EC-Lab
BT-Lab
SCAN-Lab products

Electrochemistry accessories

BioLogic
Science Instruments

- Analytical cell
- Corrosion cell
- Glassware
- Electrodes
- Rotating electrodes
- Spectroelectrochemistry
- Quartz crystal analyzer
- Battery holders
- Cells for battery testing
- Fuel cell
- Connection accessories
- Local probes accessories

Bio-Logic

Bio-Logic SAS (founded in 1983) is located near Grenoble in the French Alps.

We design and manufacture high performance, research laboratory instruments and software for electrochemistry, battery testing, fuel cell and material testing.

Bio-Logic's product range is based on a modular and flexible design.
We offer electrochemical workstations (EC-Lab) and battery test equipments (BT-Lab) from single channel up to 128-channel systems, integrating EIS capability and high current boosters.

In 2012, Bio-Logic SAS extended its choice of instruments to the scanning electrochemical workstations. The Scan-Lab division is dedicated to high resolution electrochemical mapping tools. These products are developed, designed and manufactured by Uniscan Instruments Ltd., a company based in Macclesfield, UK. For more than 20 years, Uniscan Instruments Ltd. have been at the cutting edge of scanning probe electrochemistry technology.

SVC-2 | SVC-3 | VC-4 | Bulk electrolysis cell

Small volume cells

Each voltammetry cell is designed for a specific application (specific working electrode, volume of solution, oxygen free condition...).

For example, for voltammetry investigations using standard working electrode with an outer diameter (OD) of 6 mm the fixed configuration of SVC-3 kit is recommended.

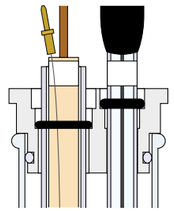
For application requiring other working electrode shape, SVC-2 is more suitable.

If only a small amount of the electroactive compound is available, SVC-2 in the microvolume mode is recommended.

- **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.

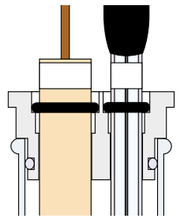
SVC-2 modularity:

microvolume mode

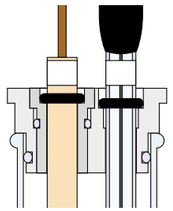


Small amount of solution (200 µL in the sample holder)

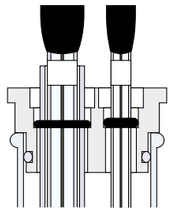
oxygen free mode



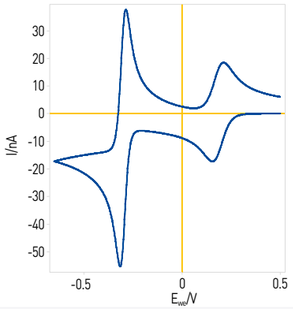
For electrode with OD of 10 mm



For electrode with OD of 6 mm

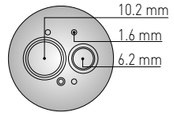
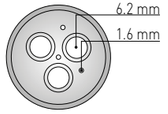
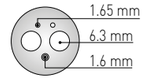


For microelectrode with OD of 4 mm



Note that a complete analytical special kit **SK-2** (A-012763) is also proposed, but the reference electrode has to be purchased separately.

This kit includes:
- SVC-3 kit (A-012669),
- PK-3 polishing kit (A-011975) (see page 18),
- one glassy carbon electrode, OD 6.0 mm, ID 3.0 mm (A-002012) (see page 18),
- one platinum electrode, OD 6.0 mm, ID 1.6 mm (A-002013) (see page 18).

Small volume cells		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	20 mL (7 pieces)	**A-001056**	20 mL (7 pieces)	**A-001056**	5 mL (7 pieces)	**A-011504**	100 mL (1 piece)	**A-012632**
Counter electrode (CE)	57 mm	**A-002222**	50 mm	**A-002222**	57 mm	**A-002222**	230 mm	**A-002234**
PTFE cap		**A-012670**		**A-012671**		**A-011226**		**A-0 12551**
Purge tube (ETFE), 100 mm		**-**		**-**		**-**		**-**
Additional items	adapter 10 to 6	**-**			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	9.0 mm (2 pieces)	**A-012177**	6.0 mm (2 pieces)	**A-012176**				
Cell holder	for 20 mL	**A-001209**	for 20 mL	**A-001209**				
Purge tube (ETFE)	1 m	**A-010537**	1 m	**A-010537**	1 m	**A-010537**	1 m	**A-010537**
Working electrodes			see page 18		see page 18			
Reference electrodes			see page 20		see page 20		see page 20	
PTFE cap								

Cell geometry

The geometry of the cell should be optimized to reduce the ohmic drop. Working and reference electrodes have to be close to each other.

The counter should not be the limiting factor for the electron transfer, so the surface area of the counter electrode should be larger than the surface area of the working electrode.

Cross flow cell

Radial flow cell

Large volume cells

This analytical cell with volumes from 50 to 250 mL is well adapted for macro electrochemistry applications.

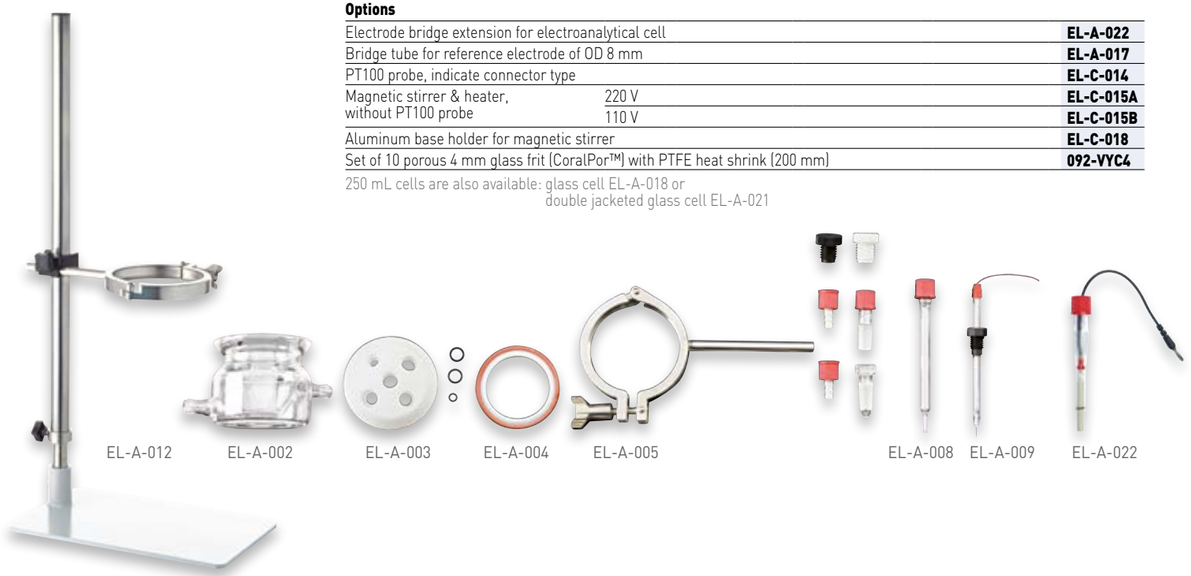
Two types of packages are offered:
- the standard analytical cell kit,
- the complete analytical cell kit (which allows temperature control and gas purging).

	Standard analytical cell kit (80 mL) EL-ELECTRO-1	Complete analytical cell kit (80 mL) EL-ELECTRO-2	Complete analytical cell kit (150 mL) EL-ELECTRO-3	Catalog n°
Glass cell 80 mL	■			**EL-A-001**
Double jacketed glass cell 80 mL		■		**EL-A-002**
Double jacketed glass cell 150 mL			■	**EL-A-020**
PTFE cap 5 holes	■	■	■	**EL-A-003**
PTFE ring, silicon encapsulated, OD 102 mm	■	■	■	**EL-A-004**
Cell collar with clamp	■	■	■	**EL-A-005**
Double purge tube		■	■	**EL-A-006**
Bridge tube for reference electrode, OD 6 mm	■	■	■	**EL-A-008**
Platinum counter electrode	■	■	■	**EL-A-009**
Purge tube	■			**EL-A-016**
Reference electrode	■	■	■	**A-013430**
Double nut 25 mm and 12 mm diameter		■	■	**EL-A-011**
Telescopic cell stand		■	■	**EL-A-012**

Options

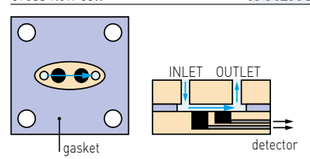
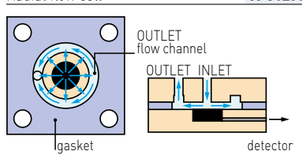
Electrode bridge extension for electroanalytical cell		**EL-A-022**
Bridge tube for reference electrode of OD 8 mm		**EL-A-017**
PT100 probe, indicate connector type		**EL-C-014**
Magnetic stirrer & heater, without PT100 probe	220 V	**EL-C-015A**
	110 V	**EL-C-015B**
Aluminum base holder for magnetic stirrer		**EL-C-018**
Set of 10 porous 4 mm glass frit (CoralPor™) with PTFE heat shrink (200 mm)		**092-VYC4**

250 mL cells are also available: glass cell EL-A-018 or double jacketed glass cell EL-A-021

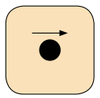


EL-A-012 EL-A-002 EL-A-003 EL-A-004 EL-A-005 EL-A-008 EL-A-009 EL-A-022

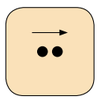
Flow cells

	Cross flow cell	Catalog n°	Radial flow cell	Catalog n°
Product	Cross flow cell*	**A-012798**	Radial flow cell*	**A-012799**
Schematic diagram				

* Gasket, working, reference electrodes and connectors are sold separately



Single/radial flow



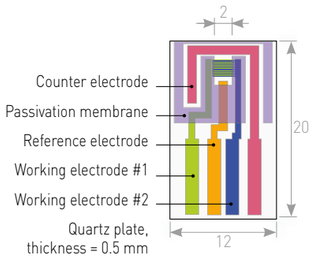
Dual, series/cross flow

Dual, parallel/cross flow

Options

Cross flow	electrode	glassy carbon	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001000**
		gold	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001002**
		platinum	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001012**
		silver	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001008**
		carbon paste	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001004**
		nickel	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001009**
		glassy carbon/gold	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-001006**
		glassy carbon/platinum	Ø 3 mm x 2 (dual type), size 25 x 25 mm	**A-012583**
	gasket	TG-2M PTFE (4 pieces)	film thickness 12 µm	**A-001046**
		TG-5M PTFE (4 pieces)	film thickness 25 µm	**A-001047**
		TG-6M PTFE (4 pieces)	film thickness 50 µm	**A-001048**
		TG-8M PTFE (4 pieces)	film thickness 100 µm	**A-001049**
		TG-11M silicon (4 pieces)	film thickness 500 µm	**A-001092**
		TG-12M silicon (4 pieces)	film thickness 1,000 µm	**A-001093**
	cross flow cell block		material PEEK	**A-001032**
Radial flow	electrode	glassy carbon	Ø 6 mm (single type), size 25 x 25 mm	**A-001016**
		glassy carbon	Ø 3 mm (single type), size 25 x 25 mm	**A-012124**
		platinum	Ø 3 mm (single type), size 25 x 25 mm	**A-009908**
		gold	Ø 3 mm (single type), size 25 x 25 mm	**A-011155**
		PFCE carbon	Ø 3 mm (single type), size 25 x 25 mm	**A-000999**
		carbon paste	Ø 3 mm (single type), size 25 x 25 mm	**A-010251**
	gasket	TG-2MR PTFE (4 pieces)	film thickness 12 µm	**A-001146**
		TG-5MR PTFE (4 pieces)	film thickness 25 µm	**A-001147**
		TG-6MR PTFE (4 pieces)	film thickness 50 µm	**A-001148**
		TG-8MR PTFE (4 pieces)	film thickness 100 µm	**A-012802**
		TG-11MR PTFE (4 pieces)	film thickness 500 µm	**A-001192**
		TG-12MR PTFE (4 pieces)	film thickness 1,000 µm	**A-001193**
	radial flow cell block		material PEEK	**A-001031**
Cross/radial	RE-3V Ag/AgCl reference electrode screw type		size Ø 10 x 48 mm	**A-012169**
	RE-7V non aqueous reference electrode (Ag/Ag^+) screw type, poly acetal resin			**A-012173**
	RE-3VP Ag/AgCl screw type electrode, PEEK resin			**A-012170**
	RE-7VP non aqueous reference electrode (Ag/Ag^+) screw type, PEEK resin			**A-012174**
	0.04" single leal connector (2 pieces)			**A-012912**
	0.04" MM connector (10 pieces)			**A-013273**
	1/16" PEEK tube		ID 0.25 mm, length 3.0 m	**A-001531**
	dynaseal PEEK fingertight (10 pieces)		screw for pipe connecting integrated 1/16"	**A-004130**

InterDigitated Array (IDA) electrodes



The passivation membrane is a Novolac resin + naphtoquinore-diazido compounds.

