

LEANCAT

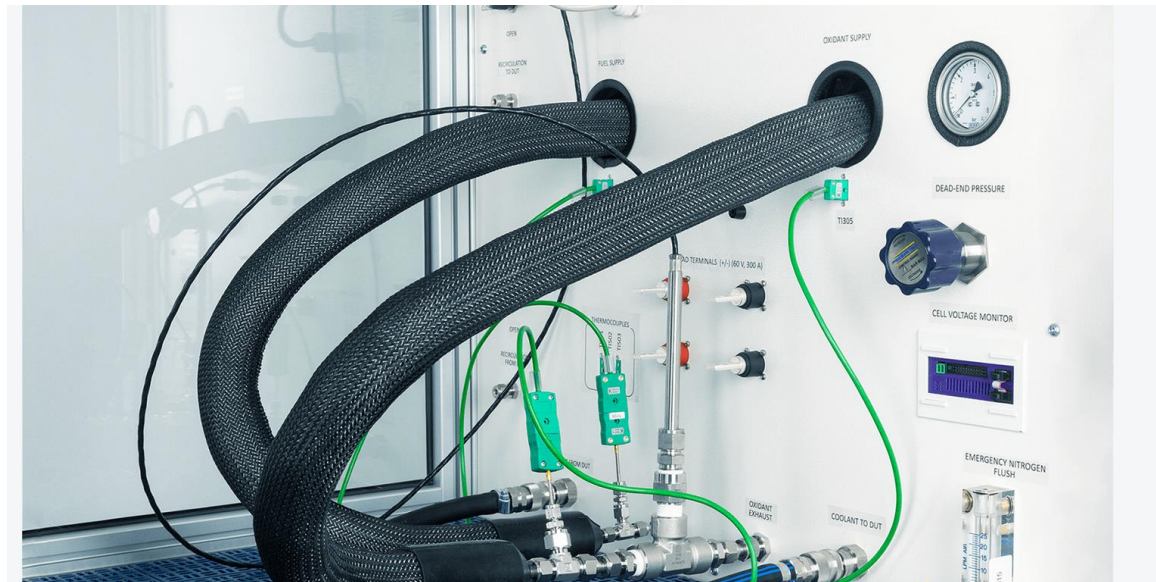
Vladimír Matolín, CEO



LEANCAT
HYDROGEN TECHNOLOGY



Water Electrolyzers



Electrolyzer and fuel cell test stations

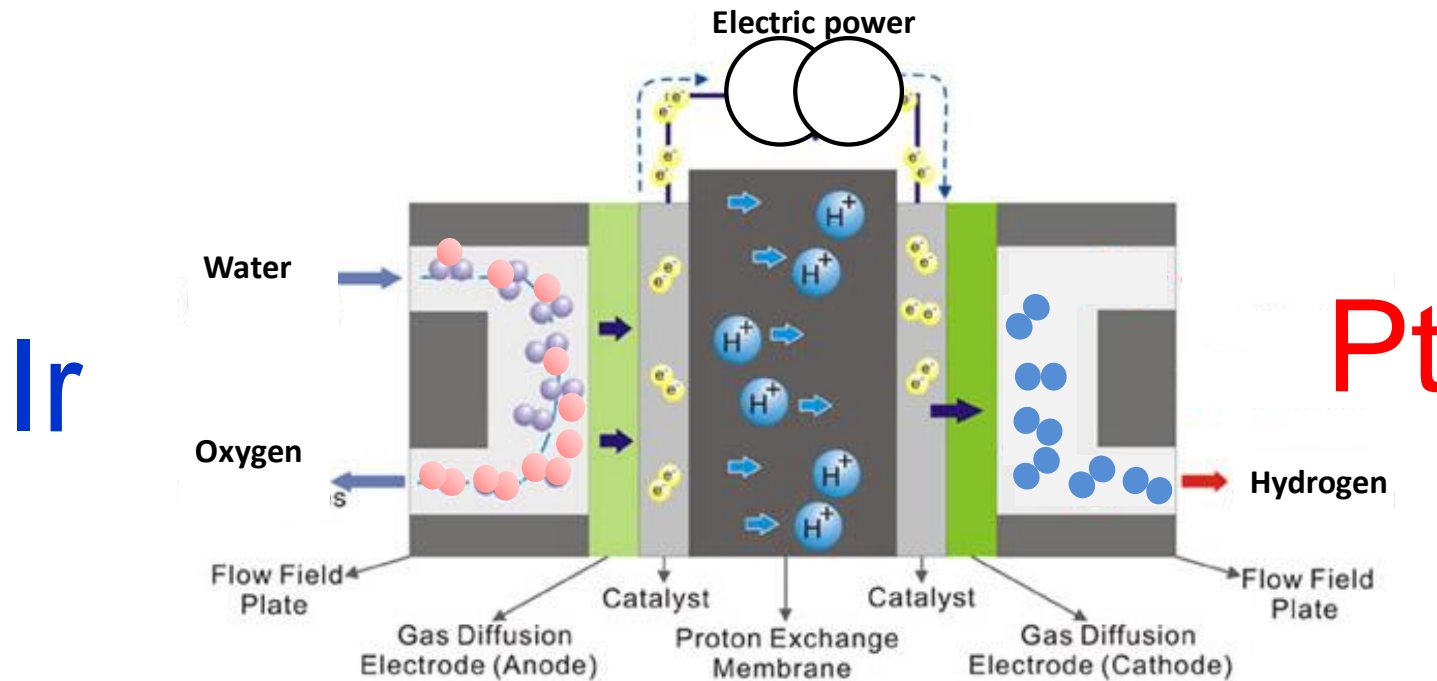
that's Leancat

The global demand for hydrogen is rising, fueled by efforts to reduce carbon footprint across energy sectors.

- In this respect, hydrogen production by water electrolysis offers the best results, compared to alternative routes, since production from purely renewable energy sources is possible.
- However, the most popular state-of-the-art PEM water electrolysis technologies still suffer from several serious issues: among them **high operational cost and too high capital cost**, which is a serious drawback limiting availability of renewable energy.
- The main issue responsible for still high cost of hydrogen technology is very small repeatability of main component production, far from large scale production necessary for cheap manufacturing.

