2026
FLOW BATTERIES

Redox Flow®



THE S-CELL

REDOX FLOW BATTERY TEST CELL

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Optimized **Flow Battery Test Cell** for Thick *Electrodes*



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The S-Cell

The S-Cell is a unique and highly optimized electrochemical flow cell specifically designed for the characterization and optimization of redox flow battery (RFB) components, particularly thick, typically carbon felt electrodes (> 0.5-1 mm), bi-polar plates, and membranes. Its innovative design allows for operation with or without bipolar plates, offering unparalleled flexibility for fundamental and applied RFB research.

What makes it a great choice for R&D?

- **Optimized for Thick Electrodes.** Ideal for studying electrode materials with thicknesses greater than 0.5-1 mm, crucial for many high-performance RFB designs.
- **Stack-Relevant Geometry.** Designed to mimic the internal geometry of large-scale flow battery stacks, providing highly relevant data for scale-up.
- **Broad Component Optimization.** Specifically intended for the optimization of electrodes, bipolar plates, and membranes, key components in RFB systems.
- **Direct Temperature & Potential Measurement.** Enables direct measurement of cell potential and temperature, avoiding the additional resistances that indirect connections would introduce.
- **Full pH Range Operation.** Compatible with strongly acidic to strongly alkaline electrolytes, depending on gasket material choices.
- **Standard Active Areas.** Available in 2.5 × 2.5 cm and 5 × 5 cm active areas, with options for customization.

Explore the most unique and versatile electrochemical flow cell for redox flow battery component research.

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Components & Configuration



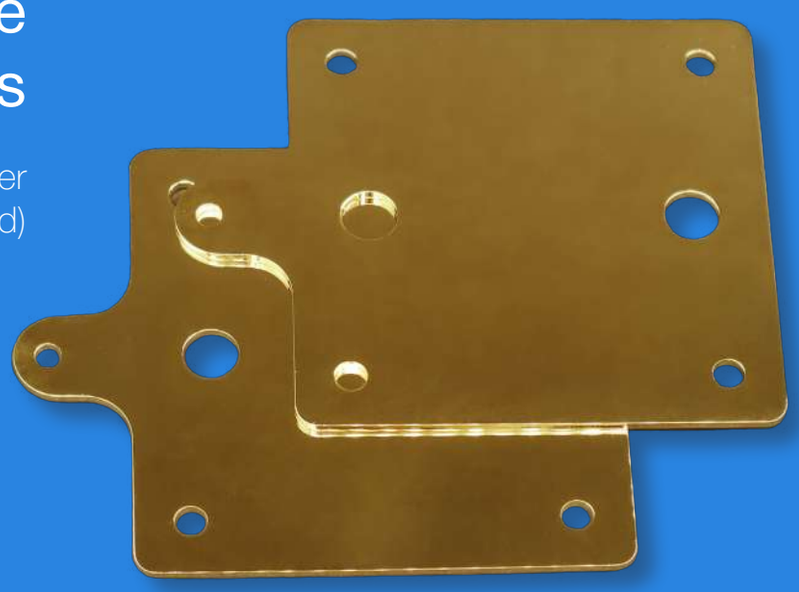
Flow Bodies

Impermeable graphite composite

Tight PFA Swagelok fittings installed

Anode and cathode current collectors

Material: Gold-plated copper current collectors (standard)



