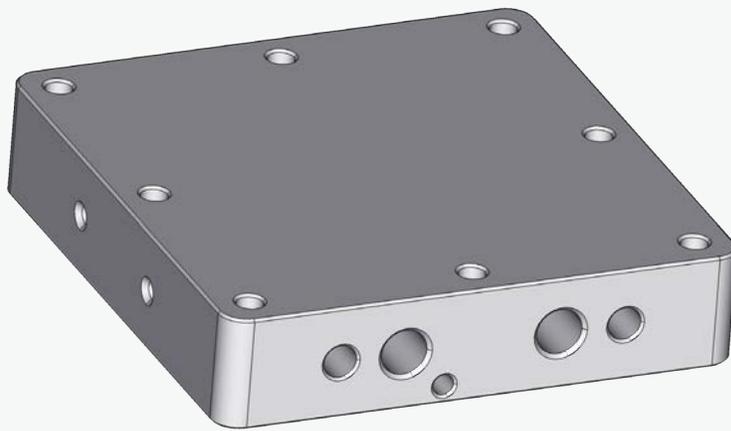
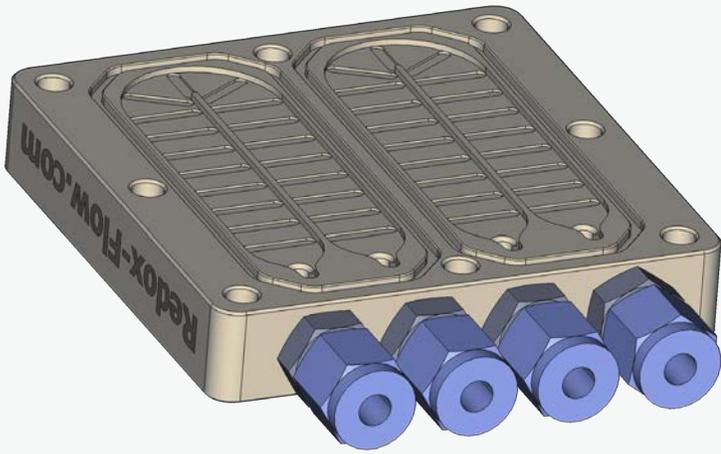


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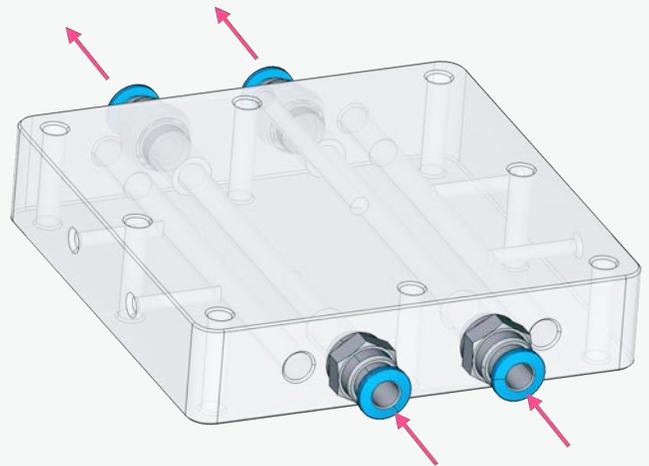
FLOW CELLS

BROCHURE: TEMPERATURE CONTROL

REDOX FLOW



Our Most
Innovative
Solution for
*Controlling
Temperature*



Temperature Control

Redox-Flow's heating & cooling units can control the temperature of electrochemical cells and liquids, including flow batteries and electrolyzers.

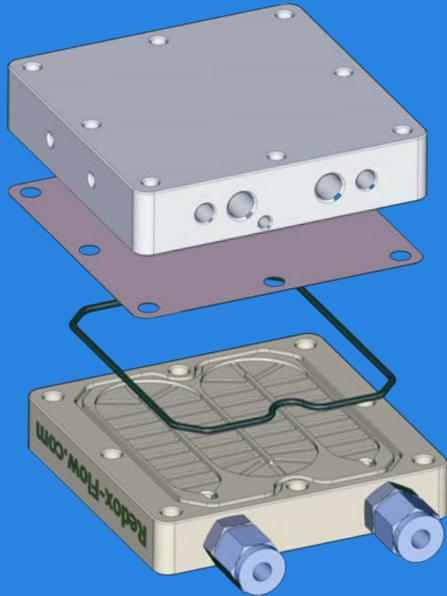
All about temperature

Controlling the temperature of cells and liquids for electrochemical flow cells is challenging. A frequently used solution is to place the cell and bottles inside a heating chamber. While this can work in many cases, it comes with a number of shortcomings:

