HORIBA

TEST SYSTEMS FOR ELECTROLYZERS

HYDROGEN TESTING SOLUTIONS

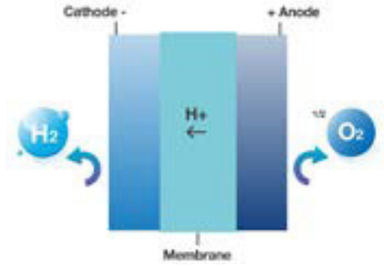
EVALUATOR ELECTROLYZER TEST STATIONS

The Evaluator electrolyser test stations are tailored to the needs of automated cell and stack tests for the evaluation of high-pressure proton exchange membrane-, anion-exchange membrane and alkaline electrolyzers. For each product development stage from the basic cell research to examine catalysts, membranes, the gas diffusssion or the cell design in total, there is a suitable test station. The testing options include proof of concept evaluation in regards to performance, efficency and durability, up to the prototype analysis for behavior under different and dynamic conditions. Different test station classes guarantee an aligned design with various test item sizes ranging from 10 W to 5 MW.

Thanks to the flexibility in the design, the test stations find their home at many use cases. They are installed at R&D institutes and universities, labs of electrolyzer manufacturers, test service providers and production lines for stacks. In addition, they are practical for all experience levels of users and complexity of the testing task.

The Evaluator Electrolyzer-Series can be used for simple load cycle tests, electrical characterisations, such as polarisation curves, but also for more advanced procedures like impedance spectroscopy, hydrogen cross over evaluation, simulation of power supply fluctuations, life cycle testing and environmental simulations in combination with climate chambers and shakers. To make this variety of applications possible, all test stations are equipped with electrolyte recirculation loops at Anode & Cathode, electronic flow control, temperature and pressure control, nitrogen purge and a electronic power supply management.

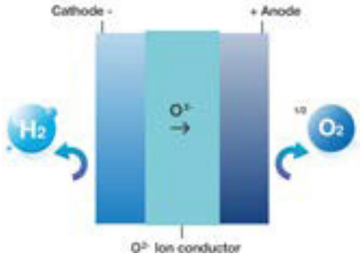
PEM - PROTON EXCHANGE MEMBRANE ELECTROLYZER



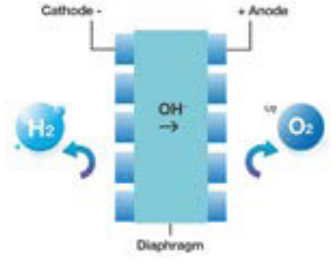
Pure water is fed into the anode of the electrolyzer, where it is split by a catalyst. Oxygen is produced directly on the anode side, whereas the hydrogen ions are passed through a solid polymer membrane and react on the cathode side to form hydrogen.

AEM - ANION EXCHANGE MEMBRANE ELECTROLYZER

Anion Exchange Membrane (AEM) electrolysis splits water into hydrogen and oxygen using a polymer membrane that conducts hydroxide ions (OH^-) from the cathode to the anode. A small amount of KOH is added to the electrolyte to provide hydroxide ions and improve ionic conductivity. Hydrogen is formed at the cathode and oxygen at the anode, while the membrane keeps the product gases separated.



AEL - ALKALINE WATER ELEKTROLYZER



Pure water is fed into the cathode of the electrolyzer, where it is split by a catalyst. Hydrogen is produced directly on the cathode side, whereas the oxygen ions are passed through an alkaline solution and react to form oxygen on the anode side.

TECHNICAL FEATURES AND YOUR BENEFITS

- High quality materials and components
  - **High reliability with approved test station components and long operating time of our test stations**
  - **Low maintenance and calibration cost**
- PEM & AEL operation in one system possible
  - **Flexibility in regards to the test item**
- Integration of climate chambers and shakers
  - **Expand test capabilities to environmental simulation**
- H_2 in O_2 and O_2 in H_2 measurement
  - **Analysis of gas cross overs through the test item**
- Multi-level event and alarm system with a safety PLC
  - **Maximize the safety for the test item, the operators and the test station itself**
- Ion exchanger cartridge in recirculation loops
  - **Long time tests due to conductivity stability of electrolyte**
- Powerful automation software HORIBA TestWork
  - **Fully automated, unattended operation with full flexibility in test program creation**
  - **High control and measurement accuracies for better test data quality**
  - **Synchronized time stamps for all data for easy cause effect analysis after tests**
- Pre pressurization concept for anode & cathode
  - **Reduce test preparation time**

GENERAL SPECIFICATIONS

Test Station Class	Evaluator EC		Evaluator ES		
					
Dimensions WxDxH [m]	1.3 x 0.8 x 1.9	3.0 x 1.6 x 2.2	6.0 x 1.6 x 2.4	5.2 x 4.0 x 2.4	4.8 x 7.0 x 6.6
Current	Up to 400 A	Up to 600 A	Up to 5,000 A	Up to 6,000 A	Up to 16,000 A
Measurement Accuracy Current	±0.2 % FS			±0.03 % FS + 0.015 % actual of value	
Voltage	Up to 6 V	Up to 12 V	Up to 30 V	Up to 200 V	Up to 1,200 V
Measurement Accuracy Voltage	±0.1 % FS			±0.03 % FS + 0.015 % actual of value	
Power	Up to 1,000 W	Up to 5 kW	Up to 100 kW	Up to 300 kW	Up to 5 MW
H2 Flow [Nl/min]	Up to 6	Up to 20	Up to 400	Up to 2,000	Up to 20,000
Measurement H2 Flow	±5 % FS				
O2 Flow [Nl/min]	Up to 3	Up to 10	Up to 200	Up to 1,000	Up to 10,000
Measurement O2 Flow	±5 % FS				
Operation Pressure	Up to 50 bara on Anode & Cathode (Optional: 100 bara)				
Pressure Measurement Accuracy	±0.125 % FS	±0.25 % FS			
Conditioning DUT	Electrolyte recirculation loop on Anode & Cathode Maximum 90 °C with 1 K Control accuracy Optional: Separate liquid cooling loop				

*All values are subject to change without further notice

OUR BENEFITS AT A GLANCE

HORIBA FuelCon is one of the world´s leading manufacturers of innovative testing and manufacturing systems for fuel cells and electrolyzers. Over 25 years of experience in this field of work built our competence and knowledge, which we put to use in every test system we design. This allows us to give you standardized solutions for your general testing demands, as well as fully customized ones for your specific testing requirements.

We always focus on the reliability and quality of our products and on proximity to our customers. To meet even the most complex requirements, we use intelligent engineering, a maximum value chain in our company and the highest safety standards in all development steps. With years of experience in the automation of test and production processes, we are your competent partner for the testing, qualification and validation of your future developments.

As part of the HORIBA Group with over 8,000 employees and 50 companies around the globe, you can rely on a strong local distribution and service network. The broad expertise of HORIBA in different measurement technologies gives us the opportunity to offer solutions beyond the sole fuel cell or electrolyzer testing. This includes gas & material analysis devices, powertrain & vehicle test beds and large-scale test field automation software.

HORIBA

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