LEANCAT is addressing these issues by developing a modular PEM electrolyzer concept bringing together everything needed for cheap, efficient and sustainable hydrogen production at large scale. Production and multiplication of high number of small identical modules is a path to efficient, repeatable, and inexpensive production enabling the future use of automated and robotic production tools.

How the PEM water electrolyzer works



PEMWE are becoming the most popular solution for hydrogen production



LEANCAT Systems - Renewable Hydrogen on Demand

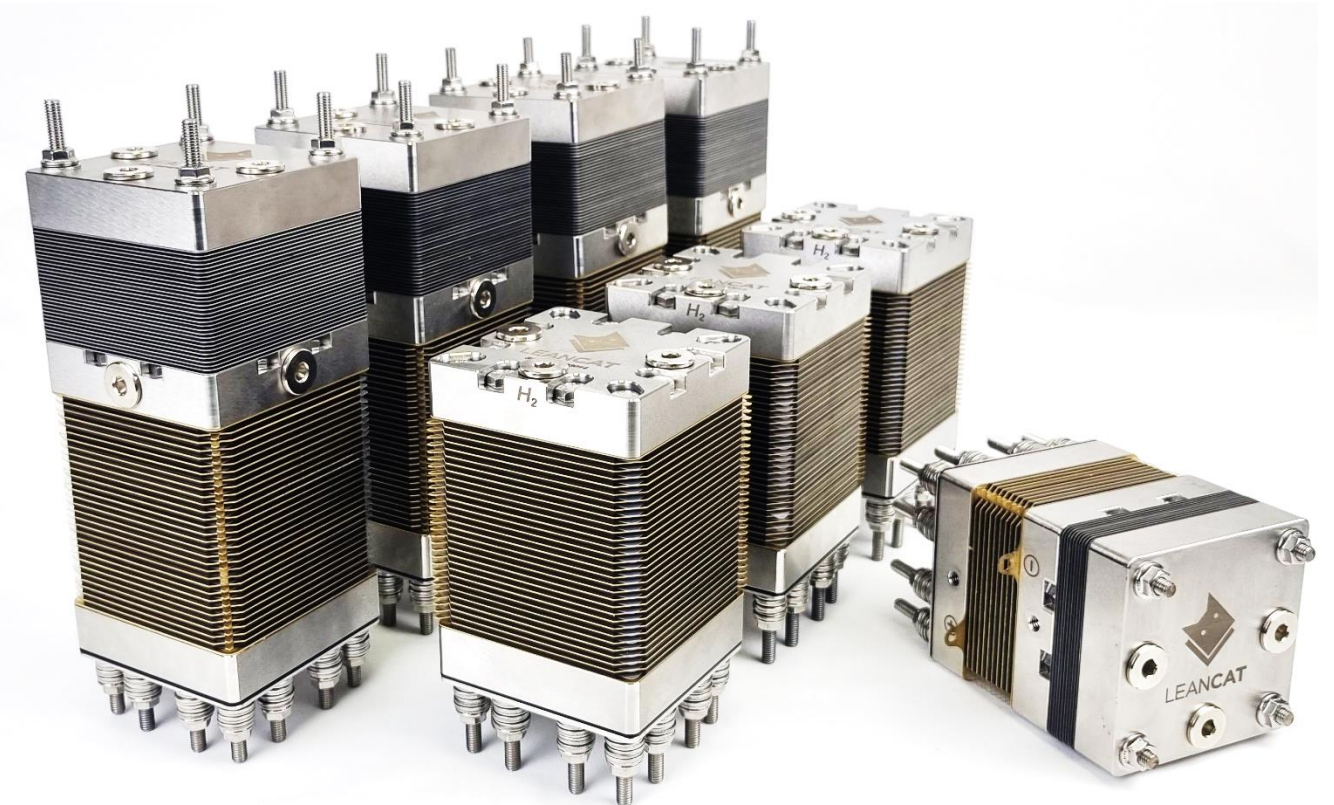
The beating heart of each water electrolysis unit is a stack. We offer stacks based on the established PEM technology with proven record of high flexibility and durability. Using 25 cm² cells, these stacks can be scaled up reaching maximum power of 5 kW.

Explore [LEANCAT family of LCWE-25 PEM water electrolyzer stacks](#)

PEM Water Electrolyzer Stack LCWE-25

Key features

- Advanced PEM water electrolysis stack
- Produces hydrogen at high pressure up to 25 Bar
- Designed for integration in H₂ systems
- Power range up to 5 kW
- Optional integrated heat exchanger for the stack cooling