- Most commercial heating chambers don't include feed-through holes for electrical wires to the cell, often requiring users to drill holes manually.
- High temperature operation, which requires placing the pump outside the chamber, can lead to long hydraulic connections and pressure loss.
- In heating and cooling chambers, space is often limited, making experimental setup tedious and time-consuming.
- Chambers with both heating and cooling are costly.
- Due to limited thermal conductance of bottles and cells, reaching the set point temperature can take a long time - often more than 1-2 hours.

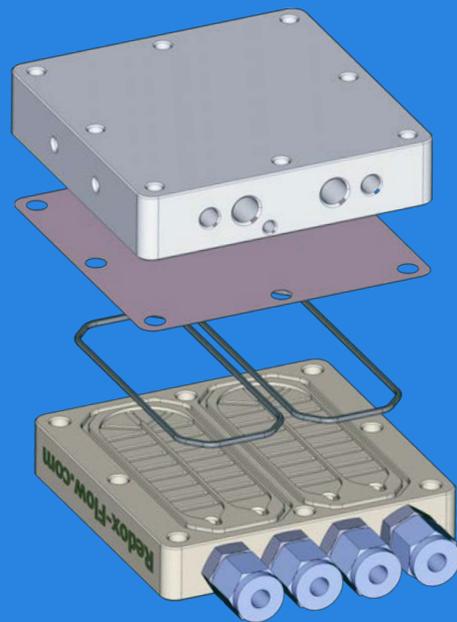
Learn more about our innovative solution for controlling temperature.