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Graphite Bipolar Plates

Optional - can be operated with and without bipolar plates

Material: Graphite

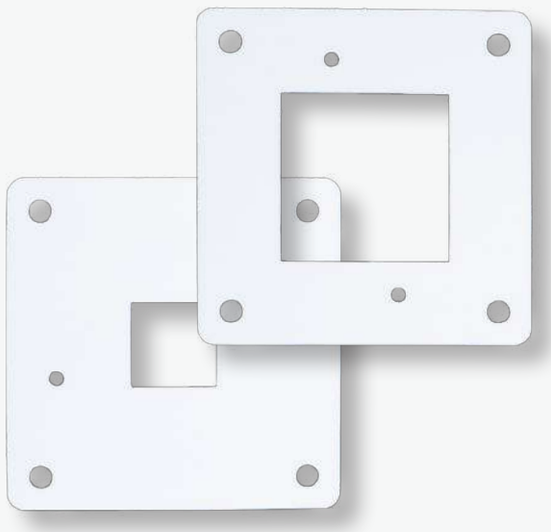
Thickness: 2 mm

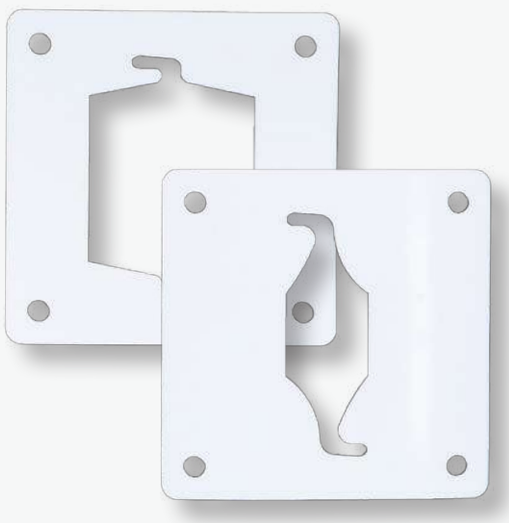
Cover gaskets

Material: VITON, EPDM, PTFE

Active 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

Material: VITON, EPDM, PTFE

Active 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

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About the cell

A Decade of Expertise in Flow Battery Optimization

The S-Cell represents the culmination of nearly a decade of specialized know-how in redox flow battery test cell design. Specifically engineered for the detailed characterization and optimization of individual RFB components under realistic conditions, it addresses the critical need for robust component testing — particularly for thick electrodes (>0.5–1 mm), where precise control over electrode compression is essential.

Its design reflects a deep understanding of the challenges researchers face in bridging the gap between fundamental material science and practical RFB stack development, supporting the optimization of electrodes, bipolar plates, and membranes alike. The use of corrosion-resistant materials throughout ensures experimental integrity, allowing researchers to push the boundaries of RFB chemistry across the full pH spectrum.

Key Features and Flexibility

- ***Unparalleled Component Testing*** - Specifically engineered for the detailed characterization and optimization of individual RFB components under realistic conditions.
- ***Versatile Bipolar Plate Integration*** - Offers the unique capability to operate with or without bipolar plates, enabling precise evaluation of intrinsic cell performance and contact resistances.
- ***Comprehensive Diagnostic Capabilities*** - Seamlessly integrates with accessories like the Flow Through Electrode Holder, and Inline Pressure Unit, UV/VIS and OCV Cell powerful in-situ monitoring and data acquisition.
- ***Modular Ecosystem Integration*** - Designed for easy conversion into A-Cell, X-Cell, or S-Stack configurations, providing exceptional flexibility for exploring diverse electrochemical energy conversion technologies.
- ***Stack-Relevant Design*** - Its geometry is carefully considered to provide data that is highly relevant for the scale-up and development of larger flow battery stacks.
- ***Robust and Chemically Inert*** - Ensures that electrolytes only contact durable, non-reactive materials (graphite, PTFE, Viton, EPDM), preventing contamination and ensuring long-term reliability.