IDA electrode	Width	Interval	Length	N° of feet	Film thickness	Catalog n°
Gold	2 µm	2 µm	2 mm	65 pairs	90 nm	**A-012257**
Platinum	2 µm	2 µm	2 mm	65 pairs	90 nm	**A-012258**
Gold without passivation membrane	2 µm	2 µm	2 mm	65 pairs	90 nm	**A-012261**
Platinum without passivation membrane	2 µm	2 µm	2 mm	65 pairs	90 nm	**A-012264**
Gold	3 µm	3 µm	2 mm	65 pairs	90 nm	**A-012129**
Platinum	3 µm	3 µm	2 mm	65 pairs	90 nm	**A-012130**
Gold without passivation membrane	3 µm	3 µm	2 mm	65 pairs	90 nm	**A-012260**
Platinum without passivation membrane	3 µm	3 µm	2 mm	65 pairs	90 nm	**A-012263**
Gold	10 µm	5 µm	2 mm	65 pairs	90 nm	**A-012125**
Platinum	10 µm	5 µm	2 mm	65 pairs	90 nm	**A-012126**
ITO	10 µm	5 µm	2 mm	65 pairs	100 ±20 nm	**A-012128**
Carbon	10 µm	5 µm	2 mm	65 pairs	1200 ±100 nm	**A-012127**
Gold without passivation membrane	10 µm	5 µm	2 mm	65 pairs	90 nm	**A-012259**
Platinum without passivation membrane	10 µm	5 µm	2 mm	65 pairs	90 nm	**A-012262**
ITO without passivation membrane	10 µm	5 µm	2 mm	65 pairs	100 ±200 nm	**A-012265**
Carbon without passivation membrane	10 µm	5 µm	2 mm	65 pairs	1200 ±100 nm	**A-012266**

Options	
Cable kit for IDA electrode	**A-011066**
Ag/AgCl ink for reference electrode (2.0 mL)	**A-011464**

Ring disk type electrodes

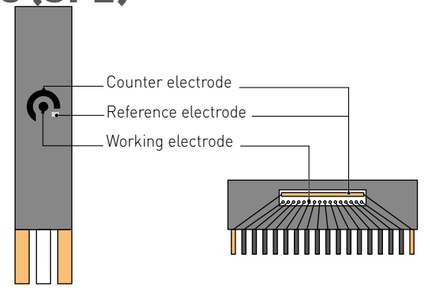
Ring disk type electrodes	Ring OD	Ring ID	Disk	Catalog n°
Gold ring disk electrode (3 pieces)	6 mm	4 mm	3 mm	**A-002081**
Platinum ring disk electrode (3 pieces)	6 mm	4 mm	3 mm	**A-002082**
Carbon ring disk electrode (3 pieces)	6 mm	4 mm	3 mm	**A-002083**

Screen Printed Electrodes (SPE)

Screen Printed Electrodes (SPE) are low cost and disposable. They include one reference electrode, one counter electrode and one or several working electrodes according to the design needed. The working electrode can be made of glassy carbon, platinum, gold. The SPE allows users to work with a small amount of solution (25-100 µL).

A two–electrode set-up is used for multi working electrode SPE with one shared reference electrode and one shared counter electrode.

Note with Bio-Logic's multichannel potentiostats, it is possible to run simultaneous investigations on each working electrode of the array (up to 16).



Three-electrode sensor

Array of 16 working electrodes

Screen Printed Electrodes	Working electrode	Counter electrode	Ref. electrode	Substrat	Packaging	Catalog n°
3-electrode	graphite	graphite	Ag/AgCl	alumina	20 pieces	**G-GGA/0**
Ø of WE: 2 mm	graphite	graphite	Ag/AgCl	alumina	100 pieces	**G-GGA/1**
size of RE: 0.5 x 1 mm	graphite	graphite	Ag/AgCl	alumina	500 pieces	**G-GGA/2**
ratio CE/WE surface area: 4/1	graphite	graphite	Ag/AgCl	valox FR1	20 pieces	**G-GGP/0**
overall dimension: 50 x 10 mm	graphite	graphite	Ag/AgCl	valox FR1	100 pieces	**G-GGP/1**
	graphite	graphite	Ag/AgCl	valox FR1	500 pieces	**G-GGP/2**
	platinum	graphite	Ag/AgCl	alumina	100 pieces	**G-PTGA/1**
	platinum	graphite	Ag/AgCl	alumina	500 pieces	**G-PTGA/2**
	platinum	graphite	Ag/AgCl	valox FR1	100 pieces	**G-PTGP/1**
	platinum	graphite	Ag/AgCl	valox FR1	500 pieces	**G-PTGP/2**
	gold	graphite	Ag/AgCl	alumina	20 pieces	**G-AUGA/0**
	gold	graphite	Ag/AgCl	alumina	100 pieces	**G-AUGA/1**
	gold	graphite	Ag/AgCl	alumina	500 pieces	**G-AUGA/2**
	gold	graphite	Ag/AgCl	valox FR1	20 pieces	**G-AUGP/0**
	gold	graphite	Ag/AgCl	valox FR1	100 pieces	**G-AUGP/1**
	gold	graphite	Ag/AgCl	valox FR1	500 pieces	**G-AUGP/2**

Option	
Connector for 3-electrode Screen Printed Electrodes (2 mm banana plug)	**U-GEM**

	Working electrode	Counter electrode & ref. electrode	Substrat	Packaging	Catalog n°
Array of 16 WE	graphite	Ag/AgCl	alumina	100 pieces	**G-A-GA/1**
Ø of WE: 0.8 mm	graphite	Ag/AgCl	alumina	500 pieces	**G-A-GA/2**
size of pseudo-RE: 20 x 1 mm	graphite	Ag/AgCl	valox FR1	100 pieces	**G-A-GP/1**
overall dimension: 45 x 19 mm	graphite	Ag/AgCl	valox FR1	500 pieces	**G-A-GP/2**
	platinum	Ag/AgCl	alumina	100 pieces	**G-A-PTA/1**
	platinum	Ag/AgCl	alumina	500 pieces	**G-A-PTA/2**
	platinum	Ag/AgCl	valox FR1	100 pieces	**G-A-PTP/1**
	platinum	Ag/AgCl	valox FR1	500 pieces	**G-A-PTP/2**
	gold	Ag/AgCl	alumina	100 pieces	**G-A-AUA/1**
	gold	Ag/AgCl	alumina	500 pieces	**G-A-AUA/2**
	gold	Ag/AgCl	valox FR1	100 pieces	**G-A-AUP/1**
	gold	Ag/AgCl	valox FR1	500 pieces	**G-A-AUP/2**

Standard corrosion cells

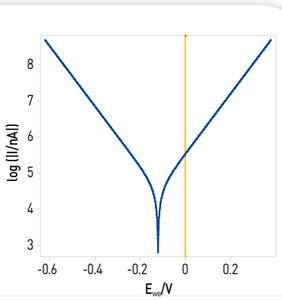
For corrosion applications,
two packages for large volume
i.e. ~1 L are available:
- basic corrosion cell kit,
- complete corrosion cell kit
  (allows temperature control
  and includes sample holder
  and cell stand).

	Basic corrosion cell kit EL-CORR-1	Complete corrosion cell kit EL-CORR-2	Catalog n°
Glass cell 1 L	■		**EL-C-001**
Double jacketed glass cell 1 L		■	**EL-C-002**
PTFE cap	■	■	**EL-C-003**
PTFE ring, silicon encapsulated, OD 102 mm	■	■	**EL-C-004**
Cell collar with clamp	■	■	**EL-C-005**
Double purge tube		■	**EL-C-006**
Graphite counter electrode rod (2 pieces)	■	■	**EL-C-009**
Double nut 25 mm and 12 mm diameter		■	**EL-C-011**
Telescopic cell stand		■	**EL-C-012**
Sample holder 1 cm^2		■	**092-C-013**
Purge tube	■		**EL-C-016**
Bridge tube for 8 mm diameter reference electrode	■	■	**EL-C-017**
Calomel reference electrode length 80 mm, OD 8 mm screw cap	■	■	**R-XR110**
Cable connection for screw cap 100 mm, 2 mm banana plug	■	■	**R-A94L111**
12 mm OD conical rings for reference electrode of 8 mm (4 pieces)	■	■	**R-X31M012**

Options

Bridge tube for 6 mm diameter reference electrode		**EL-C-008**
PT100 probe (indicate connector type)		**EL-C-014**
Magnetic stirrer & heater, without PT100 probe	220 V	**EL-C-015A**
	110 V	**EL-C-015B**
Aluminum base holder for magnetic stirrer		**EL-C-018**
Set of 10 porous frit (4 mm CoralPor™) with PTFE heat shrink (200 mm)		**092-VYC4**

500 mL or 2 L double jacketed glass cell
are also available (EL-C-020 and EL-C-021, respectively).



Avesta cell

Avesta cell is an electrochemical cell developed for pitting corrosion testing (ASTM G150).

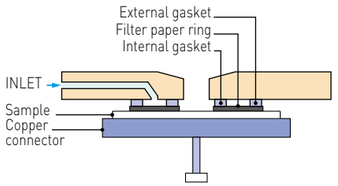
It is designed to avoid microcrevice corrosion formed between the working electrode and the gasket at the bottom aperture of the cell.

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) which delivers 0.5 to 5 mL/h.

Avesta cell	Catalog n°
Avesta cell kit	**EL-AV-001**
Content	
Double jacketed cell glass 250 mL	**EL-AV-002**
PTFE cap 5 holes	**EL-AV-003**
O-ring PTFE silcone 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)	**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 frit (4 mm CoralPor™) with PTFE heat shrink (200 mm)	**092-VYC4**

Principle of Avesta cell



Flat cells,
1 to 10 cm² sample area

This cell with a volume of 250 mL is adapted to perform AC or DC experiments on flat specimen of 1 cm² or 10 cm² area.

This cell has a double jacket for temperature control and three holes for reference electrode, purge tube and temperature probe with inner diameter of 17.6 mm and the 2 others of 8.3 mm.

Thanks to its design, any sample with a thickness inferior to 10 mm fits in the holder.

Flat cell 1 cm²	Catalog n°
Flat cell kit 1 cm²	**EL-FLAT**
Content	
RE-2B calomel reference electrode (length: 90 mm, OD: 6 mm)	**A-013430**
Platinum mesh counter electrode (54 mm wire/ 80 mesh), 25 x 35 mm	**A-702439**
Reference electrode bridge tube (6 mm diameter)	**EL-F-004**
Corrosion flat cell 1cm²	**EL-FLAT-3**
EL-FLAT-3 includes: - glass part for flat cell (250 mL) - mechanical part for corrosion flat cell 1 cm²	**EL-F-002** **EL-FLAT-3H**

Flat cell 10 cm²	Catalog n°
Flat cell kit 10 cm²	**EL-FLAT-2**
Content	
RE-2B calomel reference electrode (length: 90 mm, OD: 6 mm)	**A-013430**
Platinum mesh counter electrode (54 mm wire/ 80 mesh), 25 x 35 mm	**A-702439**
Reference electrode bridge tube (6 mm diameter)	**EL-F-004**
Corrosion flat cell 10 cm²	**EL-FLAT-4**
EL-FLAT-4 includes: - glass part for flat cell (250 mL) - mechanical part for corrosion flat cell 10 cm²	**EL-F-002** **EL-FLAT-4H**

Investigation in agressive media

If the experiment is performed in more agressive media such as fluorhydric acid media, it is possible to get a body of the flat cell in PVDF* instead of glass.

	Fluorhydric acid 48%		**Sulfuric acid** 98%		**Phosphoric acid** 85%		**Hydrochloric acid** 35%		**Nitric acid** 70%		**Perchlorique acid**		**Sodium hydroxide** 50%		**Potassium hydroxide** concentred	
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*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Borosilicated glass	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

■ excellent
■ good
■ not recommended
■ not compatible
* Polyvinylidenefluoride

Options	Catalog n°
PVDF* body (non double 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 frit (4 mm CoralPor™) with PTFE heat shrink (200 mm)	**092-VYC4**

* Polyvinylidenefluoride
** 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 may be 1 or 10 cm².

Galvanic cell 1 cm²	Catalog n°
Galvanic cell kit 1 cm²	**EL-GAL-1**
Content	
Flat cell kit 1 cm²	**EL-FLAT**
Galvanic kit 1 cm²	**092-FLAT/1**

Galvanic cell 10 cm²	Catalog n°
Galvanic flat cell kit 10 cm²	**EL-GAL-10**
Content	
Flat cell kit 10 cm²	**EL-FLAT-2**
Galvanic kit 10 cm²	**092-FLAT/10**

Plate material evaluating cell,
up to 1 cm² sample area

This cell was developed to evaluate a plate material such as a metal, semi-conducting plate...
The sample plate is sandwiched between the two cell blocks.

The required volume of solution is about 1 mL.

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

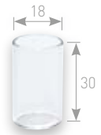
Coating cell

Coating cell	Catalog n°
Coating cell kit	**EL-COAT**
Content	
Glass for coating cell	**EL-P-002**
Nylon base with three feets	**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)	**EL-P-009**
Options	
Ag/AgCl reference electrode (OD: 6mm)	**A-012167**
Bridge tube for 6 mm reference electrode	**EL-P-008**
Mask for 1 cm² (20 pieces)	**EL-P-011**
Mask for 5 cm² (20 pieces)	**EL-P-012**
Mask for 10 cm² (20 pieces)	**EL-P-013**

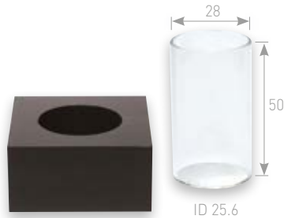
Small volume cell vials, 1 to 100 mL

To complete a kit, the cell vials are also offered separately.

Note that other volumes are available on request.



