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.

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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.

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.

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).

SVC-2 modularity: microvolume mode

For electrode with OD of 10 mm

For electrode with OD of 6 mm

For microwire electrode with OD of 4 mm

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

- 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.

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.

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- 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.

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).
**Analytical 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).

**Flow cells**

<table>
<thead>
<tr>
<th>Standard analytical cell kit (50 mL)</th>
<th>Complete analytical cell kit (80 mL)</th>
<th>Complete analytical cell kit (150 mL)</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL-ELECTRO-1</td>
<td>EL-ELECTRO-2</td>
<td>EL-ELECTRO-3</td>
<td>EL-A-001</td>
</tr>
<tr>
<td>EL-A-002</td>
<td>EL-A-003</td>
<td>EL-A-004</td>
<td>EL-A-005</td>
</tr>
</tbody>
</table>

**Options**

- Electrode Bridge extension for electroanalytical cell
- Electrode Bridge extension for reference electrode of OD 9 mm
- 1/16" PEEK tube ID 0.25 mm, length 3.0 m
- 0.04" MM connector (10 pieces)
- A-012912
- 0.04" single leal connector (2 pieces)
- A-013273
- gasket detector

**Catalog n°**

- A-010160
- A-010161
- A-010162
- A-010163
- A-010164
- A-010165
- A-010166
- A-010167
- A-010168
- A-010169
- A-010170
- A-010171
- A-010172
- A-010173
- A-010174
- A-010175
- A-010176
- A-010177
- A-010178
- A-010179
- A-010180
- A-010181
- A-010182
- A-010183
- A-010184
- A-010185
- A-010186
- A-010187
- A-010188
- A-010189
- A-010190
- A-010191
- A-010192
- A-010193
- A-010194
- A-010195
- A-010196
- A-010197
- A-010198
- A-010199
- A-010200
- A-010201
- A-010202
- A-010203
- A-010204
- A-010205
- A-010206
- A-010207
- A-010208
- A-010209
- A-010210
- A-010211
- A-010212
- A-010213
- A-010214
- A-010215
- A-010216
- A-010217
- A-010218
- A-010219
- A-010220
- A-010221
- A-010222
- A-010223
- A-010224
- A-010225
- A-010226
- A-010227
- A-010228
- A-010229
- A-010230
- A-010231
- A-010232
- A-010233
- A-010234
- A-010235
- A-010236
- A-010237
- A-010238
- A-010239
- A-010240
- A-010241
- A-010242
- A-010243
- A-010244
- A-010245
- A-010246
- A-010247
- A-010248
- A-010249
- A-010250
- A-010251
- A-010252
- A-010253
- A-010254
- A-010255
- A-010256
- A-010257
- A-010258
- A-010259
- A-010260
- A-010261
- A-010262
- A-010263
- A-010264
- A-010265
- A-010266
- A-010267
- A-010268
- A-010269
- A-010270
- A-010271
- A-010272
- A-010273
- A-010274
- A-010275
- A-010276
- A-010277
- A-010278
- A-010279
- A-010280
- A-010281
- A-010282
- A-010283
- A-010284
- A-010285
- A-010286
- A-010287
- A-010288
- A-010289
- A-010290
- A-010291
- A-010292
- A-010293
- A-010294
- A-010295
- A-010296
- A-010297
- A-010298
- A-010299
- A-010300

**Cross flow cell**

- Product: EL-ELECTRO-1
- Catalog n°: A-012799

**Radial flow cell**

- Product: EL-ELECTRO-2
- Catalog n°: A-012799
InterDigitated Array (IDA) electrodes

<table>
<thead>
<tr>
<th>IDA electrode</th>
<th>Width</th>
<th>Length</th>
<th>N° of pat</th>
<th>Film thickness</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>2 μm</td>
<td>2 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012297</td>
</tr>
<tr>
<td>Platinum</td>
<td>2 μm</td>
<td>2 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012298</td>
</tr>
<tr>
<td>Gold without passivation membrane</td>
<td>2 μm</td>
<td>2 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012241</td>
</tr>
<tr>
<td>Platinum without passivation membrane</td>
<td>2 μm</td>
<td>2 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012244</td>
</tr>
<tr>
<td>Gold</td>
<td>3 μm</td>
<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012129</td>
</tr>
<tr>
<td>Platinum</td>
<td>3 μm</td>
<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
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<tr>
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<td>3 μm</td>
<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012229</td>
</tr>
<tr>
<td>Platinum without passivation membrane</td>
<td>3 μm</td>
<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012232</td>
</tr>
<tr>
<td>Gold</td>
<td>3 μm</td>
<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012125</td>
</tr>
<tr>
<td>Platinum</td>
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<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012126</td>
</tr>
<tr>
<td>Gold without passivation membrane</td>
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<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012260</td>
</tr>
<tr>
<td>Platinum without passivation membrane</td>
<td>3 μm</td>
<td>3 μm</td>
<td>3 mm</td>
<td>65 pairs</td>
<td>A-012264</td>
</tr>
<tr>
<td>Gold</td>
<td>5 μm</td>
<td>5 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012129</td>
</tr>
<tr>
<td>Platinum</td>
<td>5 μm</td>
<td>5 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012130</td>
</tr>
<tr>
<td>Gold without passivation membrane</td>
<td>5 μm</td>
<td>5 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012229</td>
</tr>
<tr>
<td>Platinum without passivation membrane</td>
<td>5 μm</td>
<td>5 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012232</td>
</tr>
<tr>
<td>Gold</td>
<td>10 μm</td>
<td>10 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012125</td>
</tr>
<tr>
<td>Platinum</td>
<td>10 μm</td>
<td>10 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012126</td>
</tr>
<tr>
<td>Gold without passivation membrane</td>
<td>10 μm</td>
<td>10 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012260</td>
</tr>
<tr>
<td>Platinum without passivation membrane</td>
<td>10 μm</td>
<td>10 μm</td>
<td>2 mm</td>
<td>65 pairs</td>
<td>A-012264</td>
</tr>
</tbody>
</table>

Options

- Connector for IDA electrode A-GEM
- Gold wire for reference electrode (0.3 mm): A-011665

Ring disk type electrodes

<table>
<thead>
<tr>
<th>Ring disk type electrodes</th>
<th>Ring OD</th>
<th>Ring ID</th>
<th>Disk</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>2 mm</td>
<td>4 mm</td>
<td>3 mm</td>
<td>A-002080</td>
</tr>
<tr>
<td>Platinum</td>
<td>2 mm</td>
<td>4 mm</td>
<td>3 mm</td>
<td>A-002081</td>
</tr>
<tr>
<td>Gold with passivation membrane</td>
<td>2 mm</td>
<td>4 mm</td>
<td>3 mm</td>
<td>A-002082</td>
</tr>
<tr>
<td>Platinum with passivation membrane</td>
<td>2 mm</td>
<td>4 mm</td>
<td>3 mm</td>
<td>A-002083</td>
</tr>
</tbody>
</table>

Options

- Connector for 3-electrode Screen Printed Electrodes: U-GEM

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).