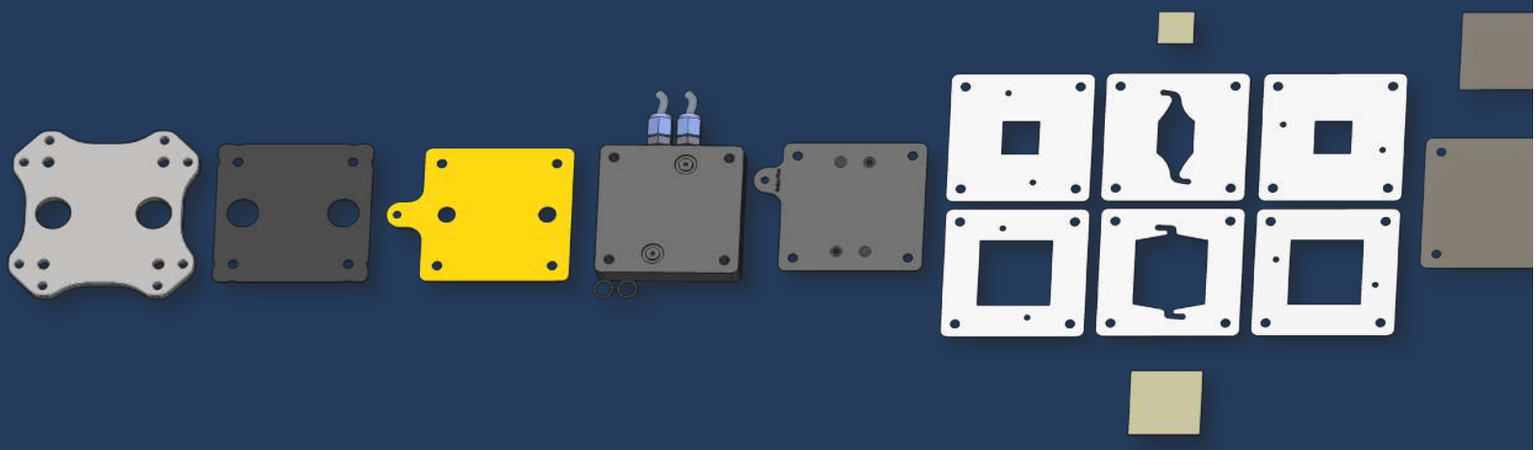
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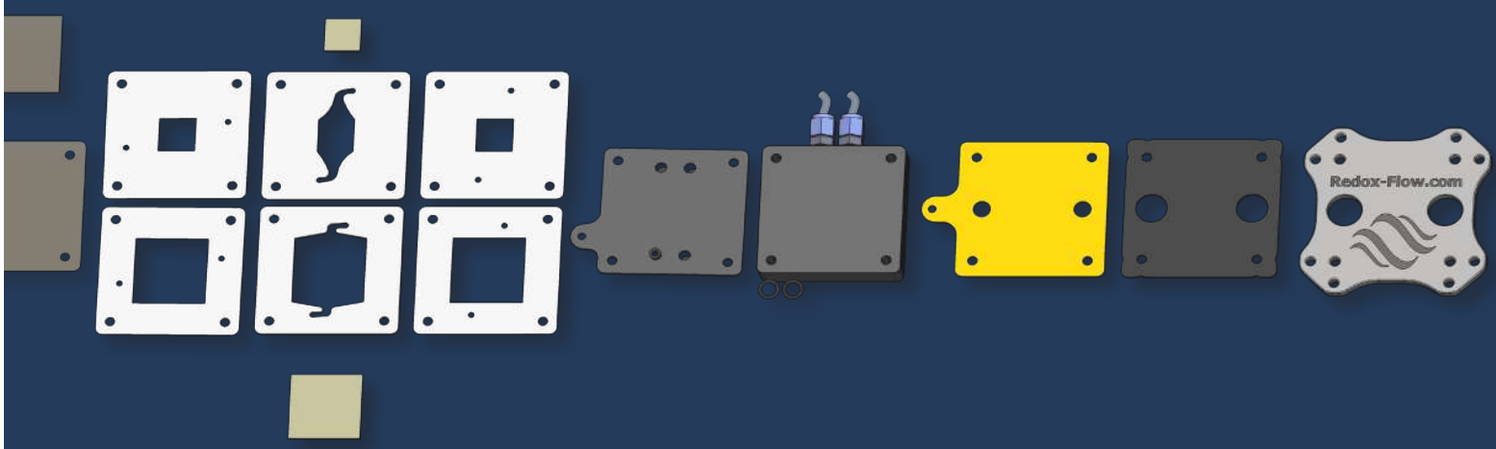
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Flexible Cell Configuration

The S-Cell is specifically designed for thick electrodes (> 0.5-1 mm) and utilizes a flexible gasket system involving both cover gaskets and flow-field gaskets to precisely control electrode thickness and compression. This configuration is crucial for optimizing the performance of carbon felt electrodes, bipolar plates, and membranes in redox flow battery research. The modular gasket approach allows researchers to fine-tune the experimental setup to match specific material properties and achieve reproducible results.



