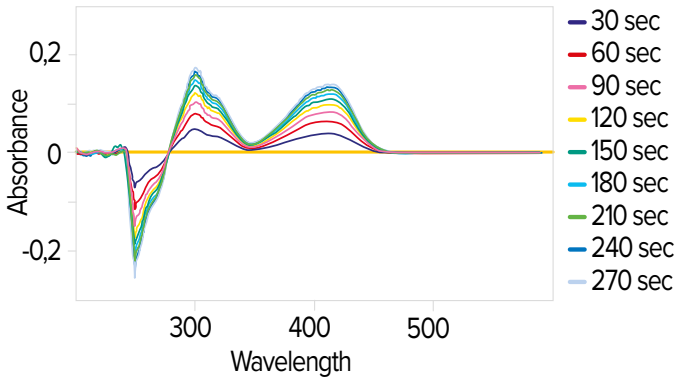


Spectrometer System

Spectroelectrochemistry (SEC) can be useful to elucidate electrochemical reaction mechanisms. The spectroelectrochemical kit is made up of three parts (spectrometer, light source and cuvette holder).

The spectrometer is equipped with a trigger to synchronise electrochemical and spectroscopic measurements.

	Information
Detector	2048 element linear silicon CCD array
Full description	SEC2021-025-DUVN
Detector range/nm	200 - 1025
Grating	Blaze wavelength (300 nm)
Slit/µm	25
Wavelength resolution/nm	1.3
Fiber connector	SMA905, core diameter: 600 µm NA=0.22
Interface	USB2.0
Operating system	Windows 10/ 11 (32bit / 64bit)
Dimensions (HxWxD)/mm	32x86x110

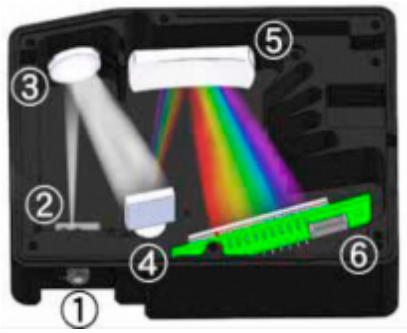


	Catalog n°
SEC2020 spectrometer kit	A-013609
Content	
SEC2021 Spectrometer (x 1)	
SEC2022 Deuterium halogen light source (x 1)	
SEC2023 Cuvette holder (x 1)	
SEC2024 Platform (x 1)	
AC adaptor (x 1)	
Power cable (x 1)	
USB cable (x 1)	
Collimator (x 2)	
Fibre collimator (x 1)	
Platform screw (x 7)	
External device connection trigger cable (x 1)	
Light source control trigger cable (x 1)	
Plastic cuvette (x 1)	
SMA905 adaptor for light source (x 3)	
SMA905 adaptor for light shielding (x 2)	
Hexagon wrench 0.89 mm (x 1)	
Hexagon wrench 1.50 mm (x 1)	
Software (USB memory) (x 1)	
Waterproof box (x 1)	
Quick manual, wavelength calibration data sheet, linearity test data sheet and warranty certificate are also included.	
Option	
Connecting cable to synchronise the SEC2020 with BioLogic instrument.	092-22/11

The SEC2020 spectrometer system uses the Czerny-Turner optical mount. This system is a M-shaped structure symmetric to the grating (4) and is an optical system with extremely small aberration.

	Information
Light type	Deuterium halogen light source
Wavelength range/nm	200 - 1700
Stability	<0.1%
Drift/h	0.25%
Bulb life/h	>1000 (D2 lamp) >2000 (halogen lamp)
Fiber connector	SMA905
Size (HxW×D)/mm	46x100×165

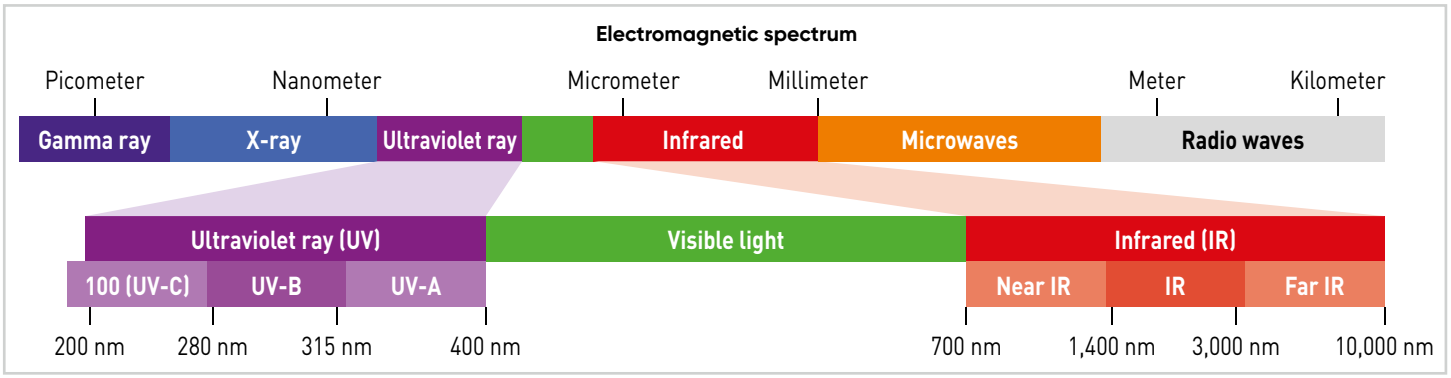
Light source structure



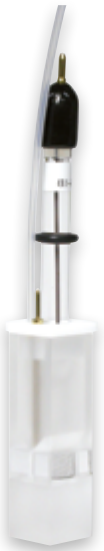
1. SMA905 Connector
2. Slit
3. Collimating mirror
4. Grating
5. Focus mirror
6. 2048 element CCD array