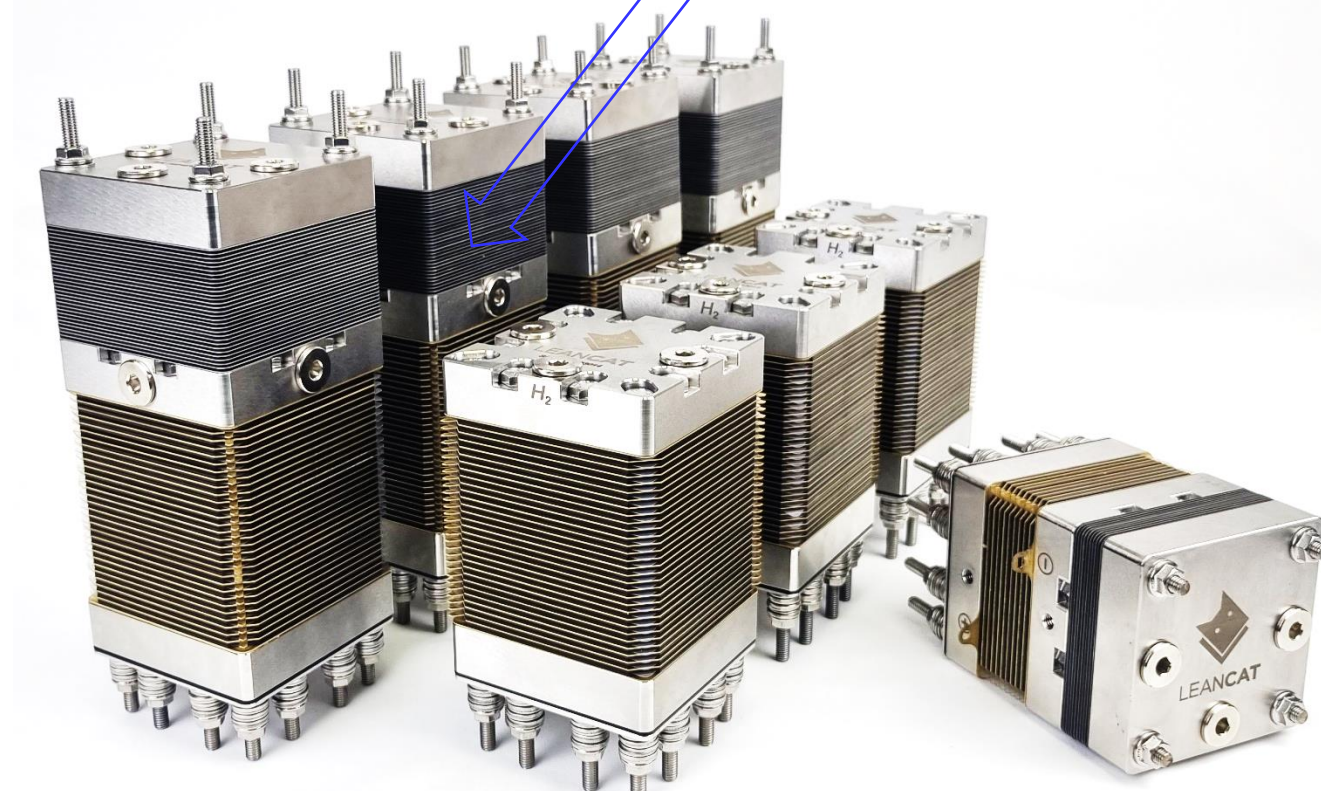




LEANCAT effort is based on two pillars:

1st pillar: Development of compact PEMWEs exhibiting high durability due to use of Ti as a structural material, additionally coated with anti-corrosion layers according to Leancat proprietary technology, and use of heat exchangers integrated directly in the stacks

Unique feature of compact LCWEs is a heat exchangers integrated directly in the WE stacks



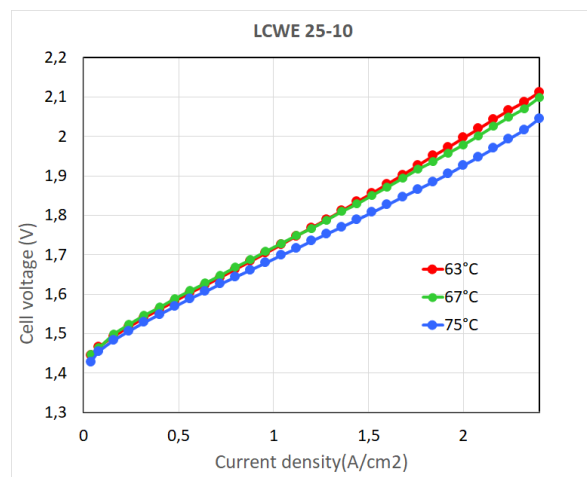
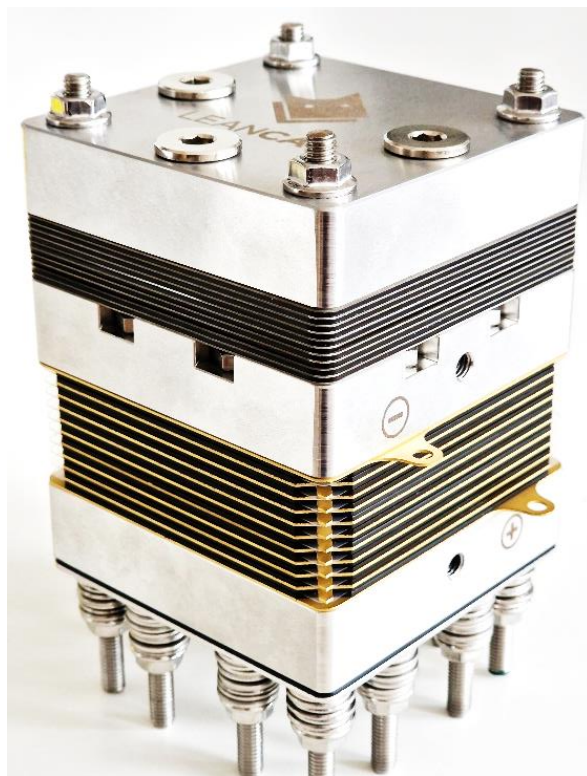
3 kW HEX