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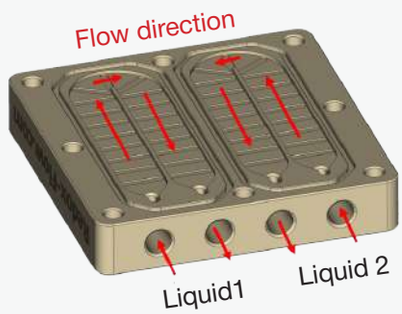
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Temperature control

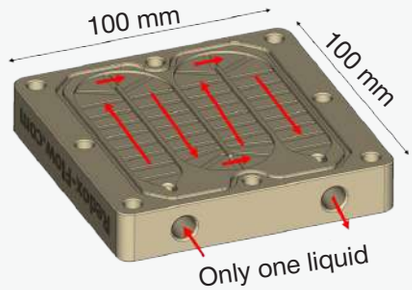
Temperature Control Unit

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.

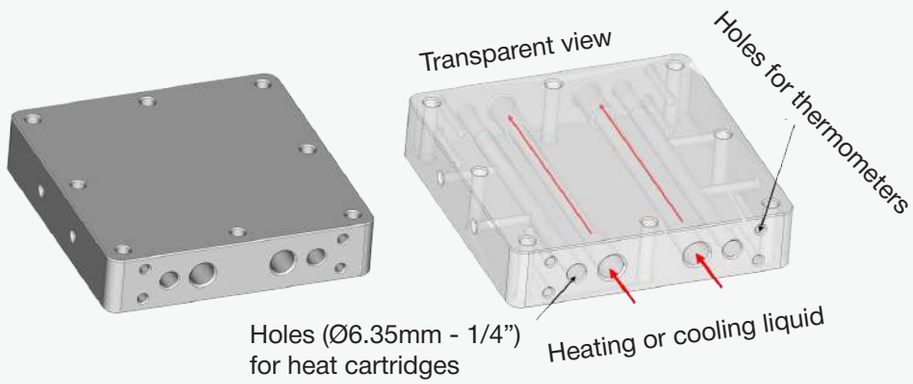
PEEK flow body variant



PEEK flow body variant 2



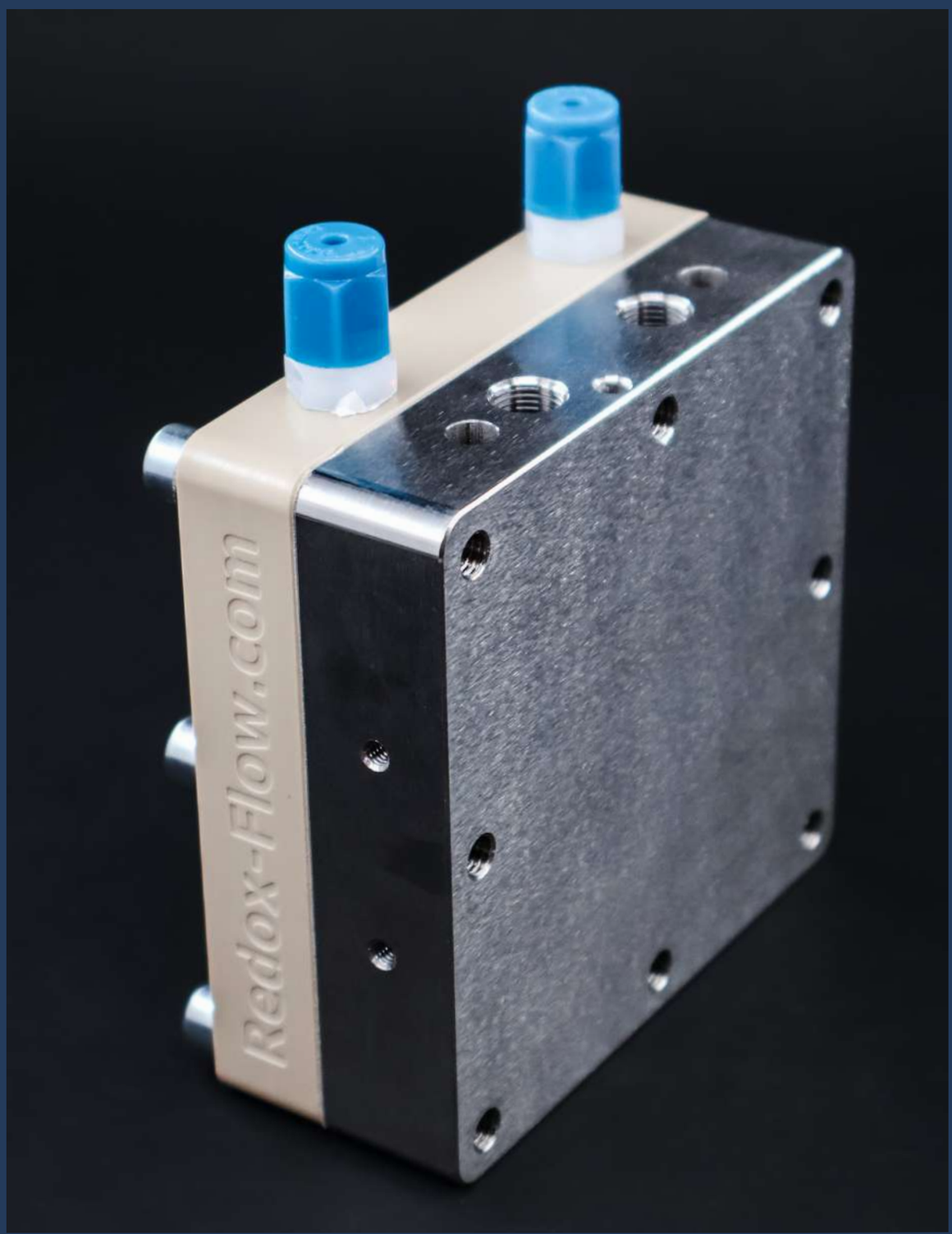
Metal heating/cooling block



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.

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REDOX FLOW

Accessories



Inline Pressure Unit

Differential Pressure Measurement Unit.

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



Open Circuit Voltage Cell

Reference Cell For OCV & Potential Monitoring.

- 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



UV/VIS Flow Cell

UV/VIS Fiber Optical Flow-Cell.

- 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
- Connects with standard fiber based spectrometers using SMA 905 connectors



Flow-through electrode holder

Inline Reference Potential Measurement Unit.

- Fits a wide range of electrode diameters (3–17 mm)
- Durable, chemically resistant construction
- Measures e.g. pH, ORP, or reference potential.

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Compatibility

The S-Cell offers exceptional flexibility within the Redox Flow product ecosystem. While optimized for thick electrodes in redox flow battery research, its modular design allows for conversion into other cell types, extending its utility across various electrochemical applications.

Easily Convertible into an S-Stack, A-Cell or X-Cell

The S-Cell can be readily converted into an S-Stack, A-Cell (for thin electrodes) or an X-Cell (for broader electrolysis applications) by acquiring specific additional components, providing long-term versatility and adaptability for evolving research needs.





Modular Design

As part of the Redox Flow family of electrochemical cells, it shares common design principles, ensuring ease of use, interchangeability of components, and seamless integration with other Redox Flow products.