Variants & Components

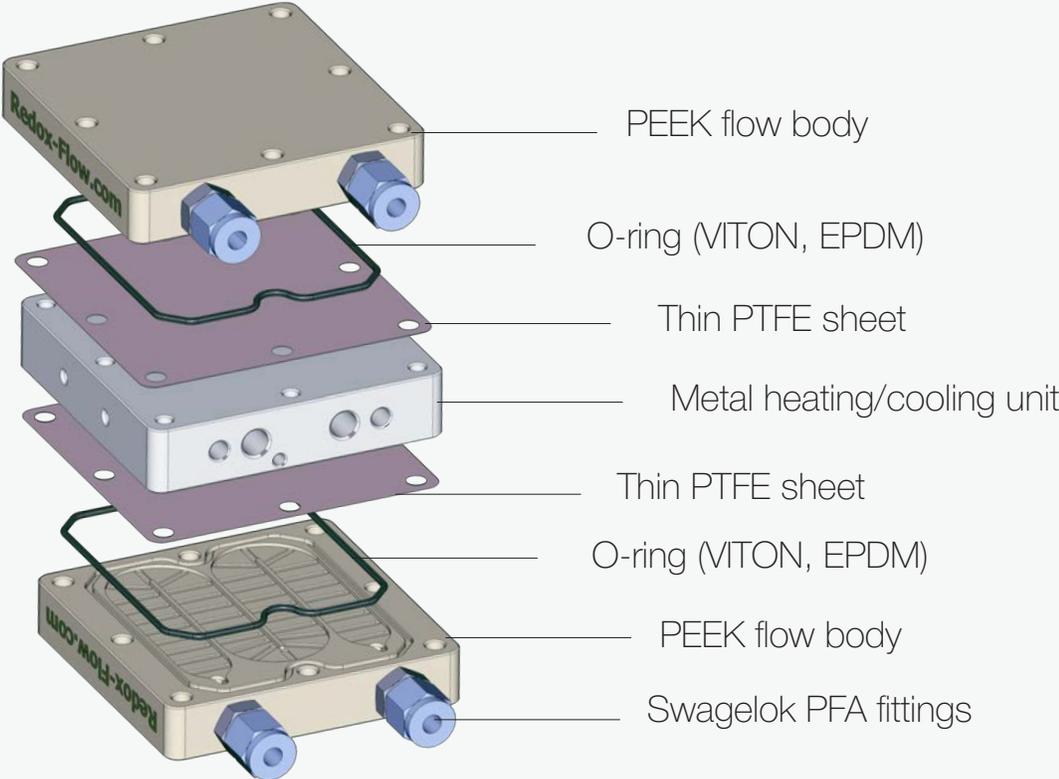


Single electrolyte flow temperature control

Double electrolyte flow temperature control



High power electrolyte temperature control



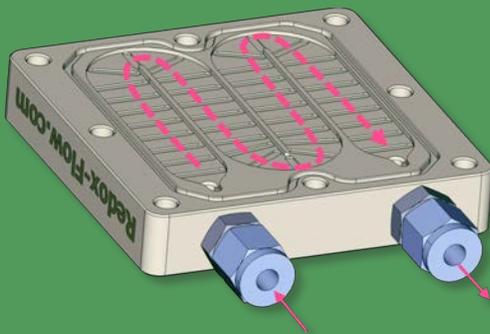
Working principles

Redox Flow's solution comes in three configurations. These are based on the same components and can be interchanged depending on the purchased option.

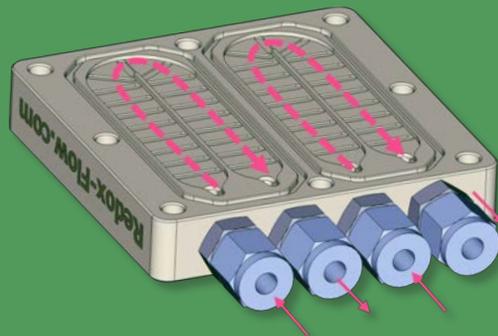
All configurations are based on a PEEK flow body and metal heating and cooling block shown in the pictures. The PEEK body contains one or two separate flow chambers, referred to as variant one and two, respectively. These chambers are for heating and cooling one or two independent liquids.

PEEK FLOW BODY

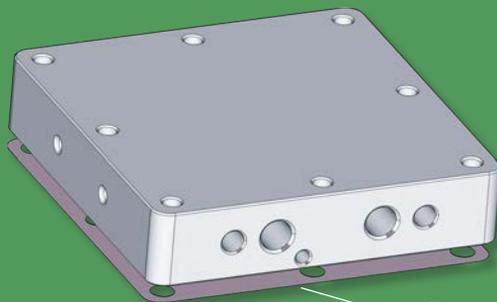
Single electrolyte PEEK flow body



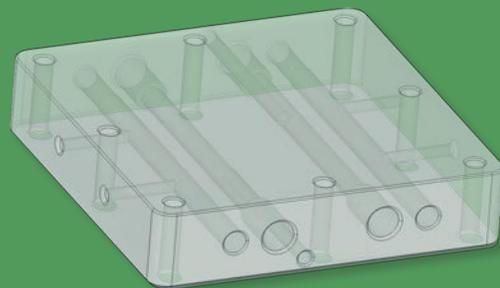
Double electrolyte PEEK flow body



METAL BLOCK



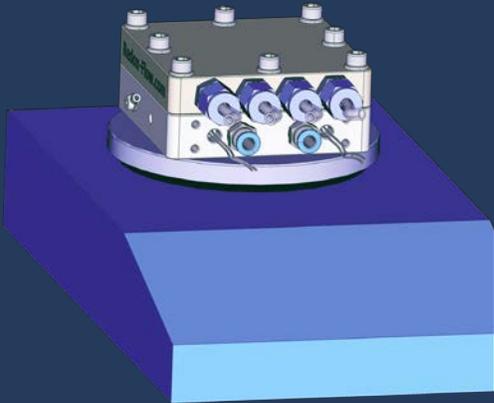
Transparent view



Protective PTFE layer
(replaceable)

In an experimental setup, the liquids are circulated through the PEEK flow body, which is placed on a metal block. Through this shared surface, heat is transferred to or from the liquids in the PEEK flow body. The metal block is separated from the liquids by a thin PTFE sheet, whereby corrosive and oxidative solutions also can be heated without corroding the metal block.