2 kW

1 kW HEX

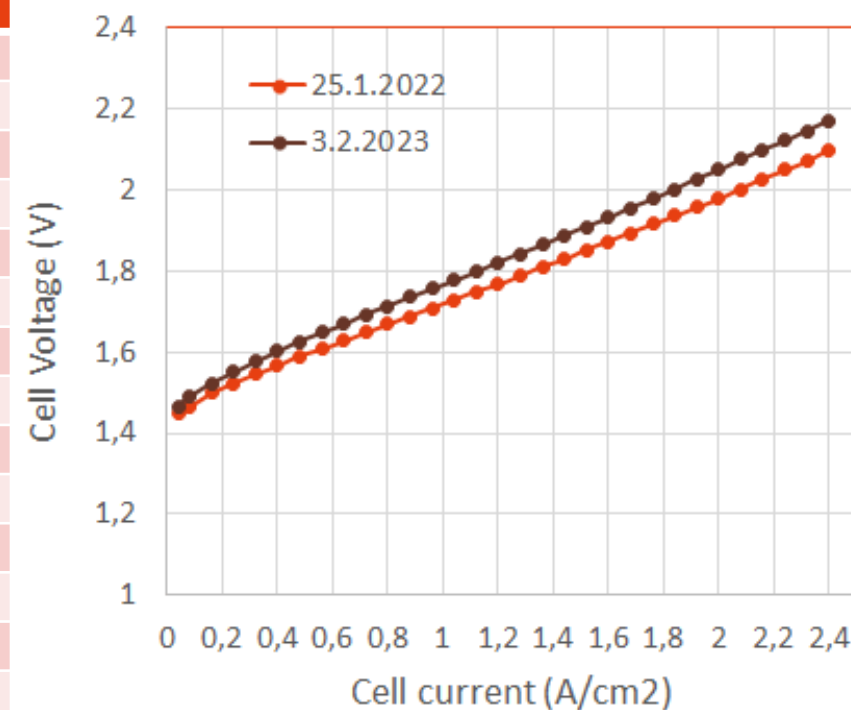


Electrolyzer 1 kW – 5,4 Nm³ H₂/day @ 25 bar



Type	LCWE 25-10
Nominal load	1 kW
Current	15–60 ADC
H ₂ maximal production	270 NI/h
H ₂ purity Degree	99.99 %
Operating pressure H ₂	0-25 Bar
Operating pressure O ₂	unpressurised
Water consumption	0.05–0.3 l/h
Cooling water flow rate	60–240 l/h
Operating temperature	30–70 °C
H ₂ O purity	DIN ISO 3696 type 1
Connection power	M6
H ₂ O connection	G 1/4"
H ₂ connection	G 1/4"
CVM connectors	Faston 2,8 mm
Dimensions L x W x H	85 x 85 x 150 mm
Weight	2,5 kg

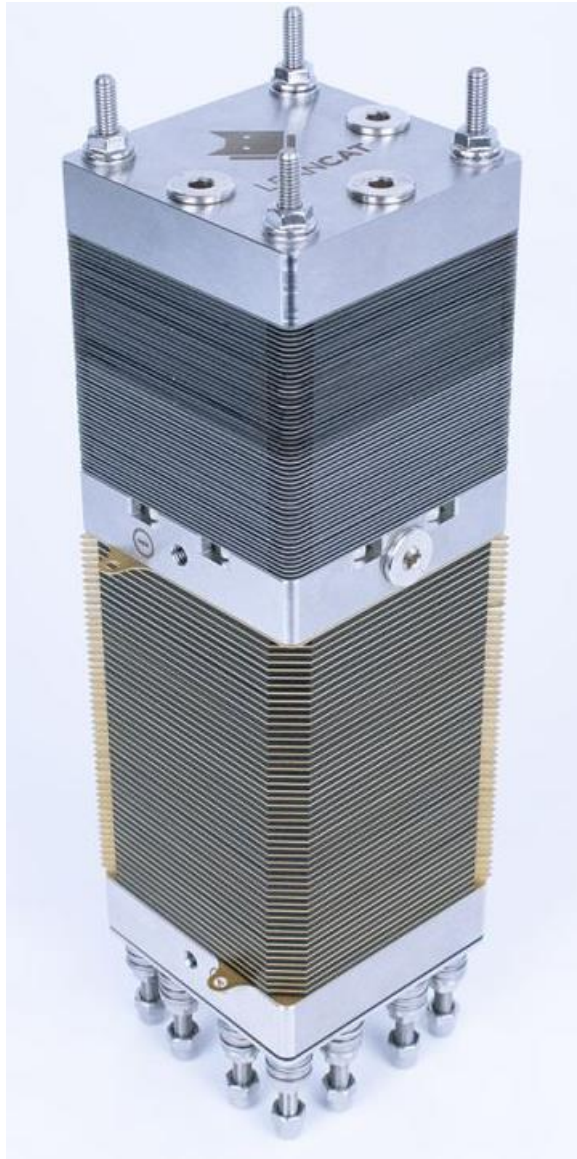
LCWE-25, Durability test 25.1.2022 - 3.2.2023



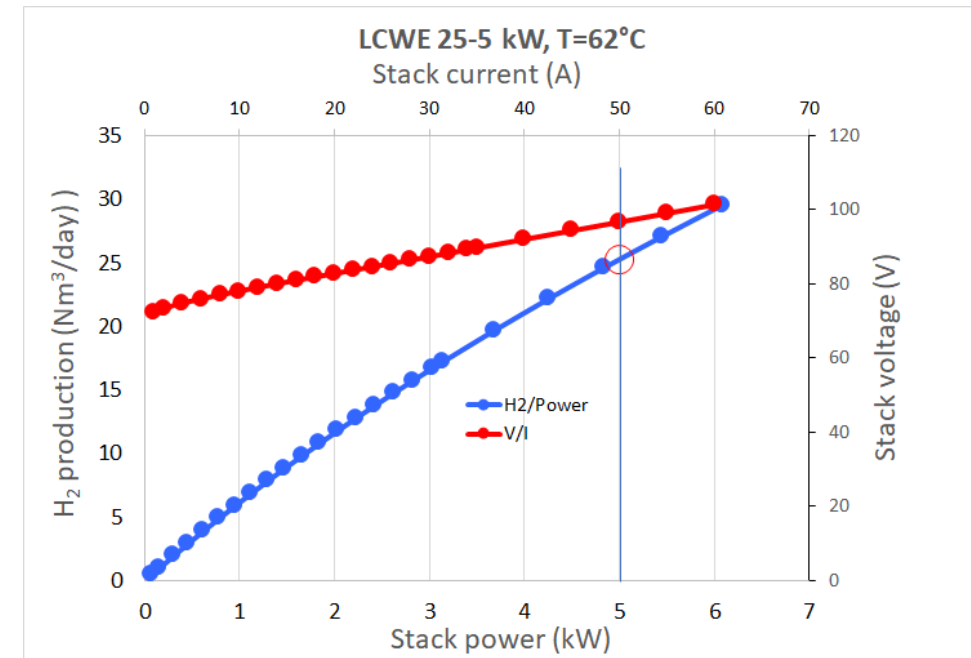
Electrolyzer 5 kW – 25 Nm³ H₂/day @ 25 bar



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Type	LCWE 25-50
Nominal load	5 kW
Current	15–60 ADC
H ₂ maximal production	1045 NI/h
H ₂ purity Degree	99.99 %
Operating pressure H ₂	0-25 Bar
Operating pressure O ₂	unpressurised
Water consumption	0.25–1.5 l/h
Cooling water flow rate	180–420 l/h
Operating temperature	30–70 °C
H ₂ O purity	DIN ISO 3696 type 1
Connection power	M6
H ₂ O connection	G 1/4"
H ₂ connection	G 1/4"
CVM connectors	Faston 2,8 mm
Dimensions L x W x H	85 x 85 x 250 mm
Weight	4,5 kg