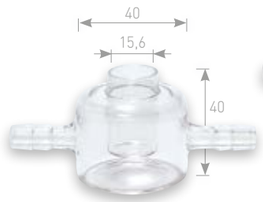
ID 15.6
A-011504



A-001209
cell holder for A-011506

ID 25.6
A-001056

ID 46.4
A-012632



A-012672

A-001051

A-012652

Small & big volume cell vials		Volume	OD	ID	Height	Quantity	Purpose	Catalog n°
Small volume cell vials	sample vial	5 mL	18 mm	15.6 mm	30 mm	10	VC-4	**A-011504**
		20 mL	28 mm	25.6 mm	50 mm	10	SVC-2, SVC-3	**A-001056**
		100 mL	50 mm	46.4 mm	72 mm	1	RRDE-3A, bulk electrolysis	**A-012632**
	water jacketed-glass vial	5 mL	40 mm	15.6 mm	40 mm	1	VC-4	**A-012672**
		20 mL	55 mm	25.6 mm	50 mm	1	SVC-2, SVC-3	**A-001051**
		100 mL	70 mm	46.4 mm	80 mm	1	RRDE-3A, bulk electrolysis	**A-012652**
	cell holder for 20 mL vial					1	SVC-2, SVC-3	**A-001209**
Big volume cell vials	sample vial	80 mL	90 mm	62 mm	80 mm	1	EL-ELECTRO-1	**EL-A-001**
		1,000 mL	120 mm	90 mm	175 mm	1	EL-CORR-1	**EL-C-001**
	water jacketed-glass vial	80 mL	90 mm	62 mm	85 mm	1	EL-ELECTRO-2	**EL-A-002**
		1,000 mL	120 mm	90 mm	200 mm	1	EL-CORR-2	**EL-C-002**
	cell holder for king size vial (1 L)					1	EL-CORR-1	**EL-C-019**

Big volume cell vials, 100 to 2,000 mL

EL-A-001

EL-A-002

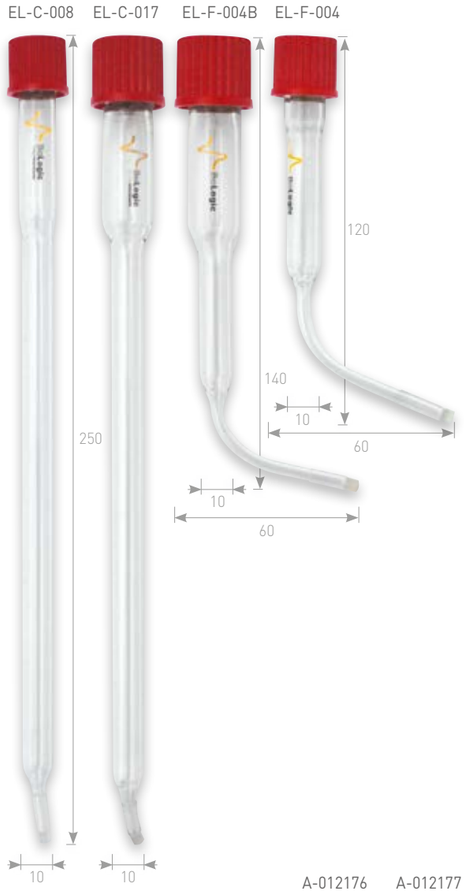
EL-C-001

EL-C-019,
cell holder for EL-C-001

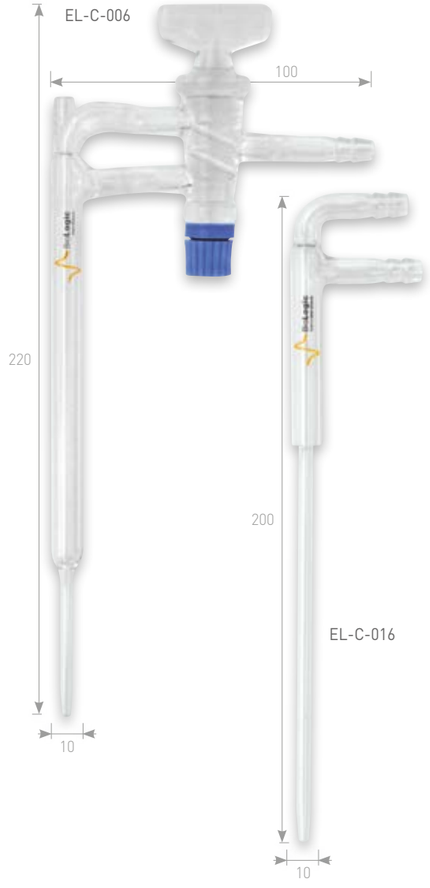
EL-C-002

Dimensions in mm

Bridge tubes
for corrosion cells



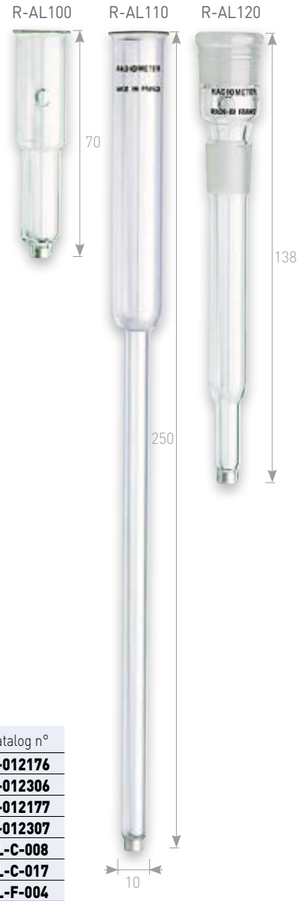
Purge tubes
for corrosion cells



Bridge tubes
for analytical cells

Purge tubes
for analytical cells

Bridge tubes
with ceramic junction



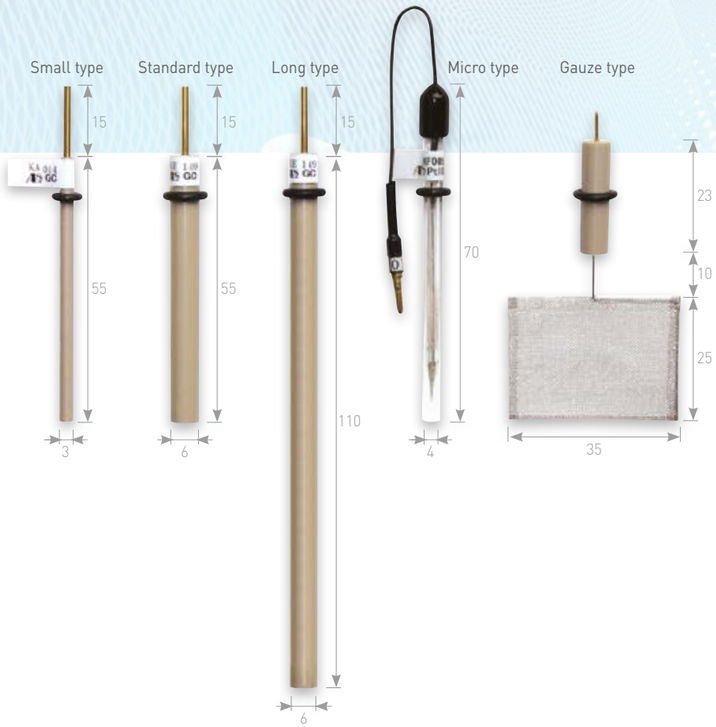
Small size bridge tubes

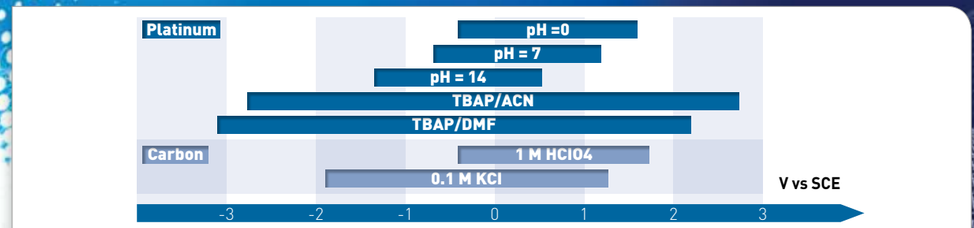
The tolerance of each dimension is approximately ±0.5 mm.

Glassware	Ref. electrode	OD	Height	Quantity	Purpose	Vycor type compatibility	Catalog n°
Small size bridge tube	Ø 6 mm	6 mm	68 mm	2	SVC-2, SVC-3	092-VYC3[1]	**A-012176**
	Ø 6 mm	6 mm	68 mm	22	SVC-2, SVC-3		**A-012306**
	Ø 9 mm	9 mm	68 mm	2	SVC-2		**A-012177**
	Ø 9 mm	9 mm	68 mm	22	SVC-2		**A-012307**
Bridge tube for corrosion cells	Ø 6 mm	10 mm	250 mm	1	EL-CORR	092-VYC4[2]	**EL-C-008**
	Ø 8 mm	10 mm	250 mm	1	EL-CORR		**EL-C-017**
		10 mm	120 mm	1	EL-FLAT		**EL-F-004**
		10 mm	140 mm	1	EL-FLAT		**EL-F-004B**
Bridge tube for analytical cells	Ø 8 mm	10 mm	165 mm	1	EL-ELECTRO		**EL-A-017**
	Ø 6 mm	10 mm	155 mm	1	EL-ELECTRO		**EL-A-008**
Purge tube for analytical cells	single	10 mm	165 mm	1	EL-ELECTRO		**EL-A-016**
	double	10 mm	200 mm	1	EL-ELECTRO		**EL-A-006**
Purge tube for corrosion cells	single	10 mm	200 mm	1	EL-CORR		**EL-C-016**
	double	10 mm	220 mm	1	EL-CORR		**EL-C-006**
Bridge tube with ceramic junction	short	12 mm	70 mm	1			**R-AL100**
	standard	8 mm	250 mm	1			**R-AL110**
	with reverse sleeve (non aqueous)	8 mm	138 mm	1			**R-AL210**
	standard	8 mm	138 mm	1			**R-AL120**
Options							
(1) Set of 10 porous 2.8 mm glass frit (CoralPor™) with PTFE heat shrink (200 mm)							**092-VYC3**
(2) Set of 10 porous 4 mm glass frit (CoralPor™) with PTFE heat shrink (200 mm)							**092-VYC4**

Dimensions in mm

Working electrodes





Electroactivity window of the working electrodes in different media

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

Working electrodes		Isolation	OD	Electrode size ±4%	Catalog n°
Carbon	long glassy carbon electrode	PEEK	6 mm	3 mm	**A-012744**
	standard glassy carbon electrode	PEEK	10 mm	5 mm	**A-002417**
		PEEK	6 mm	3 mm	**A-002012**
		PEEK	6 mm	1.6 mm	**A-012297**
		PEEK	6 mm	1 mm	**A-002411**
	small glassy carbon electrode	PEEK	3 mm	1.6 mm	**A-012298**
		PEEK	3 mm	1 mm	**A-002412**
	micro carbon fiber electrode	glass	4 mm	33 µm	**A-002002**
		glass	4 mm	7 µm	**A-002007**
	standard pyrolytic graphite electrode	basal plane PEEK	6 mm	3 mm	**A-002252**
		edge plane PEEK	6 mm	3 mm	**A-002253**
	standard PFCE carbon electrode	PEEK	6 mm	3 mm	**A-002408**
		PEEK	6 mm	1 mm	**A-002409**
	small PFCE carbon electrode	PEEK	3 mm	1 mm	**A-011854**
Platinum	platinum gauze electrode	PEEK	80 mesh	25 x 35 mm	**A-002250**
	long platinum electrode	PEEK	6 mm	3 mm	**A-012745**
	standard platinum electrode	PEEK	10 mm	5 mm	**A-002420**
		PEEK	6 mm	3 mm	**A-002422**
		PEEK	6 mm	1.6 mm	**A-002013**
	small platinum electrode	PEEK	3 mm	1.6 mm	**A-002313**
	micro platinum electrode	glass	4 mm	100 µm	**A-002009**
		glass	4 mm	25 µm	**A-002003**
		glass	4 mm	15 µm	**A-002015**
		glass	4 mm	10 µm	**A-002005**
Gold	gold gauze electrode	PEEK	100 mesh	25 x 35 mm	**A-002251**
	long gold electrode	PEEK	6 mm	3 mm	**A-012746**
	standard gold electrode	PEEK	10 mm	5 mm	**A-002418**
		PEEK	6 mm	3 mm	**A-002421**
		PEEK	6 mm	1.6 mm	**A-002014**
	small gold electrode	PEEK	3 mm	1.6 mm	**A-002314**
	micro gold electrode	glass	4 mm	100 µm	**A-002010**
		glass	4 mm	25 µm	**A-002004**
		glass	4 mm	10 µm	**A-002006**
Silver	standard silver electrode	PEEK	10 mm	5 mm	**A-002416**
		PEEK	6 mm	3 mm	**A-002419**
		PEEK	6 mm	1.6 mm	**A-002011**
	small silver electrode	PEEK	3 mm	1.6 mm	**A-002315**
Palladium	standard palladium electrode	PEEK	6 mm	1.6 mm	**A-002019**
	small palladium electrode	PEEK	3 mm	1.6 mm	**A-002319**
Nickel	standard nickel electrode	PEEK	6 mm	1.5 mm	**A-002016**
	micro nickel electrode	glass	4 mm	100 µm	**A-002273**
Copper	standard copper electrode	PEEK	6 mm	1.6 mm	**A-002017**
		PEEK	6 mm	3 mm	**A-012584**
	micro copper electrode	glass	4 mm	25 µm	**A-002271**
Iron	standard iron electrode	PEEK	6 mm	1.5 mm	**A-002018**
		PEEK	6 mm	3 mm	**A-012585**
Carbon paste	standard carbon paste electrode hole depth 4 mm	PEEK	6 mm	3 mm	**A-002210**
	small carbon paste electrode hole depth 4 mm	PEEK	3 mm	1.6 mm	**A-002223**
	CPO carbon paste oil base 1 g				**A-001010**

Working electrode maintenance

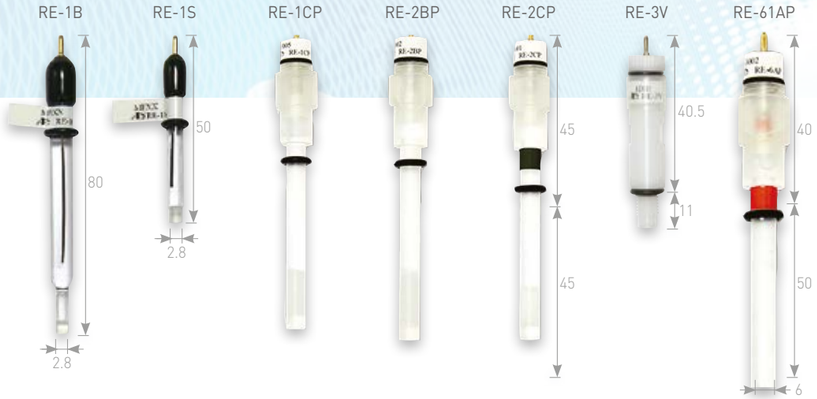
To refresh the surface of the electrode we recommend polishing the electrode after each measurement.

