



2025
FLOW CELLS
BROCHURE: THE X-CELL

REDOX FLOW



The Most
**Versatile &
Modular**
Electrolysis Cell
for *R&D*



The X-Cell

The X-Cell is a modular, high-performance flow cell designed for virtually any electrolysis application. From hydrogen production to CO₂ reduction and redox flow batteries, it adapts to your setup — not the other way around.

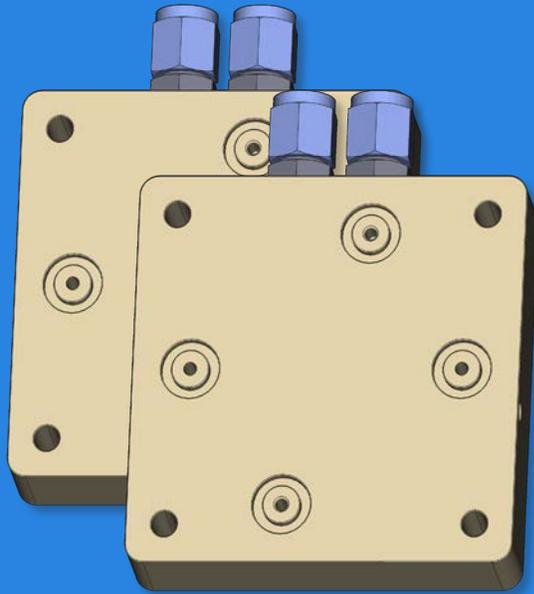
What makes it a great choice for R&D?

- Adapts to any electrode thickness - no restriction on material or format.
- Works with any membrane or separator - from PEM and AEM to alkaline and non-aqueous systems.
- Customizable with interchangeable current collectors - choose flat plates or flow-field designs in a wide range of materials.
- Supports full pH spectrum and high-temperature operation - stable up to 95°C.
- Enables precise temperature monitoring - external temperature control* ensures fast and stable operation.
- Fast assembly and disassembly - modular design reduces setup time.
- High chemical resistance - minimizes leaching and prevents catalyst poisoning.
- Available in standard active areas (2.5 × 2.5 cm and 5 × 5 cm) - with options for customization.
- Optimized for high electrochemical performance - designed to deliver reliable, reproducible results across applications.

Explore the most versatile electrochemical flow cell on the market.

* External temperature control needed

Components & Configuration



Flow Bodies

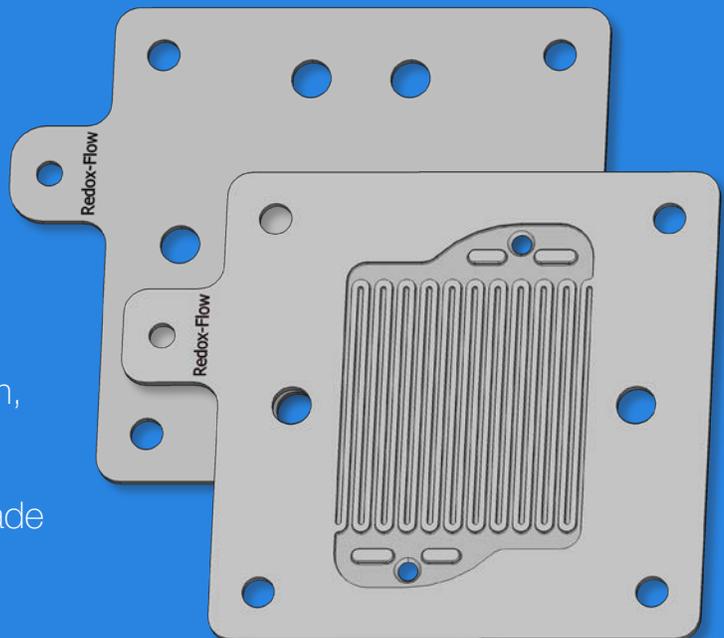
Material: PEEK or PTFE
Ensures minimal contamination.