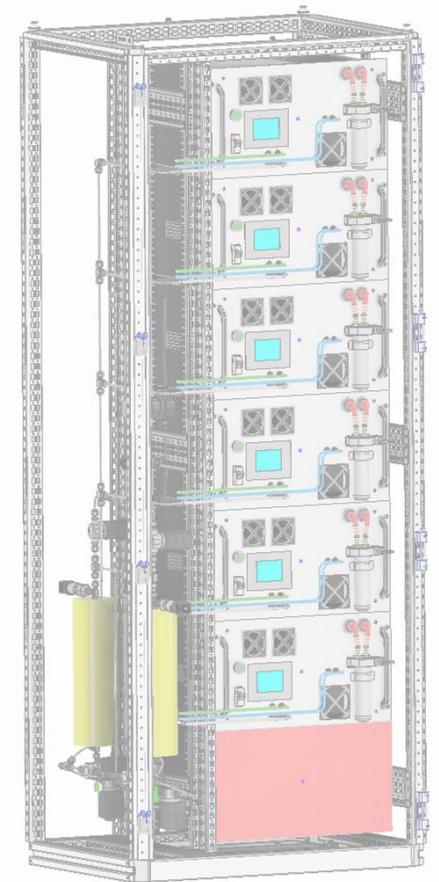
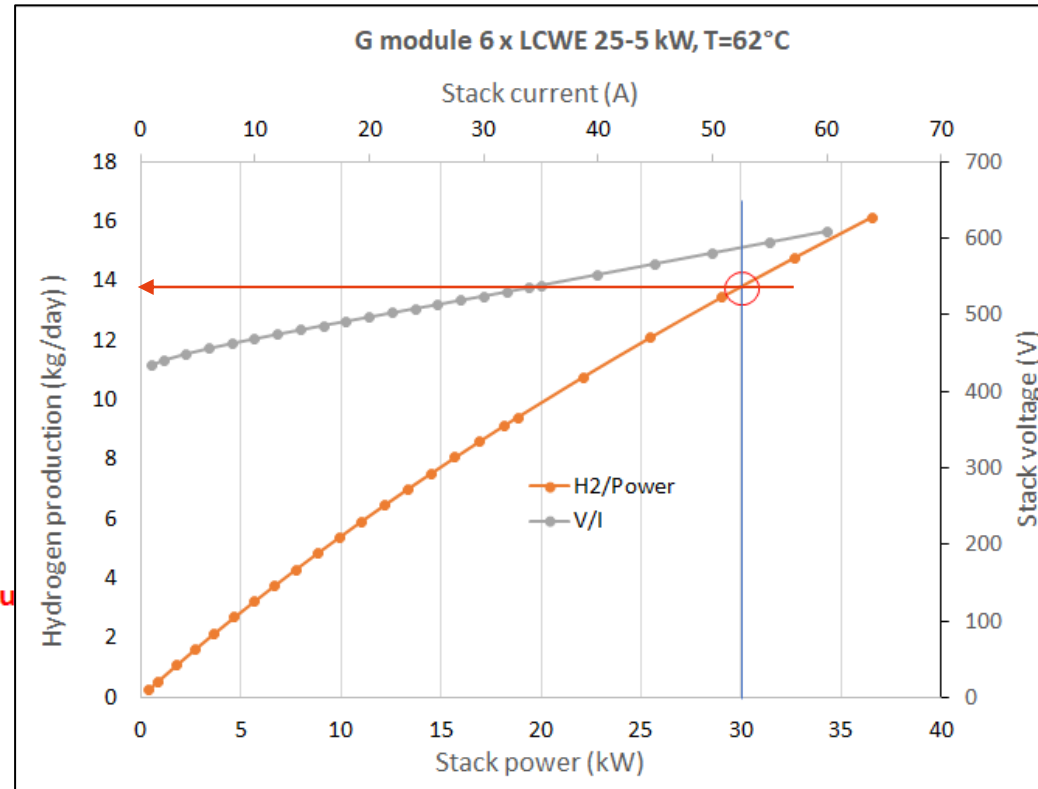
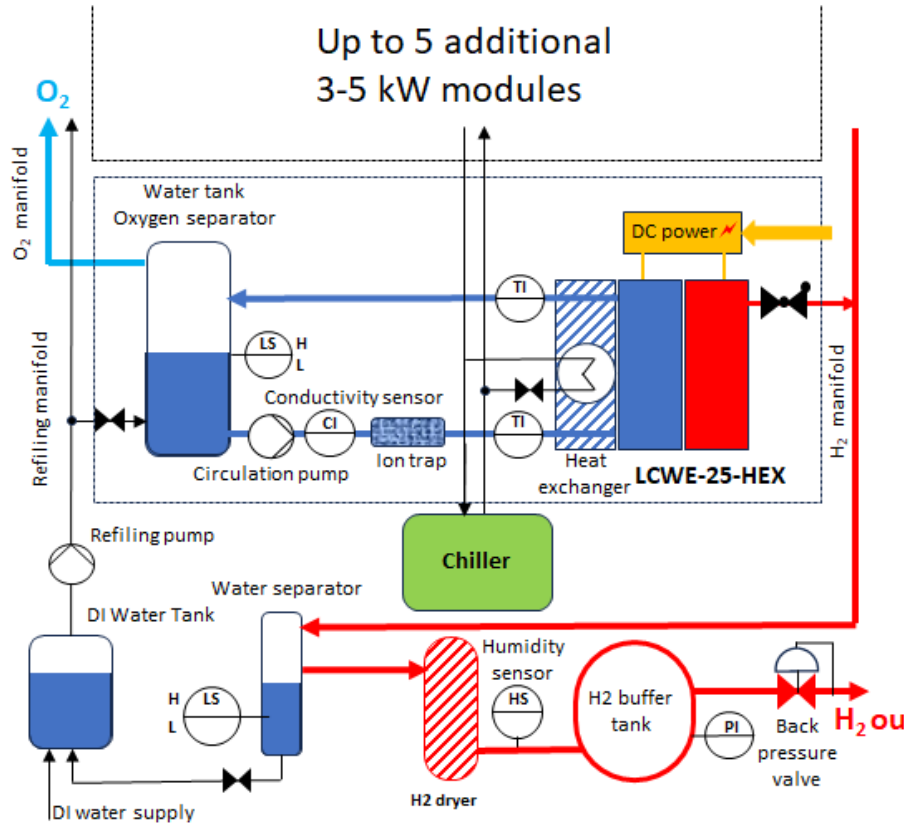