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

Dimensions in mm

Small size reference electrodes
for aqueous media (Ag/AgCl, Hg)

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



Small size reference electrode for aqueous media (Ag/AgCl, Hg)

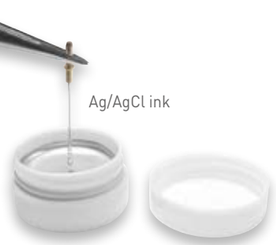
	Junction	Electrolyte	Purpose	Catalog n°
RE-1B silver, silver chloride reference electrode[1]	IPPG*	3 M NaCl	SVC-2, SVC-3, VC-4, bulk electrolysis, RRDE-3A, flat cell	**A-012167**
RE-1S silver, silver chloride reference electrode[1]	IPPG*	3 M NaCl	SECM	**A-012168**
RE-1CP silver, silver chloride reference electrode	ceramic	saturated KCl	SVC-2, SVC-3, VC-4, bulk electrolysis, RRDE-3A, flat cell	**A-013429**
RE-3V silver, silver chloride reference electrode screw type, poly acetal resin	IPPG*	3 M NaCl	for flow cell spectroelectrochemcial cell SEC-3F	**A-012169**
RE-3VP Ag/AgCl screw type electrode, PEEK resin	IPPG*	3 M NaCl	for flow cell spectro electrochemcial cell SEC-3F	**A-012170**
Ag/AgCl ink, 2 mL	- surface resistance: 0.2 Ω/sq/25.4 µm - viscosity: 50,000 ±10,000 CP @21.1 °C - flash point: 82 °C		for micro CV cell, IDA measurment	**A-011464**
RE-2BP calomel reference electrode	ceramic	saturated KCl	SVC-2, SVC-3, VC-4, bulk electrolysis, RRDE-3A, flat cell	**A-013430**
RE-2CP Hg_2SO_4 reference electrode, free from chloride	ceramic	saturated K_2SO_4		**A-013431**
RE-61AP Hg/HgO reference electrode main body in polyacetal resin	ceramic	1M NaOH	for alkaline media	**A-013395**
RHE Reversible Hydrogen Electrode kit	IPPG*	HCl or H_2SO_4	for acidic media (pH < 2)	**A-013373**

Spare parts

(1) Set of 10 porous 2.8 mm glass frit (CoralPor™) with PTFE heat shrink (200 mm)	**092-VYC3**

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**
Double junction chamber kit for RHE	**A-013375**



Maintenance of Vycor-based reference electrode

Store your reference electrode immersed in the electrolyte

When it is not in use, the recommended way to maintain the reference electrode capability and lifetime is to keep it in a sealed preservative vial with solution. This storage solution should be identical to the filling solution of the reference electrode.

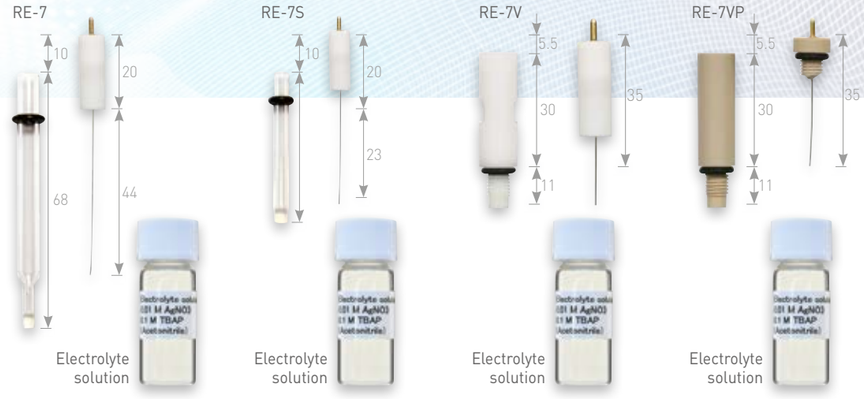
Prevent contamination

To prevent contamination of the reference electrode, a sample holder can be used.

Replace the vycor when needed

Yellowish discoloration indicates contamination. This is caused by the adsorption of organic compounds into the pores.

Small size reference electrodes
for non aqueous media (Ag/Ag⁺)



Small size reference electrode for non aqueous media (Ag/Ag⁺)

	Junction	Electrolyte	Purpose	Catalog n°
RE-7 non aqueous reference electrode (Ag/Ag⁺)[1]	IPPG*	Ag/Ag⁺/ACN**/TBAP***	CV	**A-012171**
RE-7S non aqueous reference electrode (Ag/Ag⁺)[1]	IPPG*	Ag/Ag⁺/ACN**/TBAP***	SECM	**A-012172**
RE-7V non aqueous reference electrode (Ag/Ag⁺) screw type, poly acetal resin	IPPG*	Ag/Ag⁺/ACN**/TBAP***	flow cell	**A-012173**
RE-7VP non aqueous reference electrode (Ag/Ag⁺) screw type, PEEK resin	IPPG*	Ag/Ag⁺/ACN**/TBAP***	flow cell	**A-012174**

Spare parts

Electrolyte solution (10 mL)	**A-012549**
PTFE cap with Ag wire (for RE-7)	**A-012057**
PTFE cap with Ag wire (for RE-7S)	**A-012058**
Sample holder 6 mm diameter (for RE-7) (2 pieces)	**A-012176**
(1) Set of 10 porous 2.8 mm glass frit (CoralPor) with PTFE heat shrink (200 mm)	**092-VYC3**

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
*** Tetra Butyl Ammonium Perchlorate

To avoid electrolyte leakage or concentration due to evaporation during storage or transport, the electrolyte is separated from the body. This gives the possibility to fill it regularly.

A-012177

A-012108

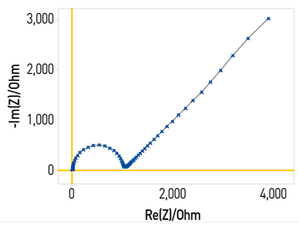
0.930 V	Hg/HgO/ NaOH (0.1 M)
0.650 V	Hg/Hg_2SO_4 / K_2SO_4 (sat)
0.624 V	Fc/Fc^+ TBAP (0.1M) ACN
0.542 V	Ag/Ag^+ TBAP (0.1M) ACN
0.241 V	Hg/Hg_2Cl_2 KCl (sat)
0.236 V	Hg/Hg_2Cl_2 NaCl (sat)
0.205 V	Ag/AgCl/ KCl (3.5 M)
0.197 V	Ag/AgCl/ KCl (sat)
0.194 V	Ag/AgCl/ NaCl(sat)
0.000 V	NHE Normal Hydrogen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

E/V vs NHE at 25 °C

Dimensions in mm

King size reference electrodes

King size reference electrodes	Connection type	Junction	Length	OD	Catalog n°
Red rod reference electrode	banana cable	ceramic	103 mm	7.5 mm	**R-REF201**
	banana cable	ceramic	103 mm	12 mm	**R-REF251**
	screw cap[1]	ceramic	103 mm	8 mm	**R-REF421**
$Hg/HgSO_4$ reference electrode in sat. K_2SO_4, chloride free	banana cable	ceramic	103 mm	7.5 mm	**R-REF601**
	screw cap[1]	ceramic	103 mm	8 mm	**R-REF621**
Calomel reference electrode non aqueous (LiCl) for general purpose	screw cap[1]	ceramic	103 mm	8 mm	**R-REF921**
Calomel reference electrode in KCl sat for CV, straight	screw cap[1]	ceramic	120 mm	8 mm	**R-XR110**
Calomel reference electrode in KCl sat for CV, curved	screw cap[1]	ceramic	120 mm	8 mm	**R-XR150**
$Hg/HgSO_4$ reference electrode in sat K_2SO_4 for CV	screw cap[1]	ceramic	120 mm	8 mm	**R-XR200**
Ag/AgCl reference electrode Sat KCl for CV	screw cap[1]	ceramic	120 mm	8 mm	**R-XR300**
Hg/HgO reference electrode in 0.1 M KOH for CV	screw cap[1]	ceramic	120 mm	8 mm	**R-XR400**
Hg/HgO reference electrode in 1 M KOH with fiber rod	screw cap[1]	ceramic	120 mm	8 mm	**R-XR440**
Ag/AgCl reference electrode for EIS	screw cap[1]	ceramic	160 mm	8 mm	**R-XR820**
Options					
(1) Cable connection for screw cap electrode, **recommended to connect these references electrodes to the Bio-Logic instruments**	banana plug of 2 mm		1 m		**R-CRI9439**
	banana plug of 2 mm		100 mm		**R-A94L111**
	banana plug of 4 mm		1 m		**R-CL111**
Salt bridge		ceramic	70 mm	12 mm	**R-AL100**
		ceramic	138 mm	8 mm	**R-AL120**
		ceramic	250 mm	8 mm	**R-AL110**
Salt bridge with reverse sleeve, non aqueous			138 mm	8 mm	**R-AL210**
Conical rings for 8 mm OD 12 mm electrodes (4 pieces)					**R-X31M012**



Counter electrodes

Counter electrodes		Length	Wire Ø	Surf. area	Purpose	Catalog n°
Platinum		57 mm	0.5 mm	~ 0.7 cm^2	SVC-2, VC-4, plate material evaluating cell	**A-002222**
		50 mm	0.5 mm	~ 0.7 cm^2	SVC-3	**A-002233**
		230 mm	0.5 mm	~ 3.6 cm^2	RRDE-3A, bulk electrolysis, SVC-3	**A-002234**
Gold		230 mm	0.5 mm	~ 3.6 cm^2	RRDE-3A, bulk electrolysis, SVC-3	**A-012638**
Nickel		230 mm	0.5 mm	~ 3.6 cm^2	RRDE-3A, bulk electrolysis, SVC-3	**A-012639**
Stainless steel		50 mm	1.5 mm	~ 2.35 cm^2	flow cell	**A-012198**
Platinum gauze electrode, PEEK	80 mesh	25 x 35 mm	0.08 mm	~ 1 cm^2		**A-002250**
Platinum gauze electrode, platinum wire of 51 mm		25 x 35 mm	0.08 mm	~ 1 cm^2	flat cell	**A-702439**
Gold gauze electrode, PEEK	100 mesh	25 x 35 mm	0.07 mm	~ 1 cm^2		**A-002251**
	55 mesh	40 x 50 mm	0.12 mm	~ 5.1 cm^2		**A-002254**

Metallic electrodes

Metallic electrodes	Length	OD	Wire dimension	Catalog n°
Platinum[1]	80 mm	8 mm	Ø 1 mm	**R-XM110**
	120 mm	8 mm	plate 5 x 5 mm	**R-XM120**
	120 mm	8 mm	plate 8 x 8 mm	**R-XM140**
	120 mm	12 mm	disk of 10 mm	**R-XM150**
Glassy carbon[1]	103 mm	8 mm	rod Ø of 3 mm	**R-M291C**
Options				
(1) Cable connection for screw cap electrode, **recommended to connect these references electrodes to the Bio-Logic instruments**	1 m, banana plug of 2 mm			**R-CRI9439**
	100 mm, banana plug of 2 mm			**R-A94L111**
	1 m, banana plug of 4 mm			**R-CL111**
Conical rings for 8 mm OD 12 mm electrodes (4 pieces)				**R-X31M012**

Dimensions in mm

A-011172 A-011162 A-011163 A-011164 A-011170 A-011171 A-011169

Rotating Ring Disk Electrode (RRDE)

RRDE-3A is a system that can be used to perform hydrodynamic (RDE or RRDE) measurement. Its design (short stainless steel shaft) allows the users to control accurately the electrode rotation and the modulation.

RRDE-3A is electronically controlled by a closed loop circuit driving a DC servo-motor. Electrodes are small and rapidly interchangeable.

The unit also provides an adjustable valve system for inert gas purging inside the cell vial. Additionally, the access to glass cell is easy for rinsing, cleaning, and replacing the electrodes.
It is easy to remove and replace the cell vial.

RRDE-3A is able to be operated as a stand-alone unit or directly controlled by Bio-Logic electrochemical workstation.

Features

- Remote- and manual-controlled rotation
- Small sample volume (up to 10 - 15 mL), gas line connector is available, remote and manual controlled purge lines
- Open architecture for easy access to cell

Specifications

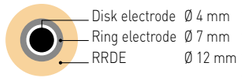
Rotational range	100 - 8,000 rpm
Setting resolution	1 rpm
Accuracy	< 0.1%
Rotation control type	PLL (phase-locked loop)
Bandwidth	60 Hz at 3,500 rpm base and 1,000 rpm peak-to-peak modulation
Inlet gas pressure	5 PSI
Temperature	10-50 °C
Power	100-240 VAC, 50/60 Hz
Dimensions (W x D x H)	185 x (base: 230, body: 120) x 400 mm
Weight	6 kg

Rotating Ring Disk Electrode	Catalog n°
RRDE-3A apparatus	**A-012180**

Working electrodes (page 25), reference electrodes (page 20) and counter electrodes (page 23) have to be purchased separately.

Content	
RRDE-3A glass cell vial 100 mL	**A-012632**
Spin coating adapter	**A-012064**
Nipple for purge valve	**A-012065**
Tygon tubing, OD 6.4 mm x ID 3.2 mm (1.3 m)	**A-010058**
PTFE cap for RRDE-3A	**A-012631**
Instruction manual	**-**
Power cable	**-**
Options	
Water-jacketed glass cell (100 mL, OD 70 mm, ID 46.4 mm, H 80 mm)	**A-012652**
DB9 cable to control RRDE-3A	**092-22/11**
Bipotentiostat cable for two standard channels	**092-22/12**
Bearing assembly	**A-012625**

Working electrode

Standard tips		Tips length	Tips OD	Ring ID	Ring OD	Disk Ø	Catalog n°
RRDE	platinum ring/platinum disk	25 mm	12 mm	5.0 mm	7.0 mm	4.0 mm	**A-011172**
	platinum ring/glassy carbon disk	25 mm	12 mm	5.0 mm	7.0 mm	4.0 mm	**A-011162**
	gold ring/glassy carbon disk	25 mm	12 mm	5.0 mm	7.0 mm	4.0 mm	**A-011163**
	platinum ring/gold disk	25 mm	12 mm	5.0 mm	7.0 mm	4.0 mm	**A-011164**
	gold ring/platinum disk	25 mm	12 mm	5.0 mm	7.0 mm	4.0 mm	**A-012617**
	glassy carbon ring/glassy carbon disk	25 mm	12 mm	5.0 mm	7.0 mm	4.0 mm	**A-012618**
RDE	glassy carbon disk	25 mm	12 mm	-	-	3.0 mm	**A-011169**
	platinum disk	25 mm	12 mm	-	-	3.0 mm	**A-011170**
	gold disk	25 mm	12 mm	-	-	3.0 mm	**A-011171**
	aluminum disk	25 mm	12 mm	-	-	3.0 mm	**A-011966**
	silver disk	25 mm	12 mm	-	-	3.0 mm	**A-011967**
	copper disk	25 mm	12 mm	-	-	3.0 mm	**A-011968**
	nickel disk	25 mm	12 mm	-	-	3.0 mm	**A-011969**
	tantalum disk	25 mm	12 mm	-	-	3.0 mm	**A-011970**
	titanium disk	25 mm	12 mm	-	-	3.0 mm	**A-011971**
	tungsten disk	25 mm	12 mm	-	-	3.0 mm	**A-011972**
	carbon paste disk, hole depth 4 mm	25 mm	12 mm	-	-	3.0 mm	**A-011973**

Option	
PK-3 polishing kit	**A-011975**

Disk Replaceable Electrode tips			Catalog n°
RRDE	platinum ring/GC disk replaceable electrode kit		**A-013336**
	content	platinum ring assembly	**A-013337**
		glassy carbon disk	**A-013338**
		PTFE spacer (3 pieces)	**A-013339**
RDE	glassy carbon disk replaceable electrode kit		**A-013362**
	content	glassy carbon disk	**A-013338**
		PTFE spacer (3 pieces)	**A-013339**
		disk assembly	**A-013361**
	gold disk replaceable electrode kit		**A-013364**
	content	gold disk	**A-013366**
		PTFE spacer (3 pieces)	**A-013339**
		disk assembly	**A-013361**
	platinum disk replaceable electrode kit		**A-013365**
	content	platinum disk	**A-013367**
		PTFE spacer (3 pieces)	**A-013339**
		disk assembly	**A-013361**
Tool kit			
Disk electrode polishing and exchanging tool kit			**A-013340**

RRDE platinum ring/GC disk replaceable electrode kit

Disk electrode polishing and exchanging tool kit

Rotating Disk Electrode (RDE)

The EDI101 is a versatile and rugged rotating disk electrode ideal for use with any Bio-Logic potentiostat/galvanostat. It is available with a wide choice of quick-fit exchangeable tips in standard or custom materials: platinum, glassy carbon, gold... Thanks to its conic shaft holder, the EDI101 can be used with a wide range of cells.