<table>
<thead>
<tr>
<th>Screen Printed Electrodes</th>
<th>Working electrode</th>
<th>Counter electrode</th>
<th>Ref. electrode</th>
<th>Substrat</th>
<th>Package</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-electrode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ø of RE:</td>
<td>2 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size of RE:</td>
<td>1 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio CE/WE surface area:</td>
<td>4/1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall dimension:</td>
<td>50 x 10 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>graphite</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>20 pieces</td>
<td>U-06A/0</td>
<td></td>
</tr>
<tr>
<td>graphite</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>100 pieces</td>
<td>U-06A/1</td>
<td></td>
</tr>
<tr>
<td>graphite</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>valox FR1</td>
<td>500 pieces</td>
<td>U-06A/2</td>
<td></td>
</tr>
<tr>
<td>platinum</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>100 pieces</td>
<td>U-06P/0</td>
<td></td>
</tr>
<tr>
<td>platinum</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>valox FR1</td>
<td>500 pieces</td>
<td>U-06P/1</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>500 pieces</td>
<td>U-06G/0</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>valox FR1</td>
<td>500 pieces</td>
<td>U-06G/1</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>500 pieces</td>
<td>U-06G/2</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>valox FR1</td>
<td>500 pieces</td>
<td>U-06G/3</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>500 pieces</td>
<td>U-06G/4</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>valox FR1</td>
<td>500 pieces</td>
<td>U-06G/5</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>alumina</td>
<td>500 pieces</td>
<td>U-06G/6</td>
<td></td>
</tr>
<tr>
<td>gold</td>
<td>graphite</td>
<td>Ag/AgCl</td>
<td>valox FR1</td>
<td>500 pieces</td>
<td>U-06G/7</td>
<td></td>
</tr>
</tbody>
</table>

Options

- Connector for 3-electrode Screen Printed Electrodes: U-GEM

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

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

<table>
<thead>
<tr>
<th>Catalog n°</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL-AV-001</td>
<td>Avesta cell kit</td>
</tr>
<tr>
<td>EL-AV-002</td>
<td>Double jacketed cell glass 250 mL</td>
</tr>
<tr>
<td>EL-AV-003</td>
<td>PTFE cap (100 pieces)</td>
</tr>
<tr>
<td>EL-AV-004</td>
<td>Cell collar with clamp</td>
</tr>
<tr>
<td>EL-AV-005</td>
<td>Bridge tube for reference electrode with OD of 8 mm</td>
</tr>
<tr>
<td>EL-AV-006</td>
<td>Single purge tube</td>
</tr>
<tr>
<td>EL-AV-007</td>
<td>Temperature probe PT100</td>
</tr>
<tr>
<td>EL-AV-008</td>
<td>Peristaltic pump for low flow</td>
</tr>
<tr>
<td>EL-AV-009</td>
<td>Set of 10 porous frit (4 mm CoralPor™) with PTFE heat shrink (200 mm)</td>
</tr>
</tbody>
</table>

### Options

- Peristaltic pump for low flow
- Set of 10 porous frit (4 mm CoralPor™) with PTFE heat shrink (200 mm)

### Principle of Avesta cell

- Internal gasket
- External gasket
- Filter paper ring
- Sample holder
- Copper connector
- INLET
- External gasket
- Fiber paper ring (internal gasket)
**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.

**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.

**Investigation in aggressive media**

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

**Flat cell 1 cm²**

- **Flat cell kit 1 cm²**
  - Content
  - Glass cell (6 mm diameter)
  - Anolyte compartment (3 mm diameter)
  - Catholyte compartment (3 mm diameter)
  - Reference electrode bridge tube (54 mm wire/80 mesh)
  - Purging tube (100 mm)
  - Screw 20 mm (1 piece)
  - O-ring (1 piece)

**Flat cell 10 cm²**

- **Flat cell kit 10 cm²**
  - Content
  - Glass cell (6 mm diameter)
  - Anolyte compartment (3 mm diameter)
  - Catholyte compartment (3 mm diameter)
  - Reference electrode bridge tube (54 mm wire/80 mesh)
  - Purging tube (100 mm)
  - Screw 20 mm (1 piece)
  - O-ring (1 piece)

**Glassware**

- Electrodes
- Rotating electrodes
- Spectro-electrochemistry
- Quartz crystal analyzer
- Battery accessories
- Fuel cell
- Connection accessories
- Local probes accessories

**Coating cell**

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, up to 1 cm² sample area**

- **Flat cell kit 1 cm²**
  - Catalog n°
  - EL-FLAT-1
- **Flat cell kit 10 cm²**
  - Catalog n°
  - EL-FLAT-10

**Plate material evaluating cell**

- **Catalog n°**
  - A-011851
- **Content**
  - Anolyte electrode & base (1 piece)
  - Catholyte electrode (1 piece)
  - Reference electrode bridge tube (54 mm wire/80 mesh)
  - Purging tube (100 mm)
  - Plummet counter electrode (1 piece)
- **Options**
  - A-012622

**Coating cell**

- **Catalog n°**
  - EL-COAT
- **Content**
  - Plate for coating cell
- **Options**
  - A-011857
  - Bridge tube for 4 mm reference electrode
  - EL-P-008
  - Rubber cap with two holes
  - EL-P-026
  - Rubber sealing
  - EL-P-006
  - Glass for coating cell
  - EL-P-004
  - Graphite rod counter electrode
  - EL-P-007
- **Catalog n°**
  - A-011851
  - Bridge tube for 4 mm reference electrode
  - EL-P-008
  - Mask for internal caryard
  - EL-P-011
  - Mask for 5 cm² (50 pieces)
  - EL-P-012
  - Mask for 10 cm² (25 pieces)
  - EL-P-013

**Coating material evaluating cell**

- **Catalog n°**
  - A-011851
- **Content**
  - Anolyte electrode & base (1 piece)
  - Catholyte electrode (1 piece)
  - Reference electrode bridge tube (54 mm wire/80 mesh)
  - Purging tube (100 mm)
  - Plummet counter electrode (1 piece)
- **Options**
  - A-012622
To complete a kit, the cell vials are also offered separately. Note that other volumes are available on request.