Electrolyzer module – 30 kW



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2nd pillar: Development of 5 kW electrolyser modules with a high level of autonomy (each module is controlled by a single chip computer), their assembly together forms a hydrogen generator easily customized to meet the customer's requirements

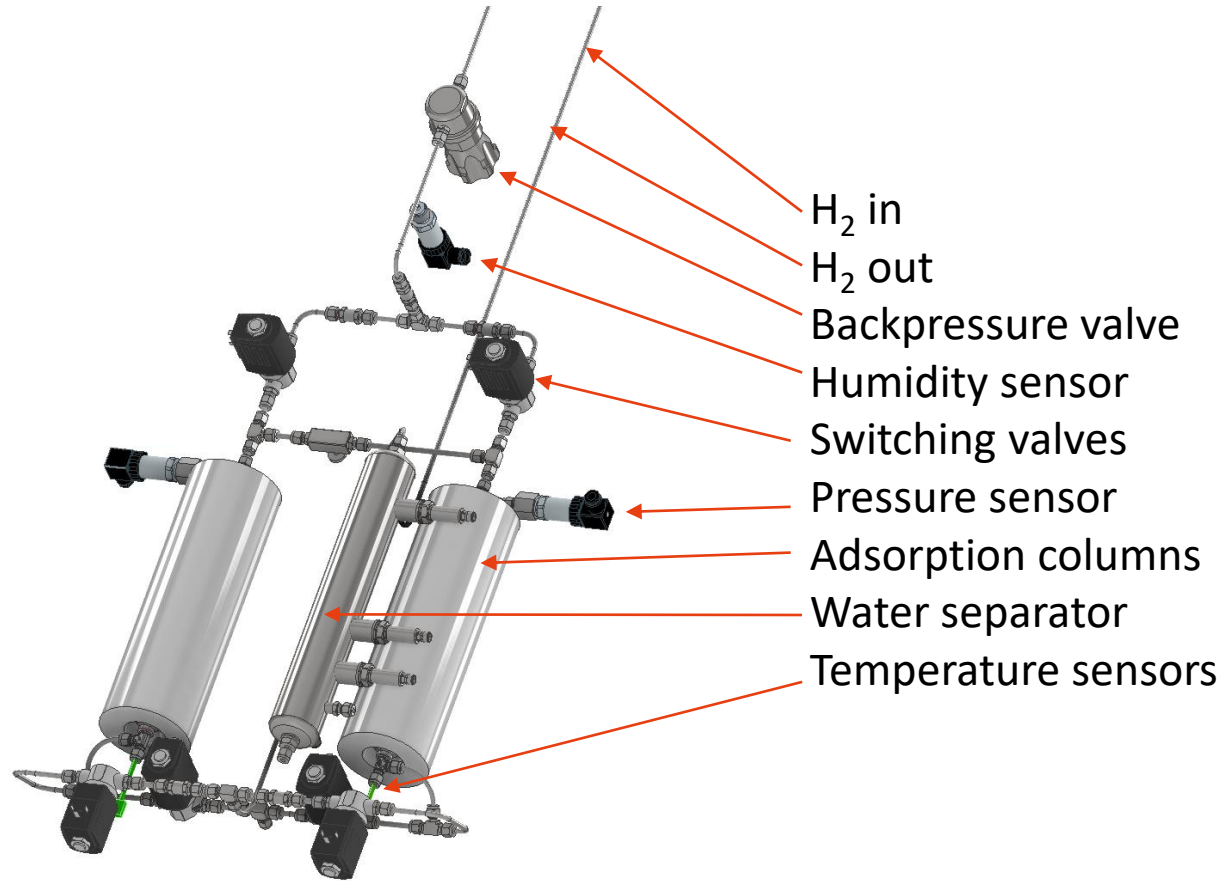


Electrolyzer Hydrogen Dryer

LC Adsorption/regeneration molecular sieve
hydrogen dryer and water separator

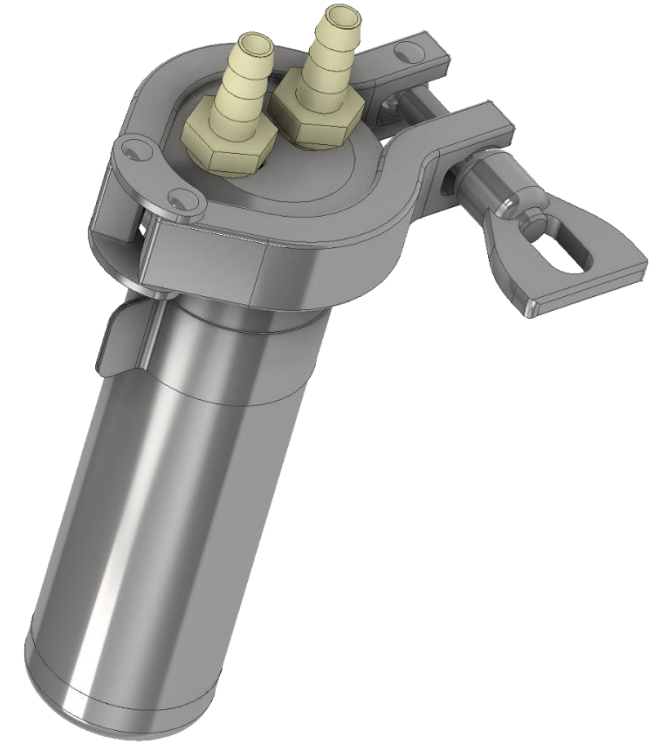


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a two-column system with a humidity sensor ensures automatic switching between drying and regeneration modes to ensure continuous drying