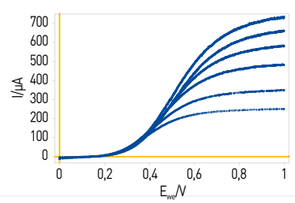
The CTV101 speed control unit controls the EDI101 rotation speed. It offers accuracy better than ±0.1% for precise and fully reproducible experimental conditions. The measured rotation speed is clearly displayed on a four-digit LCD.
The speed control unit can be directly driven from a Bio-Logic potentiostat/galvanostat. You can program the variation of the rotation speed from one method to another method and achieve a "Levich" type experiment all in one go.

This RDE can be used with the EL-ELECTRO-1, EL-ELECTRO-2 or EL-ELECTRO-3 kit.

Specifications

Rotational range	100 - 5,000 rpm
Accuracy	< 0.1%
Eccentricity	< ±0.1 mm
Setting resolution	1 rpm
Material of EDI101	Kel-F
Gas inlet for brush contact purging	Ø 2 mm
Temperature	5 - 40 °C
Power	230 Vac, 47.5 - 63 Hz
Consommation	12 VA
Dimensions	CTV101: 80 x 240 x 230 mm (W x D x H), EDI101: 255 mm (length)
Weight	CTV101: 1.5 kg EDI101: 0.3 kg

Rotating Disk Electrode			Catalog n°
Rotating Disk Electrode system including control unit and electrode rotator			**R-RDE/EDI**
Content			
CTV101, controlling unit for EDI101			**R-R21V035**
EDI101 RDE without tip (10-5,000 tr/min)			**R-A35T040**
BNC-BNC connector 1 m			**COR28100**
Options			
BEC/EDI electrochemical cell with glassware and electrodes			**R-XR51V001**
EDI tip	glassy carbon	Ø 3 mm	**R-A35T090**
	glassy carbon	Ø 5 mm	**R-A35T095**
	platinum	Ø 2 mm	**R-A35T100**
	platinum	Ø 5 mm	**R-A35T105**
	gold	Ø 2 mm	**R-A35T110**
	gold	Ø 5 mm	**R-A35T120**
	copper	Ø 5 mm	**R-A35T130**
	graphite	Ø 4 mm	**R-A35T140**
	silver	Ø 5 mm	**R-A35T150**
	nickel	Ø 5 mm	**R-A35T160**
	without any material		**R-A35T402**
	stainless steel	Ø 5 mm	**R-A35T420**
	sample holder	Ø 11 mm	**R-A35T450**
	platinum, L 40 mm	Ø 5 mm	**R-A35T452**
	gold, L 40 mm	Ø 4 mm	**R-A35T456**
Adapter EDI (banana 4 mm female, banana 2 mm male)			**R-X41V001**
DB9 cable to control RDE			**092-22/11**



Rotating electrodes
applications

RDE

A 20th century electro-chemist, Dr. Levich proposed the relationship between the voltammetry limiting current (I_L, A) of a rotating disk electrode and the physical parameters as follows:

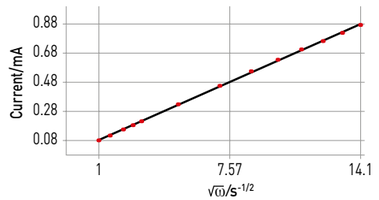
$$I_L = \pm 0.62\ n\ F\ A\ D^{2/3}\ \omega^{1/2}\ v^{-1/6}\ C$$

Where:
- ω is the rotational velocity (radian per second),
- n electrons involved within the reaction (dimensionless),
- F is the Faraday constant (F = 96,485 C/mol),
- A is the disk area (cm²),
- D is the diffusion coefficient (cm²/s),
- v is the kinematic viscosity (cm²/s),
- C is the electroactive species concentration (mol/cm³).

$$D = \left(\frac{m}{0.62\ n\ F\ A\ v^{-1/6}\ C}\right)^{3/2}$$

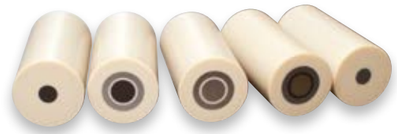
An example of the Levich analysis is performed on a 5.5 mM Potassium Hexacyanoferrate (III), in KCl (0.1 M) solution. The working electrode is a glassy carbon disk electrode.

The sequence comprised of 13 rotational velocities from 10 rpm to 2000 rpm, and 13 twin-cycle cyclic voltammograms. The resulting CVs are overlaid and presented in the image below. The Levich analysis leads to the diffusion coefficient (D) determination which is D = 6.36 x 10^{-6} cm²/s.



RRDE

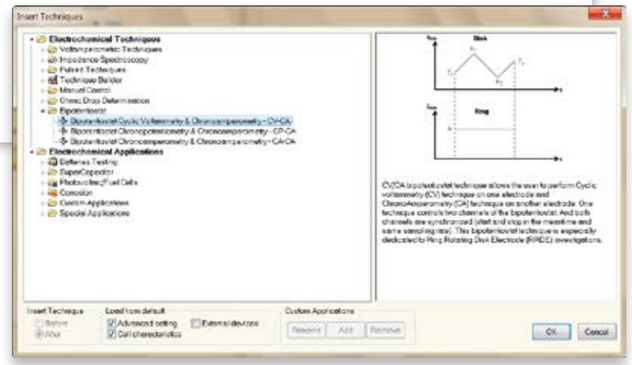
For RRDE measurement, a bipotentiostat is needed. A bipotentiostat controls the two working electrodes i.e. one channel to control the disk electrode and the other to control the ring. An SP-300 equipped with two channels would be an appropriate instrument for RRDE applications.

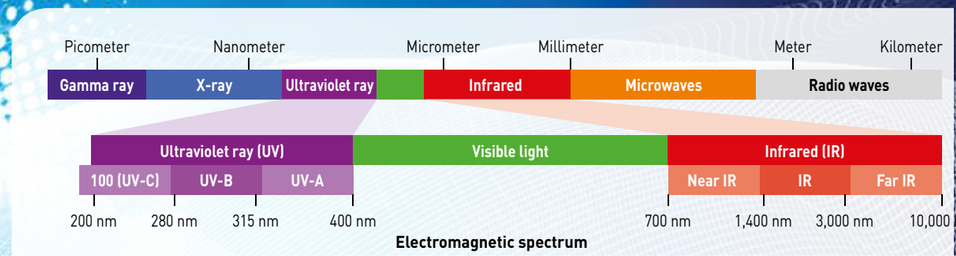


Because of the presence of two working electrodes in the same setup, a specific connection mode (to avoid any ground loop trouble) is needed.
This can be achieved in two different ways:
- isolating the two channels (at least one potentiostat in floating mode),
- grounding the counter electrode.
  The "CE-to-ground" mode of the Bio-Logic instruments provides this unique capability.

Of these two options, the latter is preferred because the leakage current is less. All of the Bio-Logic multichannel potentiostats (except cyclers) offer such electrode connection type.

At the disk electrode, the electro-active species are oxidized or reduced according to the applied potential. This new species is detected by reduction or oxidation at the ring, respectively.
In a typical experiment, a CV is performed on the disk electrode and a constant voltage is applied on the ring electrode. It is the CV-CA technique that is available in EC-Lab® in the "bipotentiostat" techniques folder.





Spectrometer

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

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

Utilization modes

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

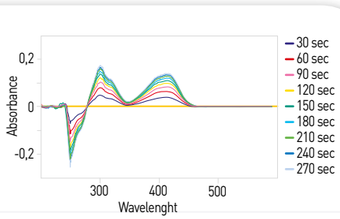
Fluorescence

Fluorescence	- Marine organisms - Biology (DNA, protein, cell proliferation assay, histamine-analysis, alga 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 system - Raman spectroscopy - Physical transition phenomena (e.g, melting point, glasstransition crystallize temperature)

Irradiance

Emission	- Astronomy (e.g, spectra of Hale-Bopp, plasma monitoring) - In situ metal monitoring - Luminescence (PL,EL), LED & laser wavelength

	SEC2000-UV/VIS	Catalog n°	SEC2000-VIS/NIR	Catalog n°
Spectrometer combo kit type	SEC2000-UV/VIS	**A-012838**	SEC2000-VIS/NIR	**A-012973**
Content				
Spectrometer	SEC2000-UV/VIS	**A-012856**	SEC2000-VIS/NIR	**A-012971**
Light source	SEC2000-DH UV	**A-012193**	SEC2000-TH visible	**A-012194**
Cuvette holder	SEC2000-CUV	**A-012195**	SEC2000-CUV with diffusion plate	**A-012244**
Option				
Connecting cable to synchronize the spectrometer and the Bio-Logic potentiostat				**092-22/11**



Spectrometer

	SEC2000-UV/VIS combo kit	SEC2000-VIS/NIR combo kit
Detector	2,048 pixels CCD array	2,048 pixels CCD array
Wave length range	220 - 800 nm	500 - 1,000 nm
Grating	blazed at 400 nm	blazed at 750 nm
Resolution	1.8 ±0.2 nm: slit 50 µm x 1,000 µm (standard) (1)	1.8 ±0.2 nm: slit 50 µm x 1,000 µm (standard) (1)
Accuracy	< 1% at a Abs	< 1% at a Abs
Dark noise	< 2 mAbs	< 2 mAbs
A/D resolution	14 bit	14 bit
Optical entrance	SMA905	SMA905
Interface	USB 2.0	USB 2.0
Operating system	Windows™ XP	Windows™ XP
Dimensions (W x D x H)	98 x 118 x 35 mm	98 x 118 x 35 mm
Catalog n°	**A-012856**	**A-012971**

(1). Slit could be selected from: 10, 25, 100, 200 µm.

Light source

		SEC2000-DH Light source (deuterium & tungsten halogen)	SEC2000-TH Light source (tungsten halogen)
Spectral range (Halogen + D2)		200 - 1,100 nm	360 - 2,000 nm
D2 lamp	spectral range	200 - 400 nm	-
	power consumption (240 nm)	< 5 x 10^{-8} W/nmsr	-
	stability	1 x 10^{-3} AU	-
	drift	< 0.25%/h	-
	bulb life (2)	> 1,000 h	-
Halogen lamp	bulb life	> 2,000 h	1,500 h
Connector		SMA905 included	SMA905 not included
Dimensions (W x D x H)		98 x 118 x 35 mm	98 x 118 x 35 mm
Catalog n°	light source	**A-012193**	**A-012194**
Spare parts			
Bulb		**A-012221** (UV bulb)	**A-012222** (TV bulb)

(2). Value for less than 50% power consumption of 240 nm.

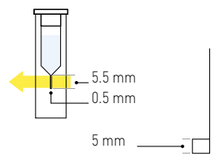
Cuvette holder

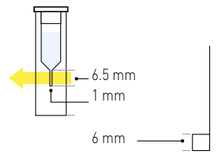
	SEC2000-UV/VIS combo kit	SEC2000-VIS/NIR combo kit
Catalog n°	**A-012195**	**A-012244**

Static experiment

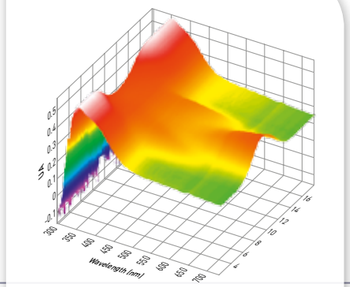
A-012904 | A-012907 | A-011498 | A-012906 | A-011501 | Purging tube

Quartz glass spectroelectrochemical cell kit		Platinum	Catalog n°	Gold	Catalog n°
0.5 mm			**A-012813**		**A-012814**
	Content				
	platinum counter electrode		**A-012609**		**A-012609**
	thin layer quartz glass cell		**A-012815**		**A-012815**
	PTFE cap		**A-011501**		**A-011501**
	purging tube (ETFE, 100 mm)		**-**		**-**
	gauze working electrode	80 mesh, height 5 mm	**A-012606**	100 mesh, height 5 mm	**A-012607**
1 mm			**A-012904**		**A-012905**
	Content				
	platinum counter electrode		**A-012906**		**A-012906**
	thin layer quartz glass cell		**A-012907**		**A-012907**
	PTFE cap		**A-011501**		**A-011501**
	purging tube (ETFE, 100 mm)		**-**		**-**
	gauze working electrode	80 mesh, height 6 mm	**A-011498**	100 mesh, height 6 mm	**A-012017**



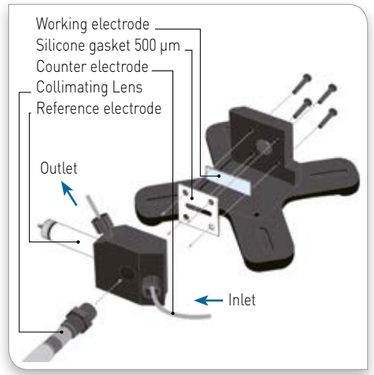


Options		
RE-1B Ag/AgCl reference electrode		**A-012167**
RE-7 non aqueous reference electrode		**A-012171**
Purging tube (ETFE), 1 m		**A-010537**