Heating & cooling options



Heating plate

Heating

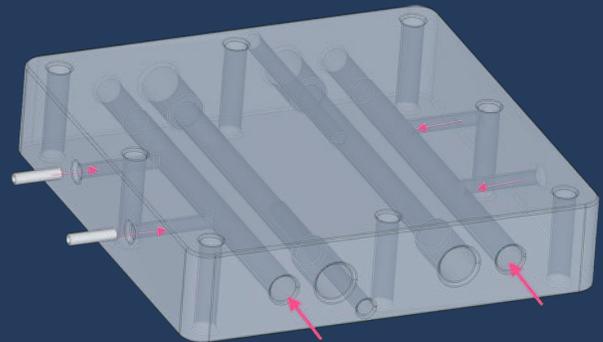
The assembled heating unit can be placed directly on a hotplate, allowing the circulating liquid to be heated with precise temperature control.

Using cartridges

Heating

Heat cartridges (1/4" / 6.35 mm) can be inserted into the aluminum block, with space for 1–4, depending on cartridge length. They are secured by side-mounted pinion screws.

Note: Requires an external heating control system, such as a PID unit (not included).

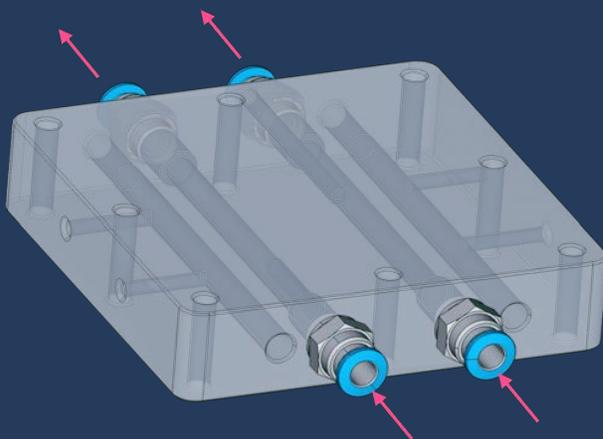


Liquids

Heating Cooling

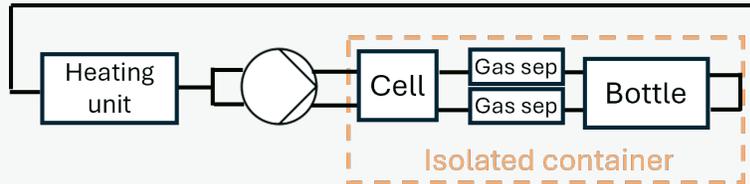
The central holes are threaded for 1/8" BSPP fittings, allowing circulation of heating or cooling liquid through the aluminum block for temperature control. While the illustration shows push-in fittings, any fitting type can be used depending on liquid and temperature requirements.

Note: Fittings are not included, as compatibility depends on the chosen liquid and external equipment.



Hydraulic configurations

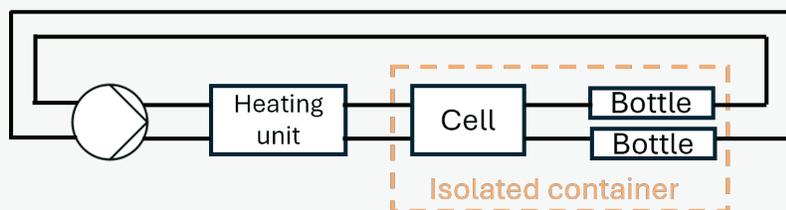
Single electrolyte PEEK flow body setup



A single-electrolyte PEEK flow body is typically used for electrolysers operating with a common electrolyte. In this setup, two T-connections are required, with the pump (e.g., a 2-channel peristaltic pump) providing independent flows to each side of the electrochemical cell. This ensures balanced flow rates that remain largely unaffected by differences in hydraulic resistance.

Note: Variants are possible, such as placing the second T-fitting closer to the heating unit or using combined bottles/gas separators.

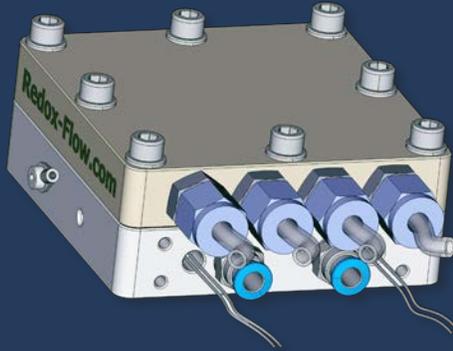
Double electrolyte PEEK flow body set-



The double-electrolyte PEEK flow body is the recommended solution for systems with two separate electrolytes (e.g., flow batteries). It can also be used with electrolysers operating on a common electrolyte, in which case no T-connections are required.