Ion trap



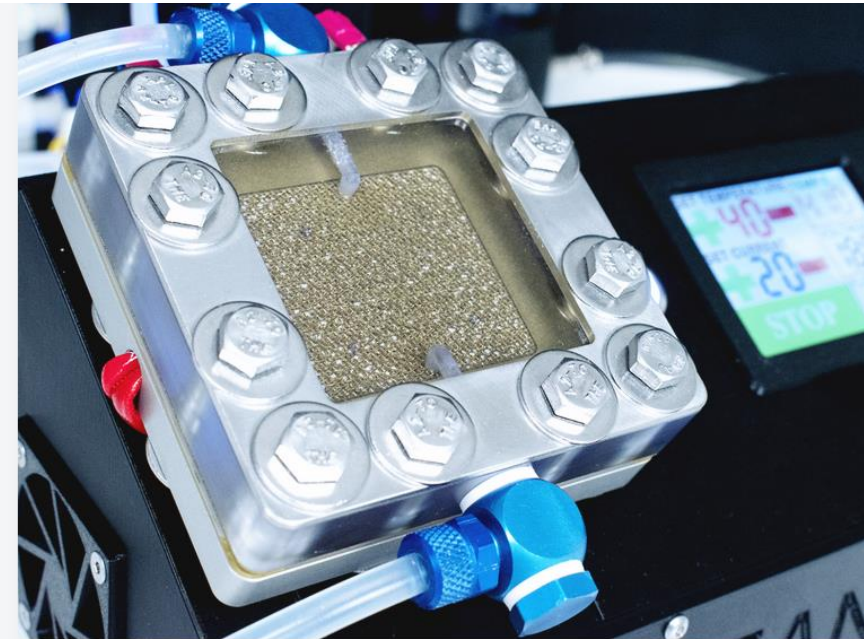
Simple replacement of active resin

Water Electrolyzer Science Kit

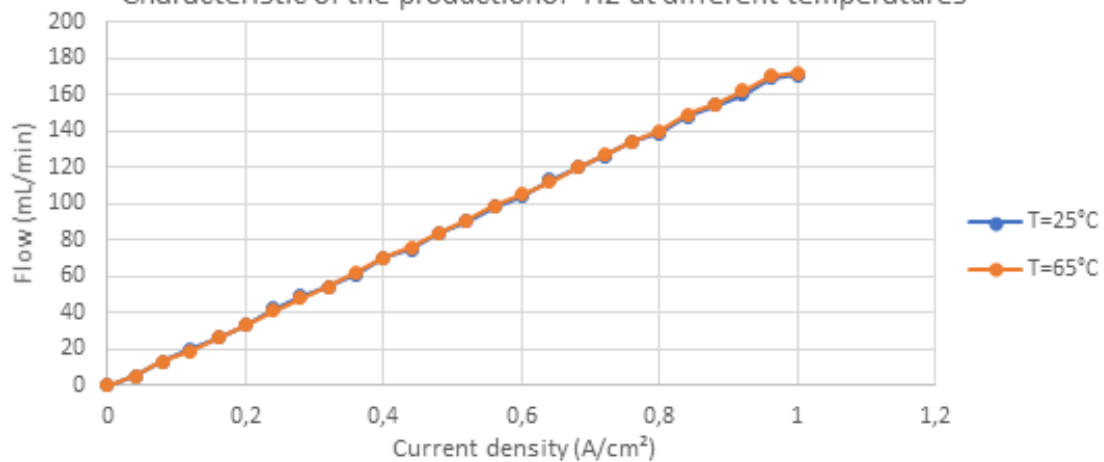


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Generation of green hydrogen in vivo. That's Leancat's science kit uses the same industrial design and components as our full-featured electrolyzers, but it is specifically designed for education. With continuous regulation of power and transparent end plate, it is possible to directly observe gas generation and characterize the behavior of the system.