<table>
<thead>
<tr>
<th>Small &amp; big volume cell vials</th>
<th>Volume</th>
<th>OD</th>
<th>ID</th>
<th>Height</th>
<th>Quantity</th>
<th>Purpose</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small volume cell vials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sample vial</td>
<td>1 mL</td>
<td>18 mm</td>
<td>15.6 mm</td>
<td>30 mm</td>
<td>10</td>
<td>VC-2, VC-3</td>
<td>A-011504</td>
</tr>
<tr>
<td></td>
<td>20 mL</td>
<td>28 mm</td>
<td>25.6 mm</td>
<td>50 mm</td>
<td>10</td>
<td>VC-2, VC-3</td>
<td>A-001056</td>
</tr>
<tr>
<td></td>
<td>100 mL</td>
<td>50 mm</td>
<td>46.4 mm</td>
<td>72 mm</td>
<td>1</td>
<td>REDE-3A, bulk electrolysis</td>
<td>A-012632</td>
</tr>
<tr>
<td>water jacketed glass vial</td>
<td>1 mL</td>
<td>36 mm</td>
<td>18.5 mm</td>
<td>90 mm</td>
<td>1</td>
<td>VC-4, VC-3</td>
<td>A-012672</td>
</tr>
<tr>
<td></td>
<td>20 mL</td>
<td>55 mm</td>
<td>25.6 mm</td>
<td>90 mm</td>
<td>1</td>
<td>VC-2, VC-3</td>
<td>A-001056</td>
</tr>
<tr>
<td></td>
<td>100 mL</td>
<td>70 mm</td>
<td>46.4 mm</td>
<td>120 mm</td>
<td>1</td>
<td>RRDE-3A, bulk electrolysis</td>
<td>A-012652</td>
</tr>
<tr>
<td>cell holder for 20 mL vial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>A-001209</td>
</tr>
<tr>
<td>big volume cell vials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sample vial</td>
<td>80 mL</td>
<td>90 mm</td>
<td>46 mm</td>
<td>80 mm</td>
<td>1</td>
<td>VC-2, VC-3</td>
<td>A-012632</td>
</tr>
<tr>
<td></td>
<td>1,000 mL</td>
<td>150 mm</td>
<td>90 mm</td>
<td>175 mm</td>
<td>1</td>
<td></td>
<td>EL-C-001</td>
</tr>
<tr>
<td></td>
<td>1,000 mL</td>
<td>150 mm</td>
<td>90 mm</td>
<td>175 mm</td>
<td>1</td>
<td>EL-CORR-1</td>
<td>EL-C-019</td>
</tr>
<tr>
<td>water jacketed glass vial</td>
<td>80 mL</td>
<td>90 mm</td>
<td>46 mm</td>
<td>85 mm</td>
<td>1</td>
<td>EL-ELECTRO-2</td>
<td>EL-C-002</td>
</tr>
<tr>
<td></td>
<td>1,000 mL</td>
<td>150 mm</td>
<td>90 mm</td>
<td>175 mm</td>
<td>1</td>
<td>EL-CORR-2</td>
<td>EL-C-019</td>
</tr>
<tr>
<td>cell holder for king size vial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>EL-C-019</td>
</tr>
<tr>
<td>cell holder for king size vial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>EL-C-019</td>
</tr>
</tbody>
</table>

Dimensions in mm

Small volume cell vials, 1 to 100 mL

Big volume cell vials, 100 to 2,000 mL
Glassware

**Bridge tubes for corrosion cells**

- EL-C-008
- EL-C-017
- EL-F-004B
- EL-F-004

**Purge tubes for corrosion cells**

- EL-C-006
- EL-C-016

**Bridge tubes for analytical cells**

- EL-A-017
- EL-A-008

**Purge tubes for analytical cells**

- EL-A-006
- EL-A-016

**Bridge tubes with ceramic junction**

- R-AL100
- R-AL110
- R-AL120

---

**Dimensions in mm**

- Small size bridge tubes
  - OD 6 mm
  - Height 68 mm
  - Quantity 2
  - Compatibility: SVC-2, SVC-3
  - Catalog no.: 092-VYC3

- Purge tubes for corrosion cells
  - Single: OD 10 mm, Height 200 mm
  - Standard: OD 10 mm, Height 220 mm

- Bridge tubes with ceramic junction
  - Standard: OD 8 mm, Height 250 mm
  - With reverse sleeve: OD 8 mm, Height 138 mm

---

**Options**

- Set of 10 porous 2.8 mm glass frit (CoralPor™) with PTFE heat shrink (200 mm)
  - Catalog no.: 092-VYC3

- Set of 10 porous 4 mm glass frit (CoralPor™) with PTFE heat shrink (200 mm)
  - Catalog no.: 092-VYC4

---

The tolerance of each dimension is approximately ±0.5 mm.

---

**Electrochemistry Accessories**
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 electrode maintenance

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

#### Working electrodes maintenance

<table>
<thead>
<tr>
<th>Description</th>
<th>Catalog #</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK-3 electrode polishing kit</td>
<td>A-011975</td>
</tr>
</tbody>
</table>

#### Content

- 0.05 μm polishing alumina (20 mL) A-001050
- 1 μm polishing diamond (10 mL) A-002054
- Water paper 180 grit (100 pieces) A-012611
- Coarse polishing pad 100 (10 pieces) A-001051

### Working electrodes

#### Catalog n°

<table>
<thead>
<tr>
<th>Working electrodes</th>
<th>Isolation</th>
<th>OD</th>
<th>Electrode size (mm)</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carbon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long glassy carbon electrode</td>
<td>PEKK</td>
<td>10 mm</td>
<td>3 mm</td>
<td>A-002242</td>
</tr>
<tr>
<td>Standard glassy carbon electrode</td>
<td>PEKK</td>
<td>6 mm</td>
<td>3 mm</td>
<td>A-002241</td>
</tr>
<tr>
<td>Small glassy carbon electrode</td>
<td>PEKK</td>
<td>3 mm</td>
<td>1.5 mm</td>
<td>A-012129</td>
</tr>
<tr>
<td>Micro carbon fiber electrode</td>
<td>glass</td>
<td>3 mm</td>
<td>0.4 mm</td>
<td>A-002133</td>
</tr>
<tr>
<td>Standard pyrolytic graphite electrode</td>
<td>glass</td>
<td>3 mm</td>
<td>0.6 mm</td>
<td>A-002125</td>
</tr>
<tr>
<td>Standard PFCE carbon electrode</td>
<td>PEKK</td>
<td>6 mm</td>
<td>3 mm</td>
<td>A-002243</td>
</tr>
<tr>
<td>Small PFCE carbon electrode</td>
<td>PEKK</td>
<td>3 mm</td>
<td>1 mm</td>
<td>A-002240</td>
</tr>
<tr>
<td><strong>Platinum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platinum gauze electrode</td>
<td>PEKK</td>
<td>100 mesh</td>
<td>25 x 35 mm</td>
<td>A-002136</td>
</tr>
<tr>
<td>Long platinum electrode</td>
<td>PEKK</td>
<td>6 mm</td>
<td>3 mm</td>
<td>A-012746</td>
</tr>
<tr>
<td>Standard platinum electrode</td>
<td>PEKK</td>
<td>6 mm</td>
<td>3 mm</td>
<td>A-002242</td>
</tr>
<tr>
<td>Small platinum electrode</td>
<td>PEKK</td>
<td>3 mm</td>
<td>1 mm</td>
<td>A-002133</td>
</tr>
<tr>
<td>Micro platinum electrode</td>
<td>glass</td>
<td>3 mm</td>
<td>0.3 μm</td>
<td>A-002249</td>
</tr>
<tr>
<td><strong>Gold</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold gauze electrode</td>
<td>PEKK</td>
<td>100 mesh</td>
<td>25 x 35 mm</td>
<td>A-002135</td>
</tr>
<tr>
<td>Long gold electrode</td>
<td>PEKK</td>
<td>6 mm</td>
<td>3 mm</td>
<td>A-012746</td>
</tr>
<tr>
<td>Standard gold electrode</td>
<td>PEKK</td>
<td>6 mm</td>
<td>3 mm</td>
<td>A-002242</td>
</tr>
<tr>
<td>Small gold electrode</td>
<td>PEKK</td>
<td>3 mm</td>
<td>1 mm</td>
<td>A-002134</td>
</tr>
<tr>
<td>Micro gold electrode</td>
<td>glass</td>
<td>3 mm</td>
<td>0.3 μm</td>
<td>A-002249</td>
</tr>
<tr>
<td><strong>Silver</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard silver electrode</td>
<td>PEKK</td>
<td>10 mm</td>
<td>5 mm</td>
<td>A-002136</td>
</tr>
</tbody>
</table>