Three configurations

Liquid is in contact with high temperature and chemically resistant PEEK, PTFE and polymer fittings only.

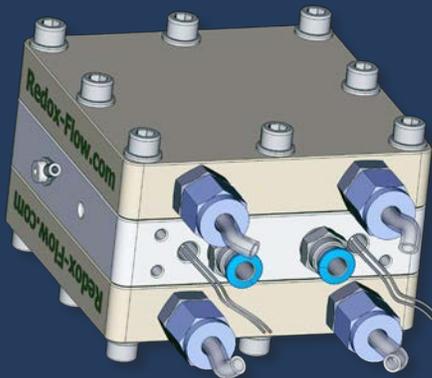


Double flow

Can be operated using

- heating on a lab hotplate*
- heat cartridges inserted into the unit (not included)
- cooling and heating water/liquid

Can heat two electrolyte streams at the same time.

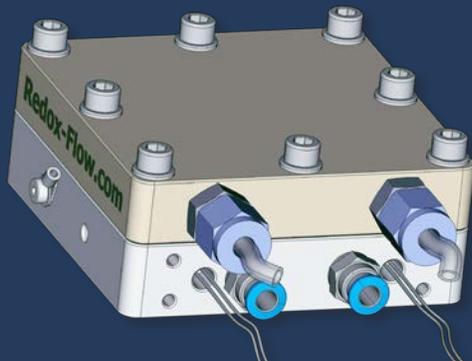


High power

Can be operated using

- heat cartridges inserted into the unit (not included)
- cooling and heating water/liquid

Can heat two electrolyte streams at the same time, making it suitable for stacks or other applications where higher heating or cooling powers are needed



Single flow

Can be operated using

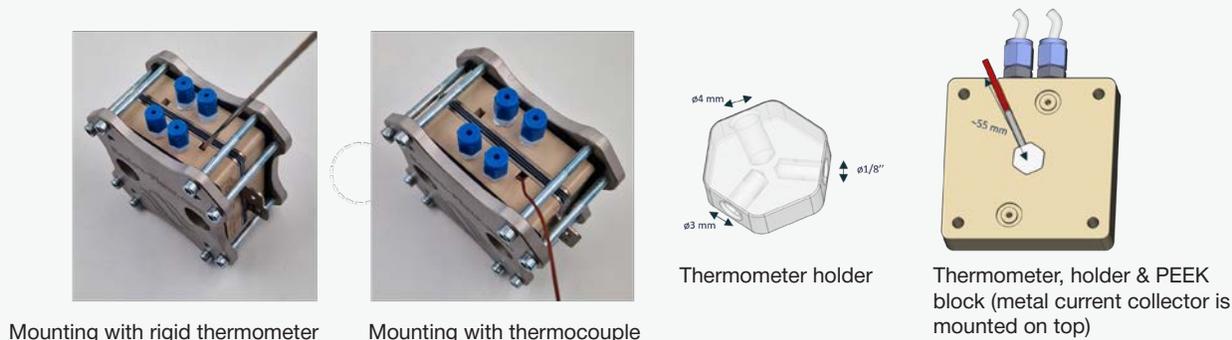
- heating on a lab hotplate*
- heat cartridges (not included) inserted into the unit
- cooling and heating water/liquid

Can heat only one electrolyte stream.

* Not included.

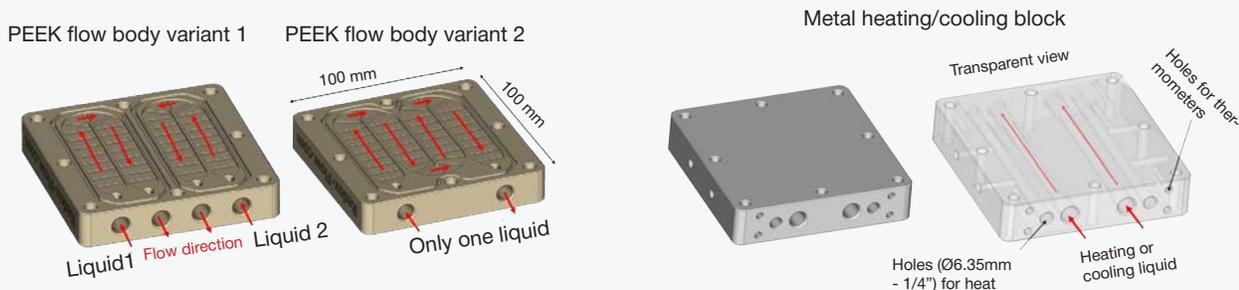
Temperature Control

The X-Cell 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").