Anode and cathode current collectors

Material: nickel, stainless steel (316L), titanium, copper, platinum-coated titanium, gold-coated titanium or custom materials

Flow field area: 2.5 x 2.5 cm, 5 x 5 cm, or no flow field

Interdigitated or custom-made serpentine

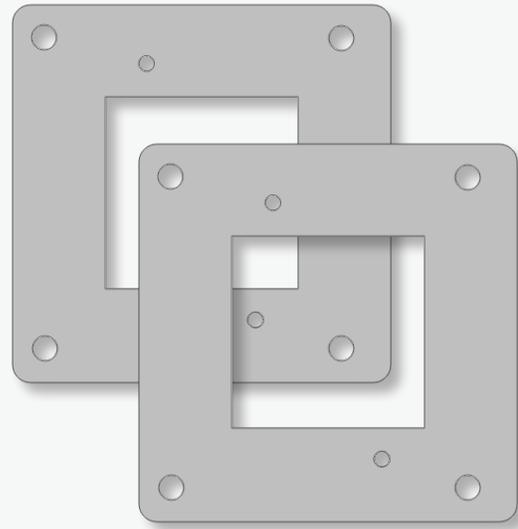


Cover gaskets

Material: VITON, EPDM, PTFE

Flow field area: 2.5 x 2.5 cm, 5 x 5 cm

Thickness: 0.05 mm, 0.1 mm, 0.25 mm,
0.5 mm, 1 mm



Flow field gaskets

Used with flat current collectors

Material: VITON, EPDM, PTFE

Flow field area: 2.5 x 2.5 cm, 5 x 5 cm

Thickness: 0.25 mm, 0.5 mm, 1 mm,
1.5 mm, 2 mm

About the cell

Modular Electrolysis Cell for Versatile Flow Applications

The X-Cell is a fully modular, high-performance electrolysis cell designed for a wide range of flow-based electrochemical applications. It is ideally suited for research and development, where flexibility, chemical compatibility, and ease of reconfiguration are critical. The platform allows researchers to adapt the setup to specific experiments without switching to a new cell. It is also fully compatible with our other electrochemical flow cells, such as the S-Cell and A-Cell.