Utilization modes

	Information
Transmittance	
Absorbance/Transmittance	- Concentration of chemicals (solution) - Polymer extrusion processes - DNA quantification
Reflectance	- Freshness testing - Film thickness/composition (quality control) - Activation energy of photocatalytic species - Textile quality control
Fluorescence	
Fluorescence	- Marine organisms - Biology (DNA, protein, cell proliferation assay, histamine-analysis, algae monitoring) - Environmental fields (waste water analysis, ground water trace studies, hydrocarbon detection, dissolved oxygen) - Plant efficiency (plant physiology, plant breeding, horticulture, agronomy, agrochemicals, pollution studies, forestry, ecology) - Tissue diagnosis
Scattering	- Oil concentrations of oil/water systems - Raman spectroscopy - Physical transition phenomena (e.g: melting point, glass transition crystallization temperature)
Irradiance	
Emission	- Astronomy (e.g, spectra of Hale-Bopp, plasma monitoring) - In situ metal monitoring - Luminescence (Photoluminescence, Electroluminescence), LED & laser wavelength



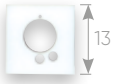
Spectroelectrochemical Cell


A-012813

A-012815

A-012606

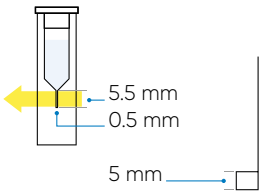
A-012609

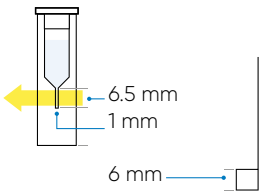


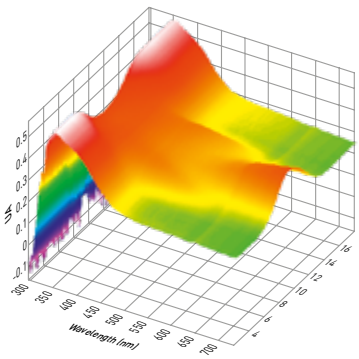
A-011501

Purge tube

		Platinum	Gold
0.5 mm	**Kit**	**A-012813**	**A-012814**
	Content		
	Platinum counter electrode	**A-012609**	
	Thin layer quartz glass cell	**A-012815**	
	PTFE cap	**A-011501**	
	Purge tube (ETFE, 100 mm)	-	
	Gauze working electrode	**A-012606** (80 mesh, height 5 mm)	**A-012607** (100 mesh, height 5 mm)
1 mm	**Kit**	**A-013510**	**A-013511**
	Content		
	Platinum counter electrode	**A-012906**	
	Thin layer quartz glass cell	**A-012907**	
	PTFE cap	**A-011501**	
	Purge tube (ETFE, 100 mm)	-	
	Gauze working electrode	**A-011498** (80 mesh, height 6 mm)	**A-012017** (100 mesh, height 6 mm)
Options			
RE-1BP Ag/AgCl reference electrode		**A-013613**	
RE-7N non-aqueous reference electrode		**A-013848**	
Purge tube (ETFE), 1 m		**A-010537**	





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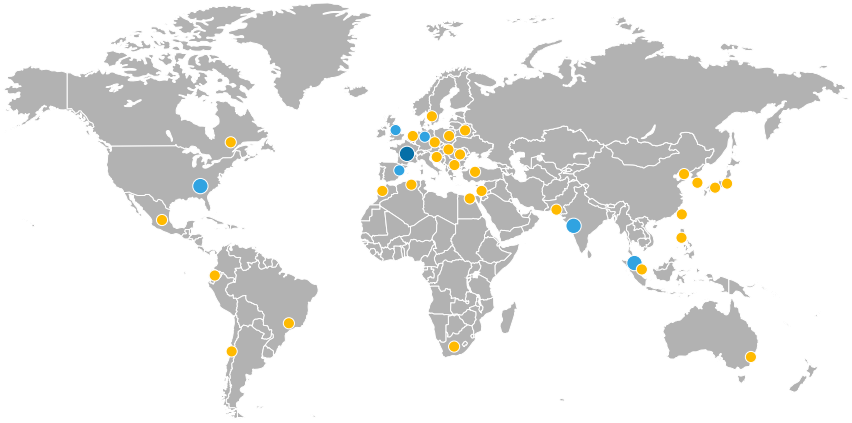

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Brochure EC-BR-035-d released on may 2023 - Specifications and pictures subject to change.