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Application Areas

General flow battery & for optimization of stack components

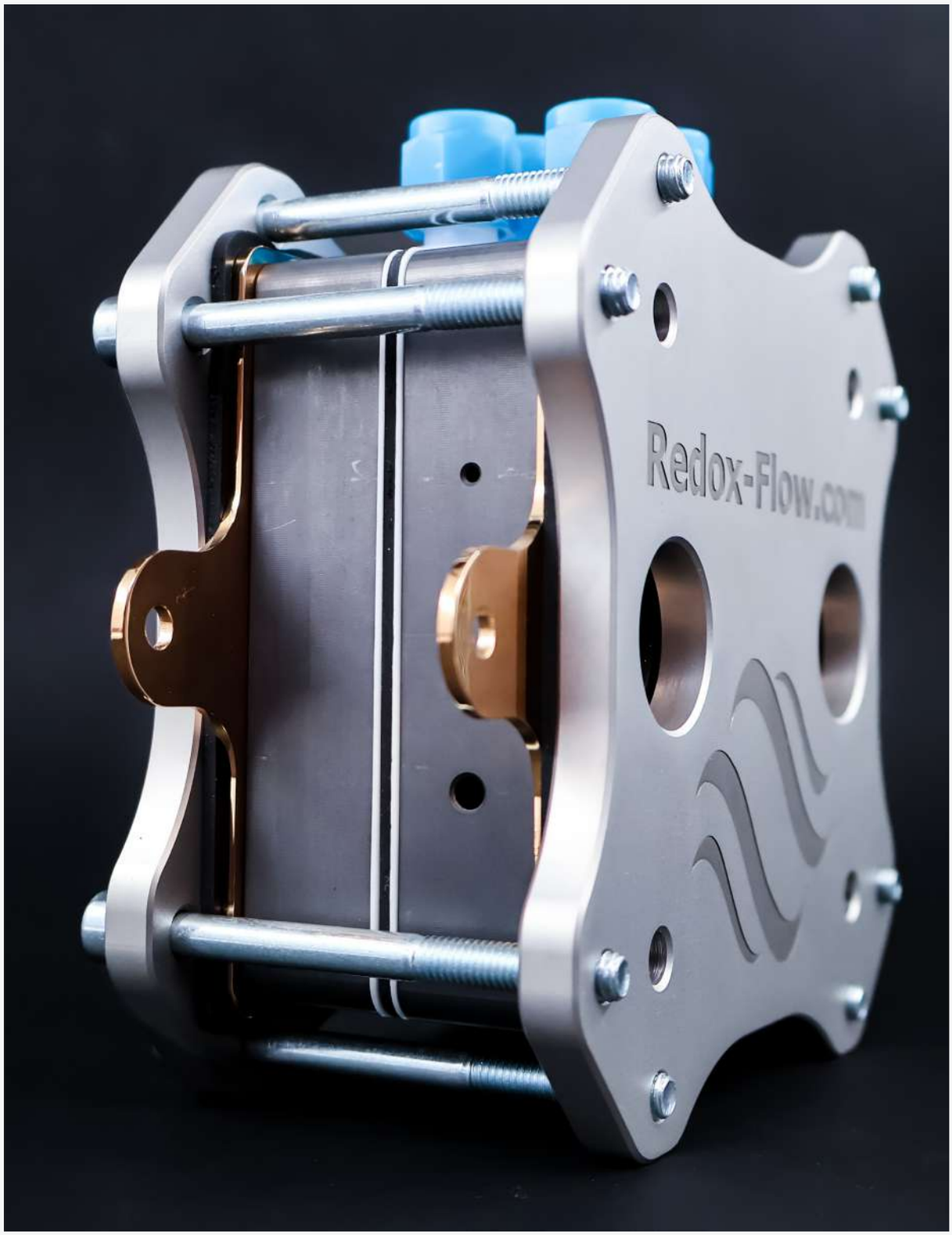
- General Redox Flow Battery R&D in particular for thicker electrodes
- PEM/Alkaline Fuel Cells
- General-purpose electrochemical flow testing
- Membrane, electrode, bipolar plate property testing
- Testing and optimization of stack components