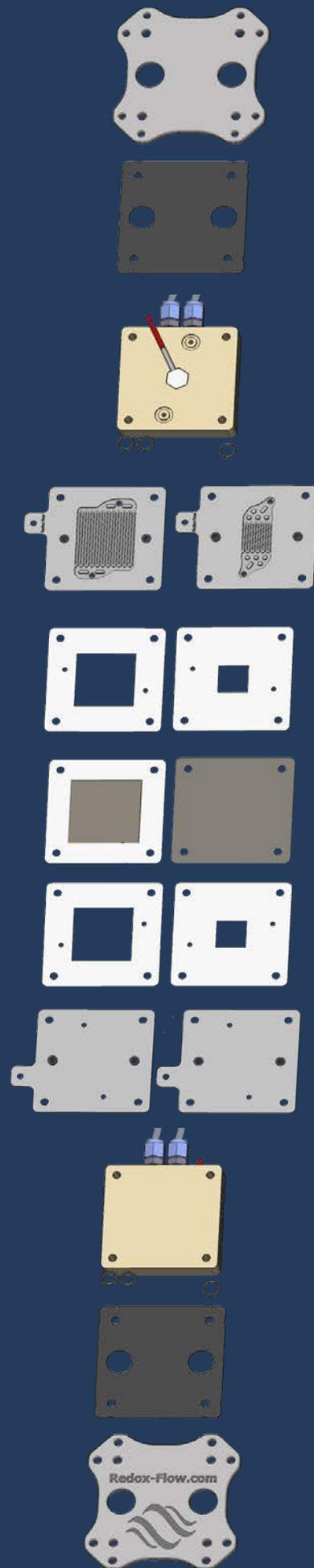
Key Features and Flexibility

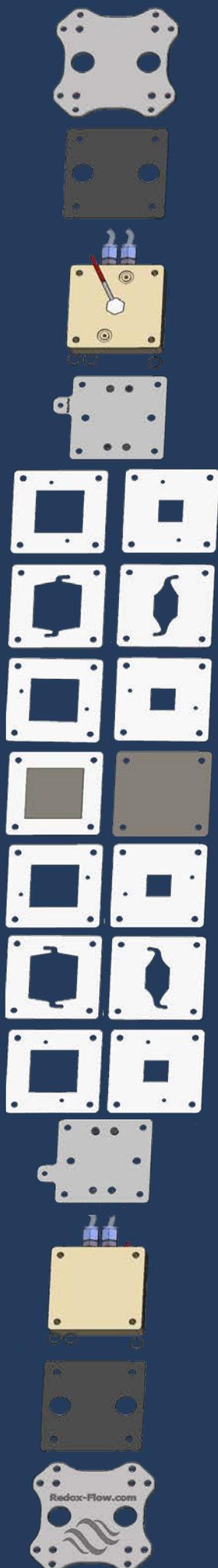
- *Fully modular design* - easily swap or customize components for different experiments.
- *Interchangeable current collectors* - available as flat plates or flow-field designs in nickel, stainless steel, titanium, copper, platinum-coated titanium, gold-coated titanium, or custom materials.
- *Integrated temperature monitoring* - embedded sensor ports provide accurate, real-time readings.
- *Broad chemical compatibility* - corrosion-resistant polymers minimize contamination and ensure stable performance.
- *Full pH and temperature range* - operates reliably across the entire pH spectrum and up to 95 °C.
- *Reference electrode compatibility* - optional Luggin capillary ports enable true three-electrode measurements.
- *Superior material selection* - only corrosion-resistant, low-impurity materials are in contact with the electrolyte, preserving catalyst and electrode integrity.
- *Customizable and upgradeable* - additional gaskets and modules allow conversion for new applications without replacing the entire cell.



Gasket configuration using current collectors **with flow field**

Simple gasket configuration limits risks of leakage. Ideal for thin electrodes and prefabricated MEAs.





Gasket configuration using **flat** current collectors

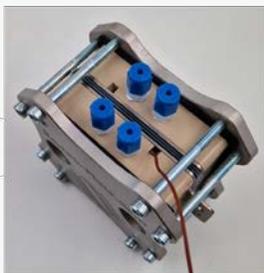
Both flow-field and cover gaskets are required. Cover gaskets are used to fine-tune the total thickness, matching the electrode thickness. Ideal for thick porous electrodes and multilayer electrodes, GDL, and MPL.

Temperature control

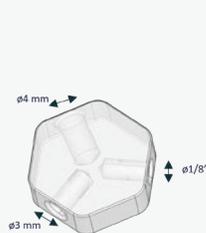
The latest version of the X-Cell (launched April 2025) includes an integrated temperature measurement system. A metal sensor block is embedded in the PEEK flow body and pressed against the current collector to enable accurate temperature readings. It supports common thermometer and thermocouple sizes (3 mm, 4 mm, and 1/8").



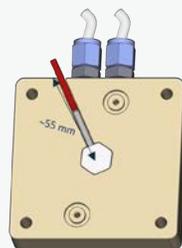
Mounting with rigid thermometer



Mounting with wire thermometer



Thermometer holder



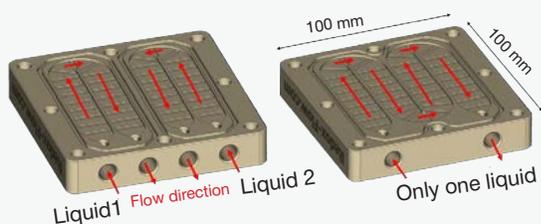
Thermometer, holder & PEEK block (metal current collector is mounted on top)

Temperature Control Unit

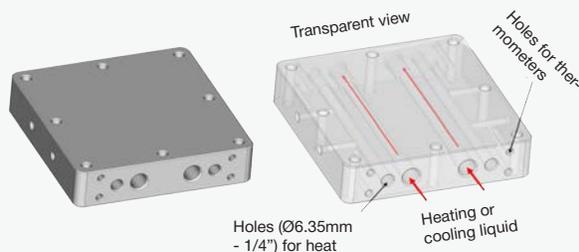
This system can be used in combination with a dedicated temperature control setup based on a flow heat exchanger principle. To the best of our knowledge, similar products cannot be found by any other companies in the field.