Flow experiment

Flow experiment		Quantity	Catalog n°
SEC-2F spectroelectrochemical flow cell			**A-012660**
Content			
SEC-2F flow cell	base	1	**-**
	cover	1	**-**
	block A	1	**-**
	block B	1	**-**
SEC-2F S500 silicone gasket		2	**A-012661**
Stainless tube OD 1.59 mm (length of 50 mm)		1	**A-012198**
Needle adaptor		1	**-**
Dynaseal PEEK fingertight		2	**-**
Silicon tube (300 mm)		1	**-**
PTFE tube (1 m)		1	**-**
Options			
Reference electrode screw type	Ø 10 x 55 mm	RE-3V aqueous	**A-012169**
		RE-3VP aqueous (PEEK)	**A-012170**
		RE-7V non aqueous	**A-012173**
		RE-7VP non aqueous (PEEK)	**A-012174**
Working grid electrode for flow cell	8 x 27 x 1 mm	platinum (1 piece)	**A-012655**
		gold (1 piece)	**A-012656**
		carbon grid electrode (1 piece)	**A-012657**
		ITO electrode (4 pieces)	**A-012658**
	8 x 27 x 0.5 mm	ITO electrode (12 pieces)	**A-011465**
	10 x 20 x 0.5 mm	ITO electrode (10 pieces)	**A-010887**
	10 x 10 x 0.5 mm	ITO electrode (30 pieces)	**A-011233**
	Ø 4 inch x 0.5 mm	ITO electrode (1 piece)	**A-011827**
Gasket	silicone	S500, 500 µm thick (4 pieces)	**A-012661**
	PTFE	T500, 500 µm thick (4 pieces)	**A-012664**
		T250, 250 µm thick (4 pieces)	**A-012665**
		T100, 100 µm thick (4 pieces)	**A-012666**
Fibre and lens		400 m optical fibre SR, 250 mm	**A-012667**
		400 µm optical fibre SR, 2 m	**A-011522**
		UV/VIS collimating lens, 200-2,000 nm	**A-012234**



Gold grid electrode **A-012656**

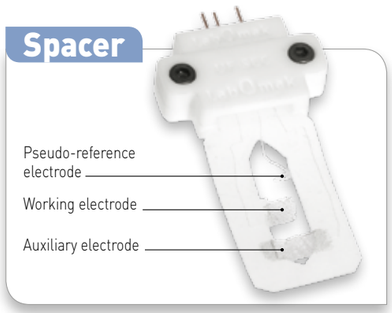
Solution volumes

		Volume
Gasket of	100 µm	4.6 µl
	250 µm	11.5 µl
	500 µm	230 µl

UF-Full

Thin layer spectroelectrochemical cell

The UFS set is conceived to perform thin-layer spectroelectrochemistry.



Full kit +
PTFE adapter for optical fibres + optical fibre

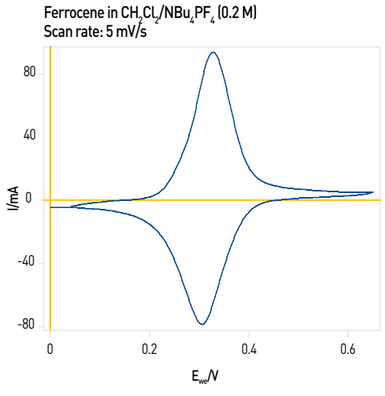
Thin layer spectroelectrochemical cell kit		Platinum	Catalog n°	Gold	Catalog n°
Full kit			**UF-Full-PT**		**UF-Full-AU**
	Content				
	1 PTFE windows aligner + 1 spacer (platinum auxiliary electrode/Ag pseudo-reference electrode)	platinum working electrode	**UF-SEC-PT**	gold working electrode	**UF-SEC-AU**
	Stainless steel body cell		**-**		**-**
	XY holder (with magnets) to universally fit the cell in a spectrophotometer		**UF-XY**		**UF-XY**
	Plug		**UF-P**		**UF-P**
	PTFE mask		**UF-M**		**UF-M**
Options					
PTFE adapter for optical fibres with UV/VIS/NIR collimating lenses (200-2500 nm), adjustable focus, SMA-905 connection					**UF-OFA**
Base stand for optical fibres measurements					**UF-BS**
PTFE cuvette holder to be used with UF-OFA and UF-BS					**UF-C**
1 spacer (platinum working electrode/platinum auxiliary electrode/Ag pseudo-reference electrode)					**UF-SPP**
1 spacer (gold working electrode/platinum auxiliary electrode/Ag pseudo-reference electrode)					**UF-SPA**
Optical fibre: SMA-SMA connector length 1 m					**092-101**

Finite diffusion conditions

In such finite diffusion conditions, a thin solution layer (≤ 0.2 mm) adjacent to the electrode is confined by the cell walls, so that the cell thickness is smaller than the diffusion layer and the mass transfer can be ignored. The most significant virtue of thin-layer cells is the absence of the effect of the diffusion process and the rapidity with which the electro-active species can be exhaustively electrolyzed. The dropping to near zero of the current flow following the peak in the current potential plot is a characteristic behavior of thin-layer cells, indicating exhaustive electrolysis of the cell reactant and minimal diffusion effects in thin-layer electrochemical cells[1] [2].

Small potential sweep rates (2-10 mV/s) are necessary both to ensure homogeneity of the reactant/product concentrations in the cell and to control the resistive effects.

A cyclic voltammetry should be registered in your SEC cell to better localize the redox process of interest: in fact, the UF spacer has an silver pseudo-reference electrode, which is sensitive to the solution medium (but is expected to remain constant in time in each given experimental condition). Potential drifts can be observed in the presence of irreversible redox reactions, which may alter the solution/analyte composition.

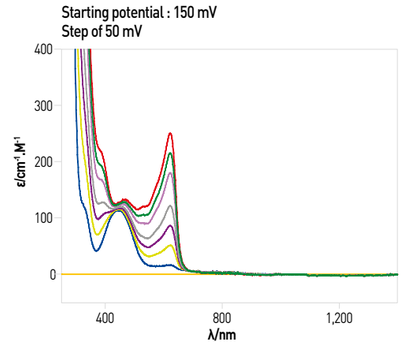


To maintain the ohmic drop as low as possible, the current should also be kept low which means low scan rates and low sample concentrations may be preferred. However, in some cases, due to the narrowness of the optical path, the use of a relatively high concentration of the sample may be required to study the changes of bands with a low molar extinction coefficient.

A milli-molar concentration appears to be the most optimized concentration, but in some cases, the concentration can be adapted.

Due to the high Infra-Red absorbance of more common solvents and electrolytes, a very carefully measured background should be obtained before each Infra-Red spectroelectrochemical experiment.

For the same reason, it is also important to avoid changing the tightness of the cell screws during the experiment itself to avoid changes of the optical path.



(1): M. Krejčik, M. Daněk and F. Hartl, J. Electroanal. Chem., 1991, 317, 179.
(2): P. Leoni, F. Marchetti, C. Bonaccorsi, F. Fabrizi de Biani, L. Marchetti, P. Zanello, Chem. Eur. J.,2008, 14, 847

092-QCA-FC SE-CL3

EQCM

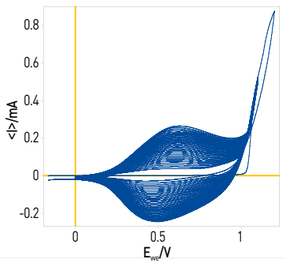
The instrument monitors both the resonant frequency and the resonant resistance which are also reflected on the two analog outputs.

It is possible to connect the Quartz Crystal Analyzer (QCA922) to a Bio-Logic potentiostat using a DB9-8BNC cable (catalog n°: 092-22/1).

EQCM		Catalog n°
Quartz crystal microbalance 27 MHz kit		**SE-QCA922A**
Content		
EQCM 27 MHz main unit and cable		**SE-QCA922A-00**
Male BNC/BNC cable (2 pieces, length 1 m)		**COR28100**
Options		
Holder is needed to get a full QCM or EQCM set-up	static and flow QCA cell	**092-QCA-FC**
	dip cell	**SE-CL3**
	well cell (PTFE)	**SE-CL4**
	well cell (PEEK)	**SE-CL4PK**
	transparent well cell	**SE-CL5**
	flow cell (90 µL) (PTFE)	**SE-CL6**
	flow cell (90 µL) transparent (PTFE)	**SE-CL7**
	flow cell (90 µL) (PEEK)	**SE-CL6PK**
Connector from QCA to potentiostat		**092-22/1**
Low flow peristaltic pump		**EL-AV-008**

EQCM specifications

Frequency range	1 MHz-30 MHz, resolution 0.1 Hz
Resonant resistance range	10-16 Ω, resolution 0.1 Ω
ΔF output	full scale: ±10 V (12 bit) ±200 Hz / ±2 kHz / ±20 kHz / ±200 kHz
Resistance output	full scale: 0-10 V (11 bit) 1 / 2 / 4 / 8 / 16 kΩ
Gate time	variable (0.1, 1.0, 10.0 s)
Display	40 digits x 2 rows
Interface	IEEE-488, RS-232C, USB
Dimensions (W x D x H)	260 x 230 x 88 mm
Weight	3.3 kg
Temperature	0 - 40 °C
Power consumption	100-120 V AC, 230-240 V AC, 50-60 Hz, (15 W)



Quartz resonators

Quartz resonator (calibration at 5 MHz at factory with no charge when purchased)				Catalog n°
5 MHz			gold electrode (25 pieces)	**SE-5AU**
9 MHz	etching finish		gold electrode (30 pieces)	**SE-9AU-E/1**
			gold electrode (100 pieces)	**SE-9AU-E/3**
	polish finish		gold electrode (30 pieces)	**SE-9AU-P/1**
			gold electrode (100 pieces)	**SE-9AU-P/3**
	standard finish	resonator and lead wire	aluminum electrode (25 pieces)	**SE-9AL**
			gold electrode (25 pieces)	**SE-9AU**
			graphite electrode (25 pieces)	**SE-9C**
			cupper electrode (25 pieces)	**SE-9CU**
			molybdenum electrode (25 pieces)	**SE-9MO**
			nickel electrode (25 pieces)	**SE-9NI**
			platinum electrode (25 pieces)	**SE-9PT**
			stainless steel (SUS304) electrode (25 pieces)	**SE-9SS**
		separated lead wire	gold electrode (25 pieces)	**SE-9AU-S**
			platinum electrode (25 pieces)	**SE-9PT-S**
	mirror finish	resonator and lead wire	aluminum electrode (25 pieces)	**SE-9AL-M**
			gold electrode (25 pieces)	**SE-9AU-M**
			gold electrode (500 pieces)	**SE-9AU-M2**
			graphite electrode (25 pieces)	**SE-9C-M**
			copper electrode (25 pieces)	**SE-9CU-M**
			ITO electrode (25 pieces)	**SE-9IT-M**
			nickel electrode (25 pieces)	**SE-9NI-M**
			platinum electrode (25 pieces)	**SE-9PT-M**
			silicon electrode (25 pieces)	**SE-9SI-M**
			stainless steel (SUS304) electrode (25 pieces)	**SE-9SS-M**
			titanium electrode (25 pieces)	**SE-9TI-M**
		separated lead wire	gold electrode (25 pieces)	**SE-9AU-MS**
			ITO electrode (25 pieces)	**SE-9IT-MS**
			platinum electrode (25 pieces)	**SE-9PT-MS**
Others				
Resonators lead wire no sputter (50 pieces)				**SE-LEAD/2**
Resonators 9 MHz, no sputter			no lead wire (50 pieces)	**SE-9Q/2**
			mirror finish no lead wire (50 pieces)	**SE-9Q-M/2**

Surface finishing

	Roughness	Electrode materials deposition
Standard finish	0.6 µm	sputtered
Etching finish	0.6 µm	vacuum deposition
Mirror finish	0.06 µm	sputtered
Polish finish	0.06 µm	vacuum deposition

Biosensor QCM

The specification (27 MHz) of the Quartz Crystal Microbalance (QCM934) allows users to measure a small mass change. QCM934 is especially suitable in the bio-sensing field.
- Excellent sensitivity and resolution.
- Specially designed oscillation circuit for added stability.
- Simultaneous measurement of resonant frequency, resonant resistance and temperature.
- Expandable up to 4 channels.
- Works with flows cell, well cell, dip cell.
- Computer control and data collection via USB interface.

Resonators of 9 MHz are compatible with QCM934 and the cell (see page 35).

Specifications

Frequency range	25 MHz-27 MHz, resolution 0.01 Hz
Resonant resistance range	2 Ω, resolution 0.1 Ω
Max channel	4
Gate time	variable (0.1, 1.0, 10.0 s)
Display	20 digits x 2 rows
Interface	USB 2.0
Dimensions (W x D x H)	320 x 280 x 133 mm
Weight	5.5 kg
Temperature	10 - 40 °C
Power consumption	100-120 V AC, 230-240 V AC, 50-60 Hz, (60 W)

Flow mode	Catalog n°
Flow cell kit	**SE-QCM934-F**
Content	
Main unit	**SE-QCM934-000**
WinQCM software	**SE-WQCM**
Oscillator & temperature control module	**SE-QCM934-200**
Cable for oscillator & temperature control module	**SE-QCM934-200A**
Measurement chamber	**SE-QCM934-500**
Flow cell (90 µL)	**SE-QCM934-510**
Options	
Additional channel	**SE-QCM934-1CHF**
Low flow peristaltic pump	**EL-AV-008**

"Flow cell-based system of QCM934", "perista pump" and "notebook computer"

Batch mode	Catalog n°
Batch cell kit	**SE-QCM934-B**
Content	
Main unit	**SE-QCM934-000**
WinQCM software	**SE-WQCM**
Oscillator & temperature control module	**SE-QCM934-200**
Cable for oscillator & temperature control module	**SE-QCM934-200A**
Cable for OSC module connection	**SE-QCM934-300**
Options	
Additional channel	**SE-QCM934-1CHB**

"Batch cell-based system of QCM934", "transparent well/dip cell" and "notebook computer"

Quartz crystal analyzer
applications

The Quartz crystal microbalance is a mass-sensitive detector based on frequency changes of an oscillating quartz crystal. The oscillation frequency of the crystal is proportional to the mass of the crystal, as well as solution properties near the surface (including viscosity, density, temperature, and compression waves).