#### Dimensions in mm

- 2-3 -1 0 1 2 3 V vs SCE
- Electroactivity window of the working electrodes in different media

<table>
<thead>
<tr>
<th>Media</th>
<th>Electroactivity window</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH = 0</td>
<td>Platinum</td>
</tr>
<tr>
<td>pH = 7</td>
<td>Carbon</td>
</tr>
<tr>
<td>pH = 14</td>
<td>Carbon</td>
</tr>
<tr>
<td>TBAP/DMF</td>
<td>Carbon</td>
</tr>
<tr>
<td>1 M HClO₄</td>
<td>Carbon</td>
</tr>
<tr>
<td>0.1 M KCl</td>
<td>Carbon</td>
</tr>
<tr>
<td>TBAP/ACN</td>
<td>Carbon</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Reference Electrode</th>
<th>Junction</th>
<th>Electrolyte</th>
<th>Purpose</th>
<th>Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE-18 3mm silver, silver chloride reference electrode</td>
<td>Ag/AgCl</td>
<td>3 M NaCl</td>
<td>In cell, 3 5 10 bulk electrodes, RDE2-3A flat cell</td>
<td>A-012167</td>
</tr>
<tr>
<td>RE-19 3mm silver, silver chloride reference electrode</td>
<td>Ag/AgCl</td>
<td>3 M NaCl</td>
<td>In cell, 3 5 10 bulk electrodes, RDE2-3A flat cell</td>
<td>A-012168</td>
</tr>
<tr>
<td>RE-20P silver, silver chloride reference electrode ceramic</td>
<td>Ag/AgCl</td>
<td>3 M NaCl</td>
<td>For flow cell spectrophotometric cell, RDE2-3A flat cell</td>
<td>A-013427</td>
</tr>
<tr>
<td>RE-20P Ag/AgCl screw type electrode, PEEK resin</td>
<td>Ag/AgCl</td>
<td>3 M NaCl</td>
<td>For flow cell spectrophotometric cell, RDE2-3A flat cell</td>
<td>A-012169</td>
</tr>
<tr>
<td>Ag/AgCl ink, 2 mm</td>
<td>- Surface resistance: 2.0±0.5 ohm/µm, viscosity: 0.030±0.001 CP @21.1°C (flash point: 82°C)</td>
<td>For micro-CEC in DA measurement</td>
<td>A-015144</td>
<td></td>
</tr>
<tr>
<td>RE-28b internal reference electrode</td>
<td>ceramic</td>
<td>3 M NaCl</td>
<td>For flow cell spectrochemical cell, RDE2-3A flat cell</td>
<td>A-013430</td>
</tr>
<tr>
<td>RE-28b Hg/Hg2Cl2 reference electrode, screw type</td>
<td>ceramic</td>
<td>saturated KCl</td>
<td>For flow cell spectrochemical cell, RDE2-3A flat cell</td>
<td>A-013431</td>
</tr>
<tr>
<td>RE-3V silver, silver chloride reference electrode ceramic 1M NaOH for alkaline media</td>
<td>Ag/AgCl</td>
<td>1M NaOH</td>
<td>For alkaline media</td>
<td>A-013395</td>
</tr>
<tr>
<td>RE-3V silver, silver chloride reference electrode ceramic</td>
<td>Ag/AgCl</td>
<td>1M NaOH</td>
<td>For alkaline media</td>
<td>A-013395</td>
</tr>
<tr>
<td>RE-3VP silver, silver chloride reference electrode ceramic saturated KCl SVC-2, SVC-3, VC-4, bulk electrolysis, RRDE-3A, flat cell</td>
<td>Ag/AgCl</td>
<td>1M NaOH</td>
<td>For alkaline media</td>
<td>A-013395</td>
</tr>
</tbody>
</table>

**Options**

- Set of 10 porous 2.8 mm glass frit CoralPor** with PTFE heat shrink (200 mm)
- 20/21 mm glass frit (Corafit) with PTFE heat shrink (200 mm) * 1000 per pack

**Dimensions in mm**

- Main body: 2.8 mm diameter (RE-7), 3 mm diameter (RE-1)
- Bridge tube: Ø 9.0 mm (22 pieces)
- Bridge tube: Ø 10 mm (2 pieces)
- Bridge tube: Ø 10 mm (2 pieces)

**Spare parts**

- RE-18 reference solution (10 ml)
- Bridge tube Ø 10 mm (2 pieces)
- Bridge tube Ø 10 mm (2 pieces)
- PTFE cap with Ag wire (for RE-7)

**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.**

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

<table>
<thead>
<tr>
<th>Reference Electrode</th>
<th>Junction</th>
<th>Electrolyte</th>
<th>Purpose</th>
<th>Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE-7 non aqueous reference electrode (Ag/Ag^+) ceramic</td>
<td>Ag/Ag^+/ACN</td>
<td><strong>Acetonitrile</strong></td>
<td>CV</td>
<td>A-012173</td>
</tr>
<tr>
<td>RE-7 non aqueous reference electrode screw type, PEEK resin</td>
<td>Ag/Ag^+/ACN</td>
<td><strong>Acetonitrile</strong></td>
<td>CV</td>
<td>A-012173</td>
</tr>
<tr>
<td>RE-7VP non aqueous reference electrode Ag/Ag^+ screen type, PEEK resin</td>
<td>Ag/Ag^+/ACN</td>
<td><strong>Acetonitrile</strong></td>
<td>CV</td>
<td>A-012173</td>
</tr>
</tbody>
</table>

**Spare parts**

- RE-7 reference solution (10 ml)
- PTFE cap with Ag wire (for RE-7)
- PTFE cap with Ag wire (for RE-7S)
- Sample holder 6 mm diameter (for RE-7) (2 pieces)
- Sample holder 6 mm diameter (for RE-7S) (2 pieces)

**Options**

- RE-7 non aqueous reference electrode (Ag/Ag^+) screw type, PEEK resin, IPPG** Ag/Ag^+/ACN** TBAP*** flow cell
- RE-7VP non aqueous reference electrode Ag/Ag^+ screen type, PEEK resin, IPPG** Ag/Ag^+/ACN** TBAP*** flow cell