PEEK flow body variant 1

PEEK flow body variant 2



Metal heating/cooling block



Our solution comes as three different configurations that are based on the same components and can be interchanged. All options are based on a PEEK flow body and metal block shown above. The PEEK body contains one (*variant 1*) or two separate (*variant 2*) flow chambers for heating/cooling one or two independent liquids, respectively. The liquids in the experimental setup are circulated through the PEEK flow body and placed up against a metal heating/cooling plate, whereby heat is transferred to or from the liquids in the PEEK flow body. The metal plate is separated from the liquids by a thin PTFE sheet, whereby corrosive/oxidative solutions also can be heated without corroding the metal plate.

Besides the possibility for placing the metal block on a heating plate, it also comes with holes for heat cartridges, cooling liquids, and thermometers.



Accessories

INLINE PRESSURE UNIT



Pressure Measurement Unit that can be connected to flow battery or electrolyser cell.

- Compact, inline design for direct pressure measurement
- Monitor hydraulic resistance of electrodes with high accuracy
- Integrated temperature sensing for added diagnostics
- Built from chemically highly resistant materials

FLOW-THROUGH ELECTRODE HOLDER



Flow through inline unit for measurement of e.g. pH, ORP, or reference potential.

- Fits a wide range of electrode diameters (3–18 mm)
- Compatible with our Luggin capillary electrolyser cell for precise reference potential measurement
- Durable, chemically resistant construction

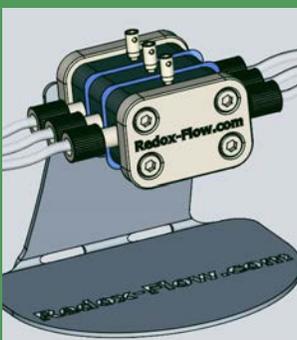
UV/VIS FIBER OPTICAL FLOW CELL



UV/VIS Optical flow-cell with a variable optical path length connects with standard fiber based spectrometers using SMA 905 connectors.

- Adjustable optical path length (0.05–8 mm) for maximum flexibility
- Supports high flow rates (>100 ml/min) with minimal pressure loss from unique design with hydraulic bypass

OPEN CIRCUIT VOLTAGE CELL



Flexible and chemically resistant OCV cell that can be readily integrated into your measurement setup.

- Integrated reference cell for accurate anode/cathode potential measurement
- Multifunctional design for OCV and overpotential studies
- Easy integration into existing setups with internal reference electrolyte chamber
- Durable graphite flow bodies ensure chemical resistance and stability

Variants

The original X-Cell

- Fully modular design with interchangeable current collectors
- Choice of flat surface or flow-field collectors
- Standard materials
- Compatible with both ion exchange membranes and porous separators
- Designed for high chemical resistance and minimal leaching or catalyst poisoning
- Suitable for operation at elevated temperatures (up to 90 °C)



X-Cell with 3 or 4 compartments



- Variable compartment/electrode thickness, determined by gaskets
- Can be supplied with current collectors (flow field or 'flat surface')
- Material choices are large, can fit almost any chemistry
- Application areas: Electrodialysis, Electrochemical CO₂ reduction

X-Cell with ports for reference electrodes

- Reference electrode measurements inside cell through Luggin Capillary
- Reference electrodes are placed outside cell
- The cell can be operated at high temperatures
- Four ports for connection of up to three reference electrodes



Application Areas

The X-Cell supports a broad range of electrochemical processes, including:

- Alkaline water electrolysis
- PEM and AEM water electrolysis
- CO₂ electrolysis and electrochemical reduction
- Electrochemical metal recovery and refining
- Desalination and ion removal
- Organic electrosynthesis and non-aqueous systems
- Electrodialysis
- Redox flow battery testing