A mass increase results in a frequency decrease. Sauerbrey was the first who provided a description and experimental verification of the mass/frequency relationship between foreign layers firmly attached to the quartz crystal resonator[1][2].

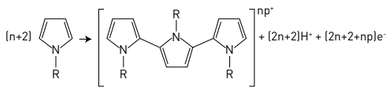
The Sauerbrey equation is defined as:

$$\Delta f = \frac{2f_0^2}{A\sqrt{\rho_q \mu_q}}\Delta m$$

f_0: resonant frequency (Hz)
Δf: frequency change (Hz)
Δm: mass change (g)
A: piezoelectrically active crystal area (area between electrodes, cm²)
ρ_q: density of quartz (ρ_q = 2.648 g/cm³)
μ_q: shear modulus of quartz for AT-cut crystal (μ_q = 2.947x1011 g/(cm.s²))

Electropolymerization of pyrrol

The polypyrrol film was coated on an Au quartz (used as the working electrode) using cyclic voltammetry (20 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).

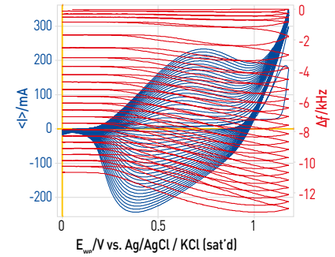
Polypyrrol film growth on the quartz working electrode

Fig. 1 presents the polypyrrol film growth on the quartz electrode during the 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). The growth is very regular but tends to slow down in the last cycles. That 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

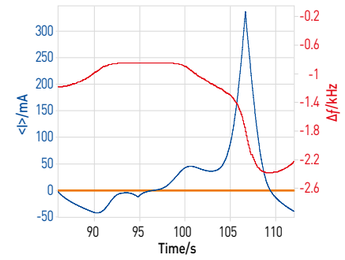
Fig. 1 shows the resonant frequency decrease and the resonant resistance increase while the polymer film is growing. Moreover the variation is dependent on the potential sweep resulting in a pseudo oscillation of frequency and resistance related to the successive cycles. This plot can also be made versus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

Fig. 1: overlaid frequency and current *vs.* E_{we} of the polymer film growth. Scanning at 100 mV/s between 0 and 1.018 V.

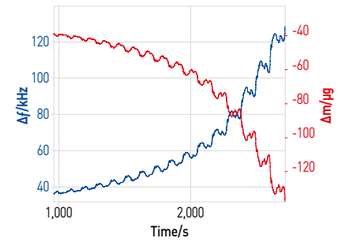


The interesting point is to follow the frequency evolution versus potential on one cycle. The figure below shows the time evolution on one cycle.

Fig. 2: graphic zoom on one cycle showing the resonant frequency and the current density versus elapsed time[3].



The mass calculation is done automatically in the process data tool of EC-Lab®. More details can be found in the application note[3].



(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".

Test cells

PAT-CORE
and PAT-TRAY

ECC-PAT-CORE

These cells allow users to characterize the electrode (positive and negative electrode). With the ECC-Ref test cell (E-ECC-REF) a reference electrode (Lithium wire) can be used to follow the behavior of the negative and positive electrode simultaneously.

This can be done with a VSP, VMP3 or MPG2 that offer the unique 5-lead type connection.

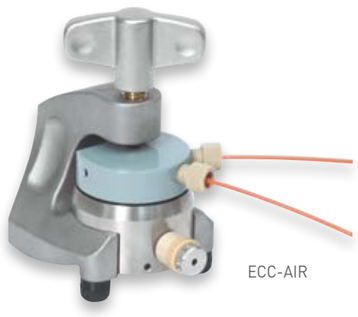
Other cells for specifics utilization are also available.

The advantages of the PAT-CORE series over the standard test cells are:

- more stable over time than the previous version
- less cross-contamination.
- higher throughput (Tray and single use consumable)/
- better EIS measurement (no artifact due to the cell)
- better reproducibility
- easy electrolyte filling
- no cleaning effort
- save time and space

3-electrode
test cell

PAT-CORE Series		Catalog n°
Leadless series		
Leadless 2/3 electrode test cell for battery materials (with PAT-core) - PAT-Cell. It has to be used with the PAT-Tray		**E-ECC-PATC**
Docking station for 16 electrochemical test cells (PAT-Cell) incl. data logger - PAT-Tray		**E-ECC-PATT**
ECC series		
2/3 electrode test cell for battery materials (ECC series with PAT-core) - ECC-PAT-Core		**E-ECC-PAT***
ECC to PAT Upgrade kit - ECC1-00-0310-A		**E-ECC-PATU**



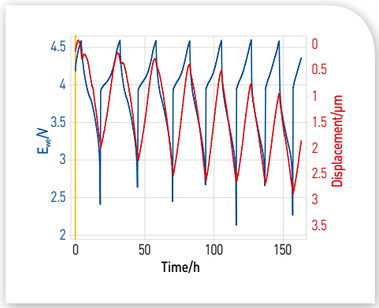
ECC-AIR

Standard test cells		Catalog n°
For lithium Ion battery and other aprotic electrochemical system	2-electrode test cell	**E-ECC-STD**
	3-electrode test cell	**E-ECC-REF**
	2/3-electrode test cell	**E-ECCCOM**
	2/3-electrode test cell for gas analysis	**E-ECCDEM**
For both aqueous and aprotic electrochemical systems with ref electrode	2/3-electrode test cell	**E-ECCAQU**
For measuring gas evolution and for drawing gas samples (pressure test cell)	ECC-press-DL	**E-ECCP-DL**
	ECC-press-Aqu	**E-ECCP-AQ**
	ECC-press-Air	**E-ECCP-A**
	ECC-press	**E-ECCP**
For gas diffusion electrodes	ECC-AIR electrochemical test cell (in aprotic media)	**E-ECCAIR**
	ECC-AIR electrochemical test cell	**E-ECCAIR-N**
For optical characterization	ECC-Opto Std face to face	**E-ECCOPT-S**
	ECC SBS side by side, complete	**E-ECC-SBS**

Dilatometers

The dilatometer is a research grade instrument dedicated to the measurement of charge-induced strain (expansion and shrinkage) of electrodes down to the sub-micrometer range.

The dilatometers have been developed for the investigation of Li-ion battery and other insertion-type electrodes. It may be used in organic as well as aqueous electrolyte solutions.



Dilatometer	Catalog n°
Electro chemical dilatometer ECD-nano-DL (complete)	**E-ECD-3N**
Electro chemical dilatometer ECD-3-DL (complete)	**E-ECD-3DL**
Options	
Cable to connect Bio-Logic instrument (DB9 connector) to ECD-nano-3DL	**E-C-3N**
Cable to connect Bio-Logic instrument (DB9 connector) to ECD-3-DL	**E-C-3DL**
Upgrade kit from ECD-2N to ECD-3N or ECD-2DL to ECD-3DL	**E-C-UP**

Specifications

	ECD-nano-DL	ECD-3-DL
Displacement sensor	capacitive	LVDT
Dilatation range	250 µm	500 µm
linearity	< 0.1% of full range	< 0.15% of full range
Resolution	≤5 nm	≤50 nm
Bandwidth	≥10 Hz	≥10 Hz
Drift (sample-free)	≤20 nm/h	≤100 nm/h
Load on test specimen	1.0 N (fixed)	0.3 N or 1.0 N (variable)
Chemical compatibility	aprotic organic electrolytes, optional aqueous electrolytes	
Cell electrolyte volume	≤3 mL (ca. 2 ml electrolyte required)	
Temperature range	-20 to 70 °C	
Electrode configurations	2-electrode, 3-electrode (reference), auxiliary	
DC output voltage	-10 to 10 V	
Dimensions (H x W x D)	230 x 100 x 110 mm	
Weight	2.5 kg	

Tools

Cutting pliers	Catalog n°
18 mm	**E-ECS18**
Option	
Cross hair to reduce cutting scrap, stop rail, assy	**E-ECS-R**

Punching tool for lithium foil	Catalog n°
18 mm	**E-ECCLI18**

Electrode alignment and assembly tool	Catalog n°
ECC CellLoad	**E-ECCLOAD**
Options	
REF - cleaning tool set	**E-ECC-104**
REF- load	**E-ECC-103**
Removing tool	**E-ECC-102**

Load the metal lithium	Catalog n°
REF-load for test cells (allow us to load lithium metal inot REF bore of the E-ECC-REF)	**E-ECCLOADR**

Rack

To get a compact setup, it is possible to put five units in a rack with a lateral tablet for a computer.

It is possible to use this rack for VMP3, booster chassis, HCP and CLB only if the sliding option is not purchased.

Rack for MPG-2xx series up to 5 units	Catalog n°
Including ethernet switch, power plugs, computer tablet	**092-85/1**
With sliding tablet including ethernet switch, power plugs, computer tablet	**092-85/2**

Specifications

Maximum units		5 units
Dimensions (W x D x H)	rack	600 x 710 x 1850 mm
	shelf with the sliding tablet	495 x 450 x 257 mm
	shelf without the sliding tablet	495 x 450 x 295 mm
Temperature range		10 - 40° C

Battery Holder

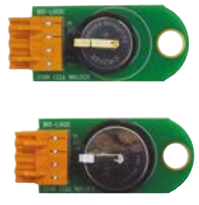
- 4-point measurement,
- 15 A maximum current,
- adaptable to a wide variety of battery sizes (coin cells, 18 650 or 26 650 cells),
- ability to link together many battery holders.

Battery Holder	Catalog n°
BH-1i, dimensions (W x D x H) 134 x 79 x 185 mm	**092-22/15**

Coin Cell Holder

The coin cell holders are directly plugged to the potentiostat/cycler front panel connectors.
No cable is required.
The CCH is compatible with VMP3 and MPG2 multichannel potentiostat/galvanostat whereas the CCH-120/CCH-124 are compatible with the BCS-805 and BCS-810 cyclers.

Coin Cell Holder	Catalog n°
CCH, dimensions (W x D x H) 82 x 83 x 65 mm for VMP3/MPG-2	**092-22/14**
CCH-120 for BCS-805/810	**096-120**
CCH-124 for BCS-805/810	**096-124**

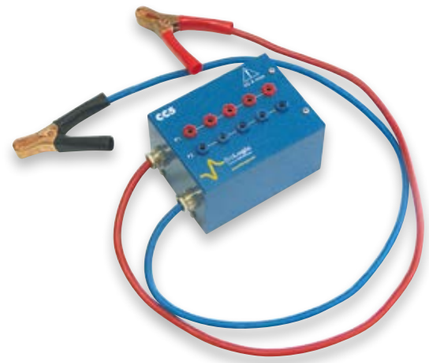


Current Collector

VSP-300/VMP-300 and BCS-815 offer the possibility to connect in parallel several channels and then increase the maximum current that can be passed through the cell. In order to simplify the connections, two current collectors have been designed, CC5 and CC8.

CC5 allows the user to connect up to five current boosters of VSP-300 or VMP-300 and with the CC-8 up to 8 channels of VMP-300 or BCS-815 can be connected in parallel.

Current Collector for 5 boosters	Catalog n°
CC5 Current Collector (5 channels) for VSP-300/VMP300	**094-201/1**
CC8 Current Collector (8 channels) for VMP-300/BCS-815	**096-015**



Sense Adapter Module (SAM-50)

To be added to a multichannel system to perform stack measurements up to 50 V for 5 channel boards and a 10-element measurement.

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

Membrane Electrode Assemblies (MEA)

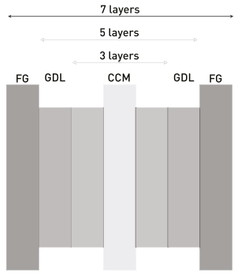
These MEAs are based on a 50 µm-thick perfluoronated membrane, and a platinum loading of 0.5 mg/cm² (±0.05), obtained with the standard catalyst concentration, 70% Pt/C.

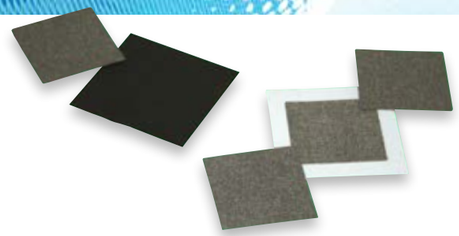
- 3 layers MEA corresponds to a Catalyst Covered Membrane (CCM): the proton exchanged membrane is covered with an ink containing the catalyst on the electroactive area. Platinum and platinum-Ruthenium alloys are available for hydrogen and reformate operations respectively.
- 5 layers MEA corresponds to a CCM with Gas Diffusion Layers (GDL) completing the electrodes on the electroactive area on both sides of the membrane.
- 7 layers MEA corresponds to a 5-layer MEA with a Flat Gasket (FG) (fiberglass reinforced silicon) around both electrodes.

A subgasket, protecting the membrane and the edges of the active layer can be added to 5 and 7-layer MEAs.

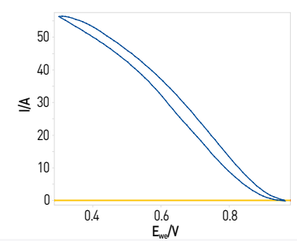
MEA selection

Only the 7-layer MEAs is fully active.
The other 3-layer and 5-layer MEAs need to be modified.





Membrane Electrode Assemblies (MEA)			Catalog n°
Single cell fixture (without MEA's)	5 cm²		**095-08/1**
	16 cm²		**095-08/2**
	25 cm²		**095-07**
	50 cm²		**095-08**
	100 cm²		**095-08/3**
Membrane Electrode Assemblies	5 cm²	3 layers	**095-09/13**
		5 layers	**095-09/14**
		7 layers	**095-09/15**
	16 cm²	3 layers	**095-09/16**
		5 layers	**095-09/17**
		7 layers	**095-09/18**
	25 cm²	3 layers	**095-09/1**
		5 layers	**095-09/2**
		7 layers	**095-09/3**
	50 cm²	3 layers	**095-09/4**
		5 layers	**095-09/5**
		7 layers	**095-09/6**
	100 cm²	3 layers	**095-09/7**
		5 layers	**095-09/8**
		7 layers	**095-09/9**
	225 cm²	3 layers	**095-09/10**
		5 layers	**095-09/11**
		7 layers	**095-09/12**



Educational kit

The educational fuel cell kit is very simple and easy to use: just plug the hydrogen tank into the cell and let the fuel cell use the oxygen in the surrounding air to produce electricity.