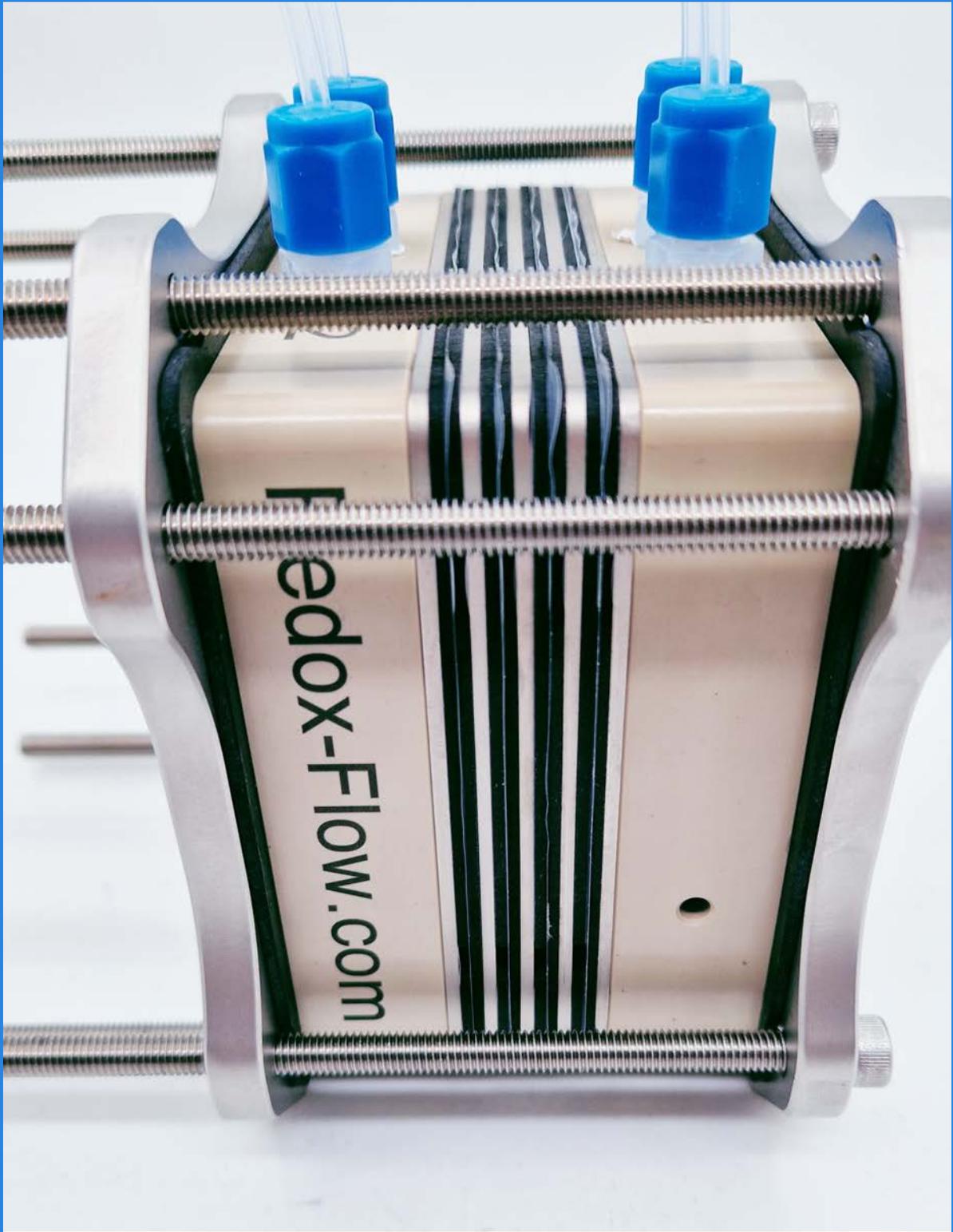
Temperature Control Unit

This system can be used in combination with the 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.



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.





Got any questions?
Feel free to contact us!



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