Technical Specifications

Active Area: 2.5cm x 2.5cm and 5cm x 5cm

Current collectors with and without flow field – any electrode thicknesses

Main flow body is machined in highly corrosion resistant PEEK

Can be operated up to 95°C

Full pH range – depending on current collector and gasket materials

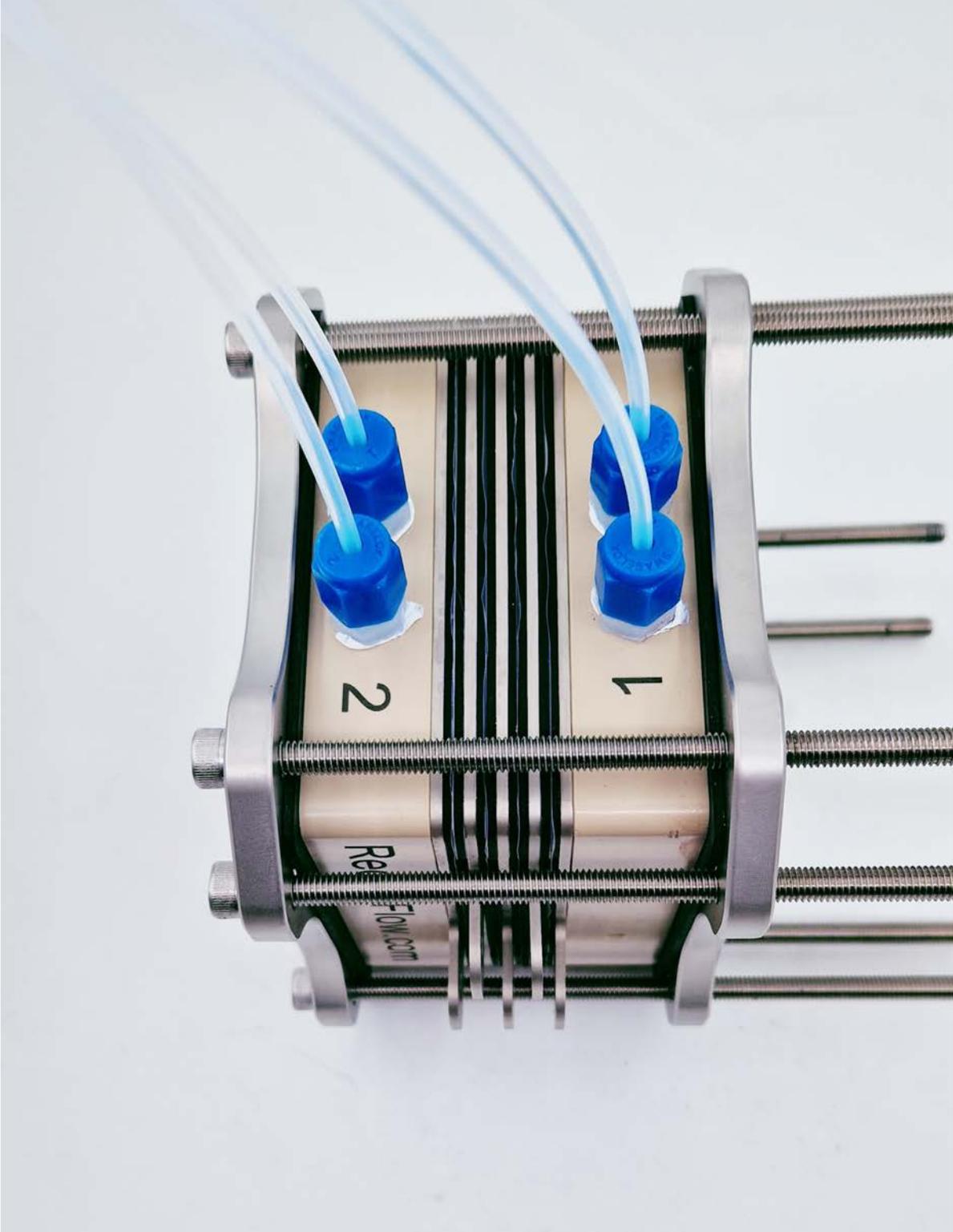
Standard materials for current collectors: nickel, stainless steel, titanium, copper,

platinum-coated titanium, gold-coated titanium

Swagelok fittings for tight connecting to 1/8" tubing

Gaskets/Spacers Materials: PTFE, EPDM or VITON

We accommodate custom requests for active area sizes, materials for current collectors, and tubing dimensions. For this, submit a request on www.redox-flow.com.





Got any questions?
Feel free to contact us!



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