**Electrolyte solutions**

- **Acetonitrile** for CV
- **Acetonitrile** for CV
- **Acetonitrile** for CV
- **Acetonitrile** for CV

** storing 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.

**Maintenance of Vycor-based reference electrode**

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

### King size reference electrodes

<table>
<thead>
<tr>
<th>R-REF621</th>
<th>R-XR110</th>
<th>R-XR300</th>
<th>R-XR600</th>
<th>R-XR920</th>
</tr>
</thead>
</table>

**Rod reference electrode**
- banana plug: ceramic 120 mm 10 mm R-ST521
- banana plug: stainless steel 120 mm 10 mm R-ST521

**Hg/HgSO4 reference electrode in sat. K2SO4, chloride free**
- screw cap: ceramic 120 mm 8 mm R-REF621

**Glass reference electrode non-aqueous (LiA)**
- screw cap: ceramic 120 mm 8 mm R-REF722

For general purpose:
- reference electrode in RCl sat for CV, straight screw cap: ceramic 120 mm 8 mm R-REF110
- reference electrode in RCl sat for CV, curved screw cap: ceramic 120 mm 8 mm R-REF210

| Ag/AgCl reference electrode for EIS screw cap: ceramic 120 mm 8 mm R-XR200 |
| Ag/AgCl reference electrode for CV screw cap: ceramic 120 mm 8 mm R-XR300 |

**Salt bridge**
- 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

**Conical rings for 8 mm OD 12 mm electrodes (4 pieces)**
- R-X31M012

**Counter electrodes**

<table>
<thead>
<tr>
<th>A-002222</th>
<th>A-002223</th>
<th>A-002254</th>
<th>A-002250</th>
</tr>
</thead>
</table>

**Counter electrodes**
- Length: 57 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: SVC-2, 3, plate material Catalog #: A-002222
- Length: 57 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: SVC-2, 3, plate material Catalog #: A-002223
- Length: 50 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: SVC-2, 3, plate material Catalog #: A-002236
- Length: 230 mm 5.5 mm
- Sulfur area: 3.6 cm²
- Purpose: VC-3, plate material Catalog #: A-013436
- Length: 230 mm 5.5 mm
- Sulfur area: 3.6 cm²
- Purpose: VC-3, plate material Catalog #: A-013437
- Length: 50 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: Plate material Catalog #: A-013718

**Metallic electrodes**

<table>
<thead>
<tr>
<th>A-002234</th>
<th>A-002235</th>
<th>A-002236</th>
</tr>
</thead>
</table>

**Metallic electrodes**
- Length: 50 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: SVC-2, 3, plate material Catalog #: A-002234
- Length: 50 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: SVC-2, 3, plate material Catalog #: A-002235
- Length: 50 mm 5.5 mm
- Sulfur area: 0.7 cm²
- Purpose: SVC-2, 3, plate material Catalog #: A-002236

**Glassy carbon**
- Diameter: 103 mm 9 mm Catalog #: R-M291C

**Platinum**
- Diameter: 103 mm 9 mm Catalog #: R-XM110
- Diameter: 120 mm 12 mm Catalog #: R-XM120
- Diameter: 120 mm 12 mm Catalog #: R-XM140
- Diameter: 120 mm 12 mm Catalog #: R-XM150

**Battery accessories**

<table>
<thead>
<tr>
<th>A-012198</th>
<th>A-002251</th>
<th>A-002254</th>
</tr>
</thead>
</table>

**Battery accessories**
- Diameter: 58 mm 9 mm Catalog #: A-012198
- Diameter: 25 mm 8 mm Catalog #: A-002251
- Diameter: 40 mm 8 mm Catalog #: A-002254

**Salt bridge Ceramic**
- Diameter: 25 mm 8 mm Catalog #: R-AL100
- Diameter: 103 mm 9 mm Catalog #: R-AL120
- Diameter: 250 mm 8 mm Catalog #: R-AL150

**Conical rings for 8 mm OD 12 mm electrodes (4 pieces)**
- R-X31M012
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.

RRDE-3A is to be operated as a stand-alone unit or directly connected. It is easy to remove and replace the cell vial. It is easy for rinsing, cleaning, and replacing the electrodes. It is easy to remove and replace the cell vial. Additionally, the access to glass cell and purging inside the cell vial. The unit also provides an adjustable valve system for inert gas purging inside the cell vial. The unit also provides an adjustable valve system for inert gas purging inside the cell vial.

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

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Rotating electrodes

Rotating Disk Electrode (RDE)

The ED101 is a versatile and rugged rotating disk electrode ideal for use with any Bio-Logic potentiostat/galvanostat. It is available with a wide range of tips: platinum, glassy carbon, gold... Thanks to its conic shaft holder, the ED101 can be used with a wide range of cells. The CVT101 speed control unit controls the ED101 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.

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 $D = 6.36 \times 10^{-3} \text{ cm}^2/\text{s}$. The resulting CVs are overlaid and presented in the image below.

Where:
- $i_a$ 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 (cm$^2$),
- $D$ is the diffusion coefficient (cm$^2$/s),
- $v$ is the kinematic viscosity (cm$^2$/s),
- $C$ is the electroactive species concentration (mol/cm$^3$).

$\tilde{I}_L = \frac{nFA D^{1/2} v^{-1/6} C}{\rho}$

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Spectroelectrochemistry

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 - CHN quantification

**Reflectance**
- Fireplace testing
- Flow thickness/composition (quality control)
- Activation energy of photoactive species
- Textile quality control

**Fluorescence**
- Marine organisms - Biology (DNA, protein, cell proliferation assay, histamine-analysis, alga monitoring)
- Environmental fields (water analysis, ground water trace studies, hydrocarbon detection, dissolved oxygen)
- Plant efficiency (plant physiology, plant breeding, horticulture, agronomy, agronomicals, pollution studies, forestry, ecology)
- Tissue diagnosis

**Scattering**
- Oil concentrations of oil-water system
- Raman spectroscopy
- Physical transition phenomena (e.g. melting point, glass transition crystallize temperature)

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

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**Spectrometer**

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**Spectroelectrochemistry (SEC)** can be useful to elucidate electrochemical reaction mechanisms.
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.

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**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-BNC cable (catalog no. 092-22/1).