Technical Specifications

Active Area: 2.5cm x 2.5cm and 5cm x 5cm
Gold-plated Copper Flat Current Collectors
Main flow body in Graphite
Can be operated up to 95°C
Full pH range – depending on current collector and gasket materials
Swagelok fittings for tight connecting to 1/8" tubing
Gasket Materials: PTFE, EPDM or VITON
Electrode thickness > 0.5mm-1 mm

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

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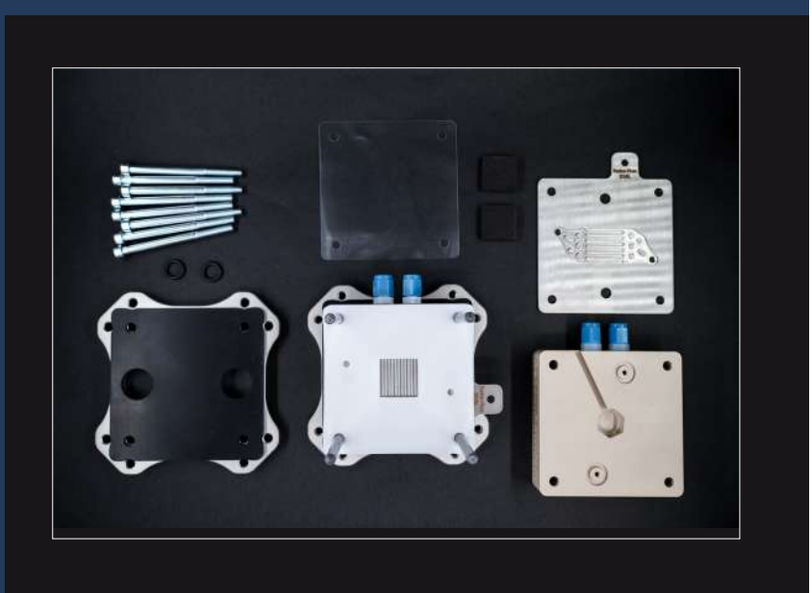


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REDOX FLOW







Our **Solutions**

Born from PhD project that identified ***the need for modular design*** in flow cell R&D, we've grown in five years into a startup with ***over 1,000 customers worldwide.***

WWW.REDOX-FLOW.COM

MIT FRAUNHOFER ISE UNIVERSITY OF WATERLOO HELMHOLTZ-ZENTRUM BERLIN UNIVERISTY OF MANCHASTER

Custom

Electrochemical research is constantly evolving — and so are we. Whether you want to test a new material, explore a novel geometry, or build something entirely from scratch, we're here to help. Serpentine flow fields, BMED cell designs, custom gasket shapes — these are just a few of the projects we've taken on over the years. From small design tweaks to full custom builds, we've got you covered.

One-Stop

We cell Complete Flow Battery Setups — including the flow cell, pump, hydraulic connection pack, battery control unit, and all the fittings and gaskets needed for a classic R&D setup. Everything arrives ready to run, so you can skip the sourcing headaches and get straight to experimentation. If you're looking for an out-of-the-box solution, this is the easy choice.

Modular & Scalable

Our flow cells are built to be flexible and upgradable. Parts are compatible across our entire cell range, so switching to a completely different chemistry is as simple as swapping a few components — no need for a new cell. Assembly and disassembly are equally straightforward, giving you the freedom to experiment as your research demands. Add extra parts to upgrade a single cell into a stack, or order replacement flow bodies and gaskets for electrode and membrane testing. One cell really can do a lot.

KTH TU DELFT HARVARD IDAHO NATIONAL LAB UNSW AARHUS UNIVERSITY STANFORD VITO ETH ZÜRICH

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Redox Flow® Family



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Any questions?
We’re happy to hear from you.



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