- 1 plastic electrolyser cell (25 cm²) containing a 7-layer membrane electrode assembly. At the anode side of the electrolyser cell there is a water reservoir, the hydrogen gas produced comes out of the cell via one of the gas exits on the top and bottom side of the cell. A plastic screw is included for closing the unused gas exit.
- 1 plastic air-breathing fuel cell (25 cm²). The cell has one hydrogen gas input and one exit.

A porous material is placed inside the kit for the homogeneous diffusion of hydrogen over the whole surface area of the membrane electrode assembly.

Educational kit		Catalog n°
Educational kit (fuel cell /electrolyzer)	110 V electrical grid	**095-20/A**
	220 V electrical grid	**095-20/B**
Content		
PEM kit	PEM#1: 25 cm² air-breathing cells (MEA S25-7L N50-Pt/C 70%), no possibility to dismantle the cell	**095-20/1**
	PEM#2: 25 cm² air-breathing cells (MEA S25-7L N125-Pt/C 70%), no possibility to dismantle the cell	**095-20/2**
	PEM#3: 25 cm² air-breathing cells (MEA S25-7L N212-Pt/C 40%), no possibility to dismantle the cell	**095-20/3**
Electrolyzer kit (including gas line)		**095-20/4**
Variable resistance		**095-20/5**
Data acquisition (including connection, data logger, software)		**095-20/7**
Power supply 220 V		**095-20/9**
110 V/220 V adapter for 110 V configuration		**095-20/10**
Options		
25 cm² air-breathing cell (no MEA)		**095-20/6**
Power supply by two photovoltaic cells		**095-20/8**

Specific cables

By default, the potentiostat and the booster are provided with a cell cable of 1.5 m long.

The cable connected from the booster to the potentiostat is 0.8 m long for VMP3 based instruments.

For some applications, the user may need cables with different length. That's why, longer cable are offered.

Moreover for applications performed in glove box, hermetic cell cables are also offered.

Set-up connection

Bad connection could induce some effects on the measurement (effect on the stability of the potentiostat, artifact...).
We recommend the user to optimize the set-up by using the accessories offered in this section.

Hermetic cell cable for glove box

Hermetic cell cable for glove box	Catalog n°
SP-50, SP-150, BiStat, VSP, VMP3, MPG2 A Jaeger connector 12 pins ensures the hermetic junction (hole diameter to make in the glove box wall: 27 mm): - cable with 2 mm connectors in one side and 12 pins Jaeger connector in the other side (length 1 m), - cable with DB-25 connector in one side and 12 pins Jaeger connector in the other side (length 1.5 m), - one feedthrough seal	**092-23/5**
SP-200, SP-240, SP-300, VSP-300, VMP-300 A Jaeger connector 25 pins ensures the hermetic junction (hole diameter to make in the glove box wall: 45 mm): - cable with electrometer in one side and 25 pins connector in the other side (length: 1 m) - cable with DB-25 connector in one side and 25 pins connector in the other side (length: 1.5 m) - two feedthrough seals one installed in the glove box wall the other dedicated to the channel board calibration outside the box	**094-101/6**

Connection cable from booster to potentiostat	Available length	Catalog n°
All boosters	3 m	**092-33/5**
	5 m	**092-33/6**

Longer cable	Available length	Catalog n°
SP-50, SP-150, VSP, VMP3, MPG2	2.5 m	**092-23/2**
	3 m	**092-23/7**
	5 m	**092-23/3**
	10 m	**092-23/4**
Booster 2 A, 4 A, 5 A	2.5 m	**092-33/11**
	3 m	**092-33/12**
	5 m	**092-33/13**
Booster 8 A, 10 A, 20 A	2.5 m	**092-33/21**
	3 m	**092-33/22**
	5 m	**092-33/23**

Connectors

	Catalog n° Black colour	Red colour	Blue colour	White colour
Alligator clip with 2 mm connector (pack of 10)	**092-1001/1**	**092-1001/2**	**092-1001/26**	**092-1001/22**
Alligator clip 4 mm (pack of 5)	**092-1001/13**	**092-1001/14**	**092-1001/23**	
Socket 2 mm female (pack of 10)	**092-1001/5**	**092-1001/6**	**092-1001/7**	**092-1001/8**
Socket 4 mm female (pack of 10)	**092-1001/25**	**092-1001/4**	**092-1001/3**	
Banana plug 2 mm (pack of 10)	**092-1001/9**	**092-1001/10**	**092-1001/11**	**092-1001/12**
Banana plug 4 mm (pack of 5)		**092-1001/16**	**092-1001/15**	**092-1001/24**
Banana adapter 2 mm female socket to 4 mm male plug (pack of 5)	**092-1001/18**	**092-1001/19**	**092-1001/20**	**092-1001/21**
Adapter for banana 2 mm female socket to 4 mm male plug (pack of 5)	**092-1001/27**			
Banana adapter 4 mm female socket to 2 mm male plug (pack of 5)	**092-1001/28**			

Connection kits			
For standard board	- 4 alligator clips of 2 mm: - 3 sockets of 2 mm:	blue, white, red, black, blue, white, red	**092-1001/30**
For booster board	- 3 alligator clips of 2 mm: - 2 alligator clips of 4 mm: - 3 sockets of 2 mm: - 2 sockets of 4 mm:	blue, white, red red, black blue, white, red blue, white	**092-1001/31**

Nstat box (8 channels)

Bipot cable: dedicated to RRDE applications

Multi-electrode investigation cables

Multi-electrode investigation cables	Channel	Nb of channels	Length	Catalog n°
Nstat box (for VSP, VMP3)	standard	4	1.5 m	**092-16**
		8	1.5 m	**092-22/3**
	low current	8	1.5 m	**092-22/4**
Bipot cable (for VSP, BiStat, VMP3)	standard	2	1.5 m	**092-22/12**
		2	3 m	**092-22/12A**
		2	4 m	**092-22/12B**
Option				
External power supply for the Nstat box (this option is needed if more than one Nstat box is connected to VMP3 or if the user uses VSP)				**092-16/1**

Advanced Faraday cage

Faraday cages

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

Please note that to activate this protection, Faraday cage has to be connected to the ground of the instrument (green plug on the rear panel of the instrument).

FC-45 Faraday cage

Advanced Faraday cage specifications

Temperature	0 - 50 °C
Power supply	100 VAC-240 VAC, 50/60 Hz
Fuse	1 A
Gas pressure	< 34 kPa max.
Interface	IEEE-488, RS-232C
Weight	3.8 kg

Faraday cages	Catalog n°
FC-45 Faraday cage, 450 x 450 x 450 mm	**094-084/1**
Stand for FC-45	**094-084/2**
Standard Faraday cage, 400 x 200 x 600 mm	**NS-FAR600**
Advanced Faraday cage, 286 x 230 x 320 mm	**A-012033**

Connection accessories

DC2

Dummy cell for booster

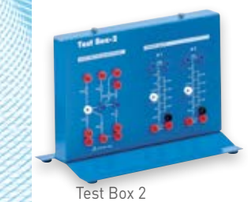
Dummy cells

The dummy cell for booster is especially dedicated to check periodically a booster. It is provided whith each booster chassis. The dummy cell for booster and DC2 can be bound together as well.

Dummy cell		Catalog n°
DC2	1 R/C circuit. For standard check	**094-111/3**
Dummy cell for booster	1 power resistor, 5 mOhm. For standard check	**092-32/1**

Dummy cell for booster specifications

Resistance/mΩ	5
Standard tolerance	1%
Temperature coefficient	±50 ppm/°C



Test Box 2

Test Box 3

Test Boxes

Test Boxes		Catalog n°
Test Box 2	several circuits with high precision resistors. For calibration and validation	**092-22/6**
Test Box 3	3 circuits: linear, exponential, non-linear. For teaching and demonstration	**092-22/7**

External device connection

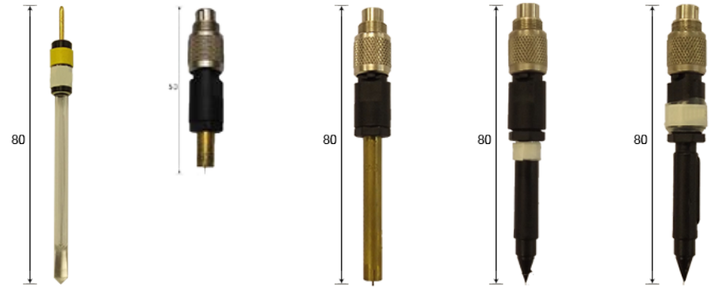
External device connection	Catalog n°
DB9-8 BNC connector for auxiliary I/O	**092-22/1**
PT100 temperature probe, to be connected to the auxiliary I/O, temperature range: -50 °C to 250 °C, dimensions: 3 x 20 mm, length of cable: 2.5 m	**092-22/13**
IS1 isolation module for auxiliary I/O for VSP300 based instruments	**094-081/5**

IS1

Transport cases

Transport cases	Catalog n°
SP-200	**094-082**
SP-240/SP-300	**094-091**

Scanning products accessories



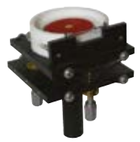
SECM HR SKP SKP LEIS SVP

Probes

A range of probes dedicated for use with our SECM, SVP, SKP, HR SKP and LEIS scanning probe applications are available for the M370 and M470 systems.

Probes	Catalog n°
SECM 10 µm diameter Platinum disk	**U-23/10**
SECM 15 µm diameter Platinum disk	**U-23/15**
SECM 25 µm diameter Platinum disk	**U-23/25**
SKP 500 µm diameter	**U-SKP370/1**
HR SKP 150 µm diameter	**U-SKP-150**
LEIS	**U-LEIS370/1**
SVP	**U-SVP370/1**

TriCell™



Shallow µTriCell™

Cells

Three cells are available :
The TriCell™ is a large volume, wide scan range cell, dedicated to LEIS, SVP, SKP, SDS techniques.
The µTriCell™ and its Shallow version are dedicated to SECM techniques (dc, ac and ic mode). The Shallow µTriCell™ contains a slightly smaller volume of electrolyte than the µTriCell™ is more accessible.

All cells accomodate samples mounted in a 32 mm diameter resin cylinder.

Cells	Volume	Catalog n°
TriCell™	~1 L	**U-TRICELL**
µTriCell™	7 mL	**U-uTRICELL**
Shallow µTriCell™	6 mL	**U-SuTRICELL**

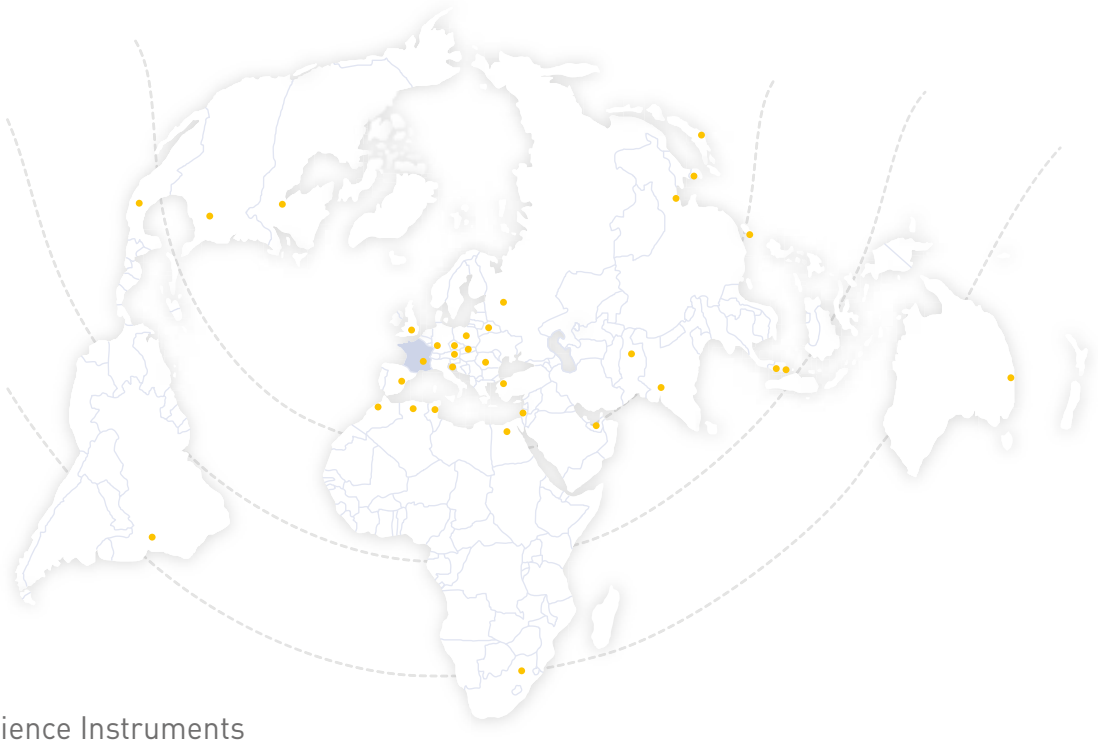
VCAM3 Video Microscope System

The VCAM3 is a long working distance video microscope which allows users to view the distance between probe tip and sample surface in many scanning probe electrochemistry techniques.

VCAM3 specifications

Min illumination	0.0003 lux
Field of view	1.4 mm (x4.5) to 8.6 mm (0.7)
Operation temperature	-30 to +70 °C
Catalog n°	**U-VCAM3**

Sales & technical contacts



Bio-Logic Science Instruments
is present in most countries through an extensive distribution network

Headquarters

Bio-Logic SAS
1, rue de l'Europe - 38 640 Claix
France
Phone: +33 476 98 68 31
Fax: +33 476 98 69 09

Affiliate offices

Bio-Logic USA, LLC
P.O.Box 30009 - 37 930 Knoxville
USA
Phone: +1 865 769 3800
Fax: +1 865 769 3801

Bio-Logic Science Instruments Pvt Ltd
304,Orion Business Park, Next to Cine Wonder,
G. B. Road, Thane(W), 400 607 Mumbai
India
Phone: +91 2225842128

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www.bio-logic.info