**EQCM specifications**

- **Frequency range**: 1 MHz - 10 MHz, resolution 0.1 Hz
- **Resonator resistance range**: 10 Ω - 1.6 kΩ, resolution 0.1 Ω
- **Freq output**: Full scale 0.05 V (1 kHz) ±0.05 V (20 Hz) ±0.2 V (20 kHz)
- **Resistance output**: Full scale 0.50 V (1 kHz) ±0.1 V (10 kHz) ±0.5 V (20 kHz)
- **Gate time**: variable (0.1, 1.0, 10.0 s)
- **Connections**: DB9-8BNC cable
- **Dimensions (W x D x H)**: 260 x 230 x 88 mm
- **Weight**: 3.3 kg
- **Temperature range**: 0 - 40 °C
- **Power consumption**: 100-120 V AC, 230-240 V AC, 50-60 Hz, (15 W)

**Surface finishing**

- **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

**ELECTROCHEMISTRY ACCESSORIES**

- **Quartz crystal microbalance 27 MHz kit**: SE-QCA922A
- **Holder is needed to get a full QCM or EQCM set-up**
- **Connector from QCA to potentiostat**: 092-22/1
- **Low flow peristaltic pump**: EL-AV-008

**EQCM Catalog no.**

- **EQCM 27 MHz main unit and cable**: SE-QCA922A-00
- **Male BNC/BNC cable (2 pieces, length 1 m)**: COR8210

**Options**

- **Gold electrode (25 pieces)**: SE-9AU
- **Gold electrode (500 pieces)**: SE-9AU-M2
- **Gold electrode (25 pieces)**: SE-9AU-M
- **Graphite electrode (25 pieces)**: SE-9C
- **Graphite electrode (25 pieces)**: SE-9C-M
- **Copper electrode (25 pieces)**: SE-9CU
- **Polish finish gold electrode (30 pieces)**: SE-9AU-P/1
- **Gold electrode (25 pieces)**: SE-9CU-P/1
- **Platinum electrode (25 pieces)**: SE-9PT
- **Platinum electrode (25 pieces)**: SE-9PT-S
- **Platinum electrode (25 pieces)**: SE-9PT-MS
- **Graphite electrode (25 pieces)**: SE-9C
- **Graphite electrode (25 pieces)**: SE-9C-M
- **Copper electrode (25 pieces)**: SE-9CU
- **Copper electrode (25 pieces)**: SE-9CU-M
- **ITO electrode (25 pieces)**: SE-9IT-M
- **Graphite electrode (25 pieces)**: SE-9C
- **Graphite electrode (25 pieces)**: SE-9C-M
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**Quartz resonators**

<table>
<thead>
<tr>
<th>Quartz resonator</th>
<th>(fabrication at 5 MHz at factory with no charge when purchased)</th>
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</tr>
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<tbody>
<tr>
<td>MHz</td>
<td>standard finish</td>
<td>etching finish</td>
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<tr>
<td>5 MHz</td>
<td>gold electrode (25 pieces)</td>
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<tr>
<td>9 MHz</td>
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**EQCM accessories**

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- **Quartz crystal microbalance 27 MHz kit**
  - SE-QCA922A
- **Holder**
  - Male BNC/BNC cable (2 pieces, length 1 m)
  - Catalog no.: COR8210
- **Options**
  - Gold electrode (25 pieces)
  - Gold electrode (500 pieces)
  - Graphite electrode (25 pieces)
  - Copper electrode (25 pieces)
  - ITO electrode (25 pieces)
  - Platinum electrode (25 pieces)
  - Stainless steel (SUS304) electrode (25 pieces)
  - Titanium electrode (25 pieces)
- **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

---

**EQCM specifications**

- **Frequency range**: 1 MHz - 10 MHz, resolution 0.1 Hz
- **Resonant resistance range**: 10 - 1.6 kΩ, resolution 0.1 Ω
- **Freq output**
  - Full scale 0.05 V (1 kHz) ±0.05 V (20 Hz) ±0.2 V (20 kHz)
- **Resistance output**
  - Full scale 0.50 V (1 kHz) ±0.1 V (10 kHz) ±0.5 V (20 kHz)
- **Gate time**: variable (0.1, 1.0, 10.0 s)
- **Connections**: DB9-8BNC cable
- **Dimensions (W x D x H)**: 260 x 230 x 88 mm
- **Weight**: 3.3 kg
- **Temperature range**: 0 - 40 °C
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. Sauercrøy 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.[2,3]

The Sauercrøy equation is defined as:

$$\Delta f = \frac{2\pi f_0}{Q} \Delta m$$

where:
- $f_0$ is the resonant frequency (Hz)
- $Q$ is the quality factor
- $\Delta m$ is the mass change (g)
- $A$ is the piezoelectrically active crystal area (area between electrodes, cm$^2$)
- $\mu$ is the shear modulus of quartz for AT-cut crystal
- $\delta$ is the thickness of the polymer film

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$_4$NPF$_6$, 0.2 mol.L$^{-1}$) containing a solution of 1-methylpyrrol monomer (0.01 mol.L$^{-1}$).

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.

Specifications

- **Frequency range**: 25 MHz to 1.4 GHz, resolution 0.1 Hz
- **Resonant frequency range**: 3.5 to 200 MHz
- **Max channels**: 4
- **Saturation rate**: variable (0.1 to 10 Hz)
- **Size**: 340 x 190 x 220 mm
- **Power consumption**: 100-120 V AC, 230-240 V AC, 50-60 Hz
- **Dimensions**: W x D x H = 320 x 280 x 133 mm
- **Weight**: 5.5 kg
- **Interface**: USB 2.0
- **Display**: 20 digits x 2 rows
- **Max channel**: 4
- **Resonant resistance range**: 2 Ω, resolution 0.1 Ω
- **Frequency range**: 25 MHz to 27 MHz, resolution 0.01 Hz

Electrolyte & temperature control module

- **Control module**: SE-QCM934-300
- **Cable for oscillator & temperature control module**: SE-QCM934-200
- **Cable for oscillator & temperature control module**: SE-WQCM
- **Main unit**: SE-QCM934-000
- **Content**: WinQCM software

Control module

- **Control module**: SE-QCM934-300
- **Cable for oscillator & temperature control module**: SE-WQCM
- **Main unit**: SE-QCM934-000
- **Content**: WinQCM software

Flow cell kit

- **Flow cell kit**: SE-QCM934-300
- **Cable for oscillator & temperature control module**: SE-WQCM
- **Main unit**: SE-QCM934-000
- **Content**: WinQCM software

Additional channel

- **Additional channel**: SE-QCM934-1CHF
- **Cable for OSC module connection**: SE-QCM934-200

Battery accessories

- **Battery accessories**: EL-AV-008
- **Additional channel**: SE-QCM934-1CHF

Connection accessories

- **Connection accessories**: SE-QCM934-000
- **Content**: WinQCM software

Local probes accessories

- **Local probes accessories**: SE-QCM934-000
- **Content**: WinQCM software

Power consumption 100-120 V AC, 230-240 V AC, 50-60 Hz

Temperature 10 - 40 °C

Dimensions (W x D x H) 320 x 280 x 133 mm

Interface USB 2.0

Display 20 digits x 2 rows

Max channel 4

Resonant resistance range 2 Ω, resolution 0.1 Ω

Frequency range 25 MHz-27 MHz, resolution 0.01 Hz

Specifications

<table>
<thead>
<tr>
<th>Power consumption</th>
<th>100-120 V AC</th>
<th>230-240 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>10 - 40 °C</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>320 x 280 x 133 mm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>5.5 kg</td>
<td></td>
</tr>
</tbody>
</table>

Additional channel

- **Additional channel**: SE-QCM934-1CHF
- **Cable for OSC module connection**: SE-QCM934-200

Battery accessories

- **Battery accessories**: EL-AV-008
- **Additional channel**: SE-QCM934-1CHF

Connection accessories

- **Connection accessories**: SE-QCM934-000
- **Content**: WinQCM software

Local probes accessories

- **Local probes accessories**: SE-QCM934-000
- **Content**: WinQCM software

Quartz crystal analyzer

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.