Characteristic of the production of H₂ at different temperatures



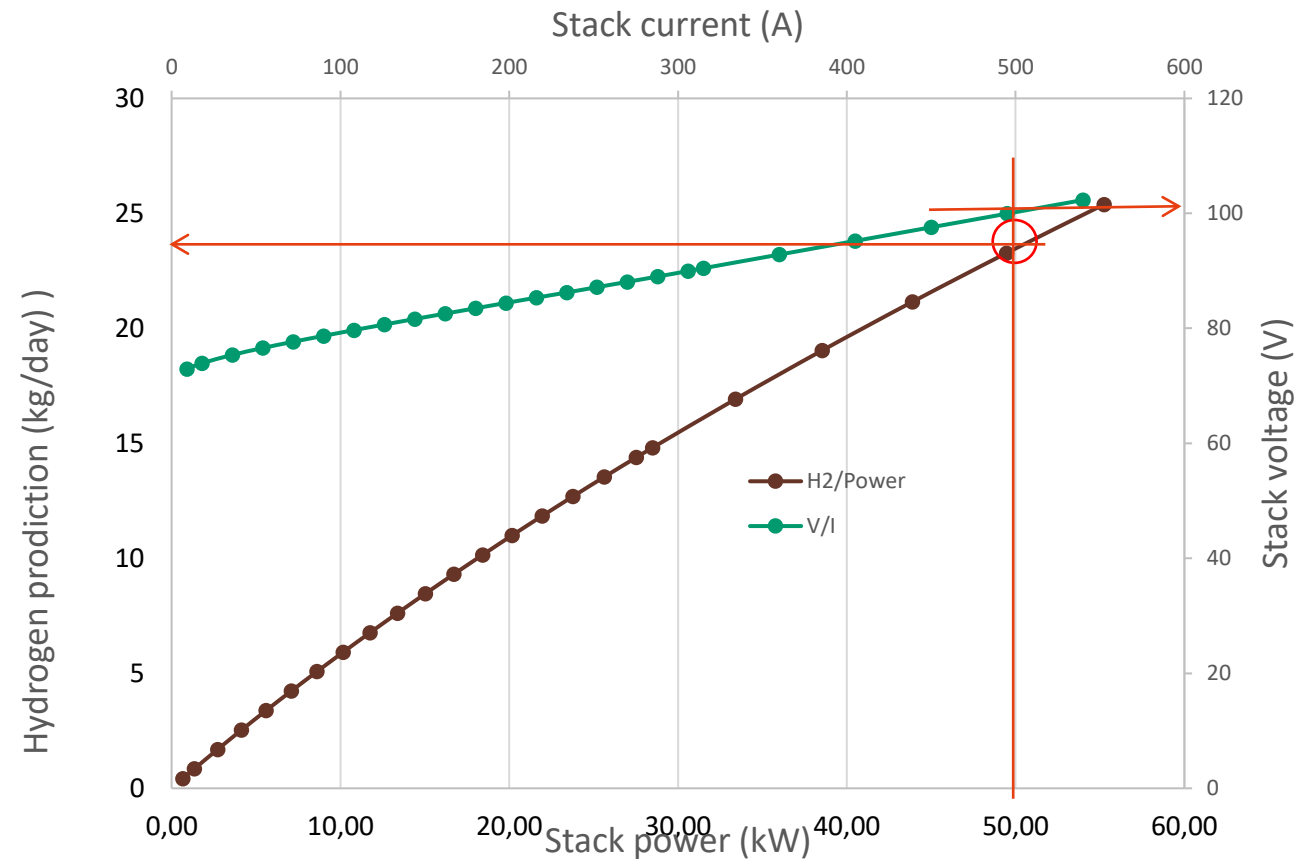
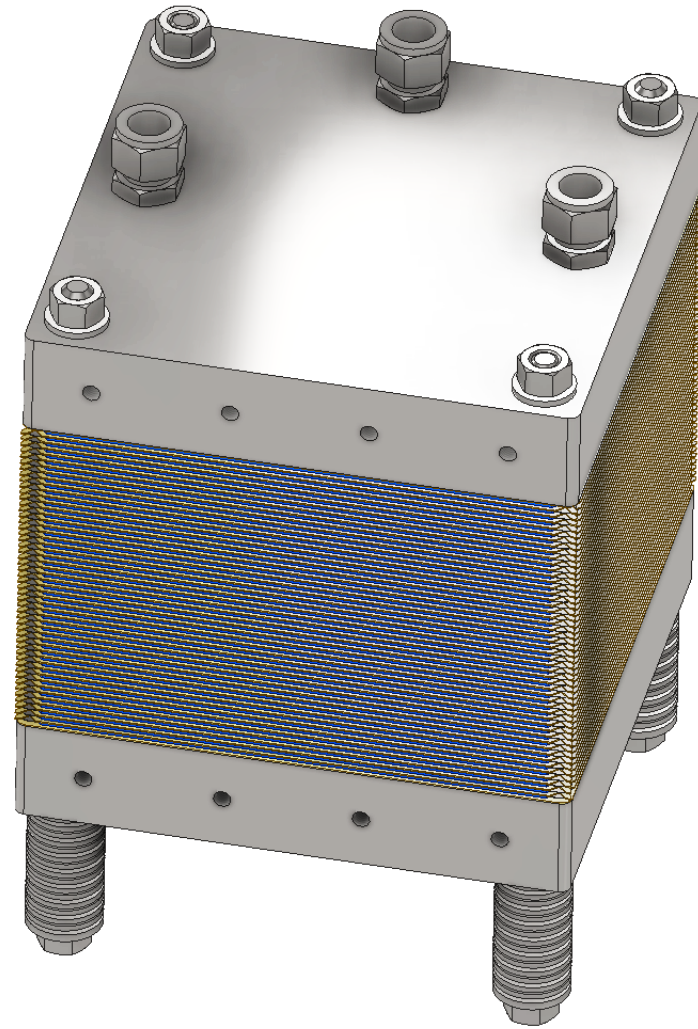
ONGOING PROJECT



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Electrolyzer 50 kW – 250 Nm³ H₂/day @ 25 bar

LCWE 225-50, T=62°C



Water Electrolyser Test Station ETS-1



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Key features

- User-Friendly manual operation with P&ID visualization or automated operation using in-house developed Python library
- Ability to perform a wide range of tests, including JRC standard performance curve, H₂ crossover, hydraulic curve, and many more
- Streamlined standardization for rapid deployment
- Hydrogen and oxygen production measurement

Applications

- Material and stack assembly research
- Efficient stack production
- Parameter testing of electrolyzers under various conditions
- Testing of electrolyzers according to JRC standards





LEANCAT expertise

- Benefits from **fuel cell research knowledge**
- Experience with **applying fuel cells to real world applications**

THANK YOU

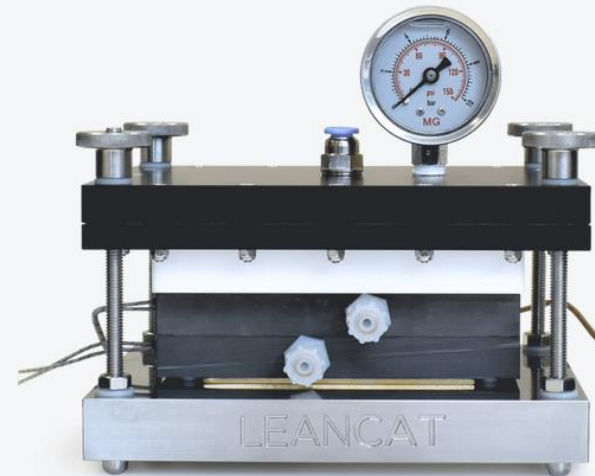
Testing Hardware

Fuel cell and water electrolyser research requires researchers to work with many degrees of freedom. We offer a portfolio of tests cells of various sizes and working temperature. LeanCat AirCells can be quickly and easily assembled / disassembled and offer reproducibility of the compression force thanks to the air-compression mechanism.



Air-pressed Test Cell AirCell

Compression hardware for single-cell testing (5 - 50 cm²)



Air-pressed Test Cell AirCell-HT

Compression hardware for single-cell testing (5 cm²)



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FUEL CELL TECHNOLOGY

Test Stations

Robust, reliable & customizable

- PEM Fuel Cells
- SOFC
- Contamination Testing
- **100 W — 50 kW**

We offer customers test stations for PEM fuel cells, electrolysers and SOFC/SOE in the range of 100 W to 50 kW, and we offer a variety of customization options based on the requests of our customers.



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Open-Cathode Stack Tester OBT

Testing of open-cathode (air-cooled) stacks



Fuel Cell Test Station STS-10

Testing of short stacks or large-area single cells



Fuel Cell Test Station PTS-10

Testing of short stacks or large-area single cells



Fuel Cell Test Station PTS-100

Testing of short or full stacks



Fuel Cell Test Station PBT

Single-cell testing of fuel cells up to 50 cm²



Fuel Cell Test Station PTS-50

Testing of short stacks or large-area single cells



Fuel Cell Test Station PTS-500

Testing of short or full stacks



Fuel Cell Poisoning Module FCPM

Testing of contamination effects