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where:
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- $Q$ is the quality factor
- $\Delta m$ is the mass change (g)
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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.

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

### 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.

#### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ECD-nano-DL</th>
<th>ECD-3-DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement sensor</td>
<td>Capacitive LVDT</td>
<td>LVDT</td>
</tr>
<tr>
<td>Drift (sample-free)</td>
<td>≤ 20 nm/h</td>
<td>≤ 10 nm/h</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>≤ 10 Hz</td>
<td>≤ 10 Hz</td>
</tr>
<tr>
<td>Resolution</td>
<td>&lt; 5 nm</td>
<td>&lt; 0.1% of full range</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; 0.1% of full range</td>
<td>&lt; 0.1% of full range</td>
</tr>
<tr>
<td>Dilatation range</td>
<td>250 μm</td>
<td>500 μm</td>
</tr>
<tr>
<td>Dimensions (H x W x D)</td>
<td>230 x 100 x 110 mm</td>
<td>230 x 100 x 110 mm</td>
</tr>
<tr>
<td>DC output voltage</td>
<td>-10 to 10 V</td>
<td>-10 to 10 V</td>
</tr>
<tr>
<td>Electrode configurations</td>
<td>2-electrode, 3-electrode (reference), auxiliary</td>
<td>2-electrode, 3-electrode (reference), auxiliary</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20 to 70 °C</td>
<td>-20 to 70 °C</td>
</tr>
<tr>
<td>Cell electrolyte volume</td>
<td>≤ 3 mL (ca. 2 ml electrolyte required)</td>
<td>≤ 3 mL (ca. 2 ml electrolyte required)</td>
</tr>
<tr>
<td>Load on test specimen</td>
<td>1.0 N (fixed), 0.3 N or 1.0 N (variable)</td>
<td>1.0 N (fixed), 0.3 N or 1.0 N (variable)</td>
</tr>
<tr>
<td>Chemical compatibility</td>
<td>Aprotic organic electrolytes, optional aqueous electrolytes</td>
<td>Aprotic organic electrolytes, optional aqueous electrolytes</td>
</tr>
</tbody>
</table>

### Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Catalog#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting pliers</td>
<td>E-EDT18</td>
</tr>
<tr>
<td>3-electrode test cell</td>
<td>E-ECCAIR</td>
</tr>
<tr>
<td>2/3-electrode test cell</td>
<td>E-ECCP-3DL</td>
</tr>
<tr>
<td>Gas evolution test cell</td>
<td>E-ECCP-G</td>
</tr>
<tr>
<td>Gas diffusion test cell</td>
<td>E-ECCP-G</td>
</tr>
<tr>
<td>Optical characterization</td>
<td>E-ECCOPT-5</td>
</tr>
</tbody>
</table>

### Electrode alignment and assembly tool

<table>
<thead>
<tr>
<th>Tool</th>
<th>Catalog#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead the metal lithium</td>
<td>E-ECCLAAD</td>
</tr>
</tbody>
</table>

---

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 VGP, VMP3 or MPG2 that offer the unique 5-lead type connection. Other cells for specific utilization are also available.
Battery accessories

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.

<table>
<thead>
<tr>
<th>Battery Holder</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH-1i</td>
<td>092-22/15</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Coin Cell Holder</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCH-120 for VMP3/BCS-805</td>
<td>096-120</td>
</tr>
<tr>
<td>CCH-124 for BCS-810</td>
<td>096-124</td>
</tr>
</tbody>
</table>

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, CCS and CCB.

CCS 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.

<table>
<thead>
<tr>
<th>Current Collector for 5 boosters</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCS-85 for VSP-300/VMP300</td>
<td>094-26/57</td>
</tr>
<tr>
<td>CCS-85 for BCS-805</td>
<td>096-015</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Sense Adapter Module</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAM-50</td>
<td>092-26</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Battery Holder</th>
<th>Maximum units</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 units</td>
<td>134 x 79 x 185 mm</td>
<td>0.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coin Cell Holder</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>82 x 83 x 65 mm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Collector for 5 boosters</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCS-85</td>
<td>85 x 82 x 83 mm</td>
<td>0.1</td>
</tr>
<tr>
<td>CCS-85</td>
<td>85 x 82 x 83 mm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Rack for MPG2-xx series up to 5 units</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Including ethernet switch, power plug, computer tablet</td>
<td>092-46/1</td>
</tr>
<tr>
<td>With sliding tablet, including ethernet switch, power plug, computer tablet</td>
<td>092-46/2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coin Cell Holder</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80 x 82 x 83 mm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Collector for 5 boosters</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCS-85</td>
<td>86 x 82 x 83 mm</td>
<td>0.1</td>
</tr>
<tr>
<td>CCS-85</td>
<td>86 x 82 x 83 mm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Collector for 8 channels</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCS-85</td>
<td>86 x 82 x 83 mm</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Battery Holder</th>
<th>Maximum units</th>
<th>Dimensions (W x D x H)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 units</td>
<td>600 x 710 x 1850 mm</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>495 x 450 x 297 mm</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>495 x 450 x 257 mm</td>
<td>1.5</td>
</tr>
</tbody>
</table>

| Temperature range | 10 - 40°C |

ELECTROCHEMISTRY ACCESSORIES
Education 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.

---

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.

### Educational kit

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---

**Membrane Electrode Assemblies (MEA)**

<table>
<thead>
<tr>
<th>Catalog n°</th>
<th>MEA Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>095-08/1</td>
<td>5 cm², 7 layers</td>
</tr>
<tr>
<td>095-08/2</td>
<td>10 cm², 7 layers</td>
</tr>
<tr>
<td>095-08/3</td>
<td>25 cm², 7 layers</td>
</tr>
<tr>
<td>095-08/4</td>
<td>50 cm², 7 layers</td>
</tr>
<tr>
<td>095-08/5</td>
<td>100 cm², 7 layers</td>
</tr>
<tr>
<td>095-08/6</td>
<td>225 cm², 7 layers</td>
</tr>
</tbody>
</table>

**Content**

- **Educational kit** (fuel cell / electrolyzer)
  - PEM kit PEM#1: 25 cm² air-breathing cells (MEA S25-7L N50-Pt/C 70%), no possibility to dismantle the cell
  - PEM#2: 25 cm² air-breathing cells (MEA S25-7L N125-Pt/C 70%), no possibility to dismantle the cell
  - PEM#3: 25 cm² air-breathing cells (MEA S25-7L N212-Pt/C 40%), no possibility to dismantle the cell
- **Electrolyzer kit** (including gas line)
- **Variable resistance**
- **Data acquisition** (including connection, data logger, software)
- **Power supply** 220 V
- **Adapter** 110 V/220 V

**Options**

- 25 cm² air-breathing cell (no MEA)
- Power supply by two photovoltaic cells

---

**Educational kit**

<table>
<thead>
<tr>
<th>Catalog n°</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>095-20/A</td>
<td>110 V electrical grid</td>
</tr>
<tr>
<td>095-20/B</td>
<td>220 V electrical grid</td>
</tr>
</tbody>
</table>

**Content**

- **Contact**
  - PEM kit PEM#1: 25 cm² air-breathing cells (MEA S25-7L N50-Pt/C 70%), no possibility to dismantle the cell
  - PEM#2: 25 cm² air-breathing cells (MEA S25-7L N125-Pt/C 70%), no possibility to dismantle the cell
  - PEM#3: 25 cm² air-breathing cells (MEA S25-7L N212-Pt/C 40%), no possibility to dismantle the cell
  - Electrolyzer kit (including gas line)
  - Variable resistance
  - Data acquisition (including connection, data logger, software)
  - Power supply 220 V
  - Adapter 110 V/220 V

**Options**

- 25 cm² air-breathing cell (no MEA)
- Power supply by two photovoltaic cells
Analytical cell
Corrosion cell
Glassware
Electrodes
Rotating electrodes
Spectroelectrochemistry
Quartz crystal analyzer
Battery accessories
Fuel cell
Connection accessories

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 lengths. That's why, longer cables 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.

Connectors
- 2 sockets of 4 mm: blue, white
- 3 sockets of 2 mm: blue, white, red
- 2 sockets of 2 mm: blue, white
- 3 alligator clips of 2 mm: blue, white, red

Hermetic cell cable for glove box
Catalog n°
SP-30, SP-130, VSP, VMP3, MPG2
091-233/6
A larger connector 25 pins ensures the hermetic junction (hole diameter to make in the glove box wall: 10 mm).
- cable with DC-25 connector in one side and 25 pins connector in the other side (length: 1 m)
- cable with DC-25 connector in one side and 25 pins connector in the other side (length: 1.5 m)
- A Jiager connector 25 pins ensures the hermetic junction in the glove box wall the other dedicated to the channel board calibration outside the box

Connection cable from booster to potentiostat
Available length Catalog n°
All boosters 2 m 092-333/5
3 m 092-333/6

Larger cable
Available length Catalog n°
SP-30, SP-130, VSP, VMP3, MPG2
2.5 m 092-233/2
3 m 092-233/3
4 m 092-233/4

Breaker 2 A, 4 A, 9 A
2.5 m 092-333/11
3 m 092-333/12
4 m 092-333/13

Breaker 9 A, 10 A, 20 A
2.5 m 092-333/21
3 m 092-333/22
5 m 092-333/23

Multi-electrode investigation cables

Multi-electrode investigation cables
Channel Nb of channels Length Catalog n°
NStat box (for VSP, VMP3) standard 1.5 m 092-16/6
5 m 092-26/2

BiPot cable (for VSP, VSP3, VMP3)
standard 1.5 m 092-22/12
5 m 092-22/12A

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)

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).

Advanced Faraday cage specifications
- Temperature: 0 - 55 °C
- Power supply: 100 VAC-240 VAC, 50/60 Hz
- Flow: 1 l/min
- Gas pressure: < 25 kPa
- Size box: 44 x 45 x 45 mm
- Weight: 3.9 kg

Faraday cages
Catalog n°
PC-45 Faraday cage, 400 x 200 x 600 mm
094-101/6

For booster board
- 2 banana adapters 4 mm female socket to 2 mm male plug (pack of 5)
- 1 banana adapter 2 mm female socket to 4 mm male plug (pack of 5)

For standard board
- 6 alligator clips 2 mm: blue, white, red, black
- 2 banana adapters 2 mm female socket to 4 mm male plug (pack of 5)
- 3 banana adapters 2 mm female socket to 4 mm male plug (pack of 5)

For transfer board
- 6 alligator clips 2 mm: blue, white, red, black
- 3 banana adapters 2 mm female socket to 4 mm male plug (pack of 5)
**Dummy cells**

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

| Dummy cell | DC2: 1 R/C circuit, for standard check | DC2/133 |
| Dummy cell for booster | 1 power resistor, 5 mOhm, for standard check | DC2/134 |

**Dummy cells for booster specifications**

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

**External device connection**

<table>
<thead>
<tr>
<th>External device connection</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB9-BNC connector for auxiliary I/O</td>
<td>092-22/1</td>
</tr>
<tr>
<td>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</td>
<td>092-22/13</td>
</tr>
<tr>
<td>IS1 isolation module for auxiliary I/O for VSP300 based instruments</td>
<td>094-081/5</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Probes</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECM 15 μm diameter Platinum disc</td>
<td>U-23/10</td>
</tr>
<tr>
<td>SECM 15 μm diameter Platinum disc</td>
<td>U-23/15</td>
</tr>
<tr>
<td>SECM 25 μm diameter Platinum disc</td>
<td>U-23/25</td>
</tr>
<tr>
<td>SVP 50 μm diameter</td>
<td>U-SVP370/1</td>
</tr>
<tr>
<td>LEIS 10 μm diameter</td>
<td>U-LEIS370/1</td>
</tr>
<tr>
<td>HR SKP 150 μm diameter</td>
<td>U-HR-SKP370/1</td>
</tr>
</tbody>
</table>

**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 accommodate samples mounted in a 32 mm diameter resin cylinder.

<table>
<thead>
<tr>
<th>Cells</th>
<th>Volume</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>TriCell™</td>
<td>2.5 mL</td>
<td>U-TRICELL</td>
</tr>
<tr>
<td>Shallow μTriCell™</td>
<td>0.6 mL</td>
<td>U-STRICELL</td>
</tr>
</tbody>
</table>

**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

**External device connection**

<table>
<thead>
<tr>
<th>External device connection</th>
<th>Catalog n°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB9-8 BNC connector for auxiliary I/O</td>
<td>092-22/1</td>
</tr>
<tr>
<td>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</td>
<td>092-22/13</td>
</tr>
</tbody>
</table>

**Local probes accessories**

- **Test Boxes**
  - Test Box 2: several circuits with high precision resistors, for calibration and validation.
  - Test Box 3: 3 circuits: linear, exponential, non-linear, for teaching and demonstration.

- **Transport cases**
  - TriCell™: ~1 L, U-TRICELL
  - μTriCell™: 7 mL, U-μTRICELL
  - Shallow μTriCell™: 6 mL, U-Shallow μTRICELL

- **VCAM3**
  - 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

- **IS1 isolation module for auxiliary I/O**
  - for VSP300 based instruments
  - Catalog n°: 094-081/5

- **PT100 temperature probe**
  - to be connected to the auxiliary I/O, temperature range: -50 °C to 250 °C, dimensions: 3 x 20 mm, length of cable: 2.5 m
  - Catalog n°: 092-22/13

- **DB9-8 BNC connector for auxiliary I/O**
  - for standard check
  - Catalog n°: 092-22/1

- **IS1 isolation module for auxiliary I/O**
  - for VSP300 based instruments
  - Catalog n°: 094-081/5

**ELECTROCHEMISTRY ACCESSORIES**
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