



GREEN ELECTROLYZER

Hydrogen from Renewable Energy



► ENERGY

... in the Right Time at the Right Place

One of the keys to successful implementation of energy conversion is electrolysis of water: hydrogen is generated from renewable energy, for example wind and solar power plants, and used as a storable energy carrier or for processes in industry.

The GREEN ELECTROLYZERS of iGas energy are based on the "Proton Exchange Membrane" (PEM)- technology. All needed is electricity and tap water. GREEN ELECTROLYZERS are designed for autonomous operation and require minimal maintenance only.

SUSTAINABILITY

DECARBONISATION

CLIMATE NEUTRALITY

CO₂ REDUCTION POTENTIAL

METHANATION

POWER RECONVERSION

POWER-TO-X

SECTOR COUPLING

BALANCING POWER

E-MOBILITY



Efficient Use of Renewable Energy

The Benefits of GREEN ELECTROLYZERS of iGas energy at a Glance:

○ HIGH EFFICIENCY OF STACKS

- ➔ More than 80 % (4,47 kWh/Nm³ hydrogen) at 2 A/cm²
- ➔ More than 76 % (4,71 kWh/Nm³ hydrogen) at 3 A/cm²

○ HIGH EFFICIENCY OF THE PLANT

- ➔ More than 68 % at 100 % rated power
- ➔ More than 74 % at 50 % rated power

○ WIDE RANGE OF OPERATION

- ➔ 10 to 100 % of the nominal load

○ QUICK RESPONSE TIME

- ➔ Below 1 sec (within the limits of range of operation)
- ➔ 10 sec (from stand-by-operation to nominal load)

○ HIGH PRESSURE

- ➔ Up to 40 bar pressure directly connectable to natural gas infrastructure or to pressure-controlled processes in the industry

For generating hydrogen from electrical power PEM-electrolyzers gain more and more assets. They are able to follow fluctuating loads instantly, make use of the lower load range especially and operate very efficiently. Even more their design is extremely compact.

iGas energy supplies PEM-electrolysis modules with nominal outputs of hydrogen of 5 - 205 Nm³ per hour. This corresponds to an electrical power of 25 kW to 1.3 MW. Thanks to the modular design, a coupling of GREEN ELECTROLYZERS of up to several MW is possible.

Heart of the GREEN ELECTROLYZERS are compact stacks of the latest version from Giner Inc./USA. They are characterized by a high current density of up to 3 A/cm², that they even achieve in continuous operation. Consequently they can be adapted to almost any specific requirement of Power-to-X.

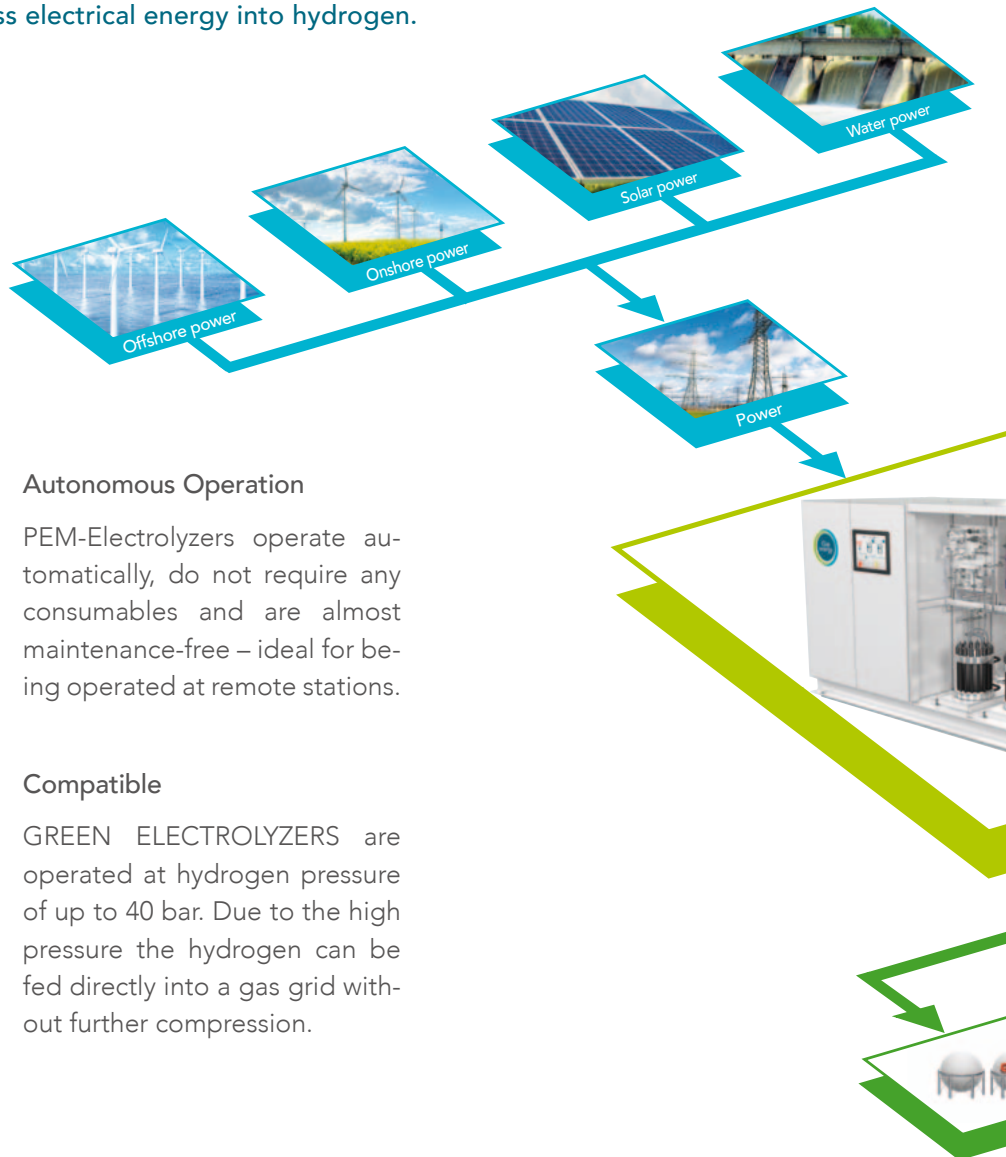
► IDEAL FOR POWER-TO-X

Whether for storage of hydrogen as an energy carrier, methanation for feeding into the gas grid, use in the fuel cell vehicles or use in the industry: the GREEN ELECTROLYZER is the ideal tool for the efficient conversion of excess electrical energy into hydrogen.

Dynamical

The stacks can operate between 10 to 100 percent of the rated power and follow load changes almost instantly. Even at partial load they work efficiently. Within a few seconds they can be from stand-by-operation in a full-load modus. The stacks also can be switched off at full-load operation or switched to stand-by operation just as quickly - an important aspect especially when making use of wind energy.

Cold start of GREEN ELECTROLYZER takes only a few minutes to achieve nominal power.



Autonomous Operation

PEM-Electrolyzers operate automatically, do not require any consumables and are almost maintenance-free – ideal for being operated at remote stations.

Compatible

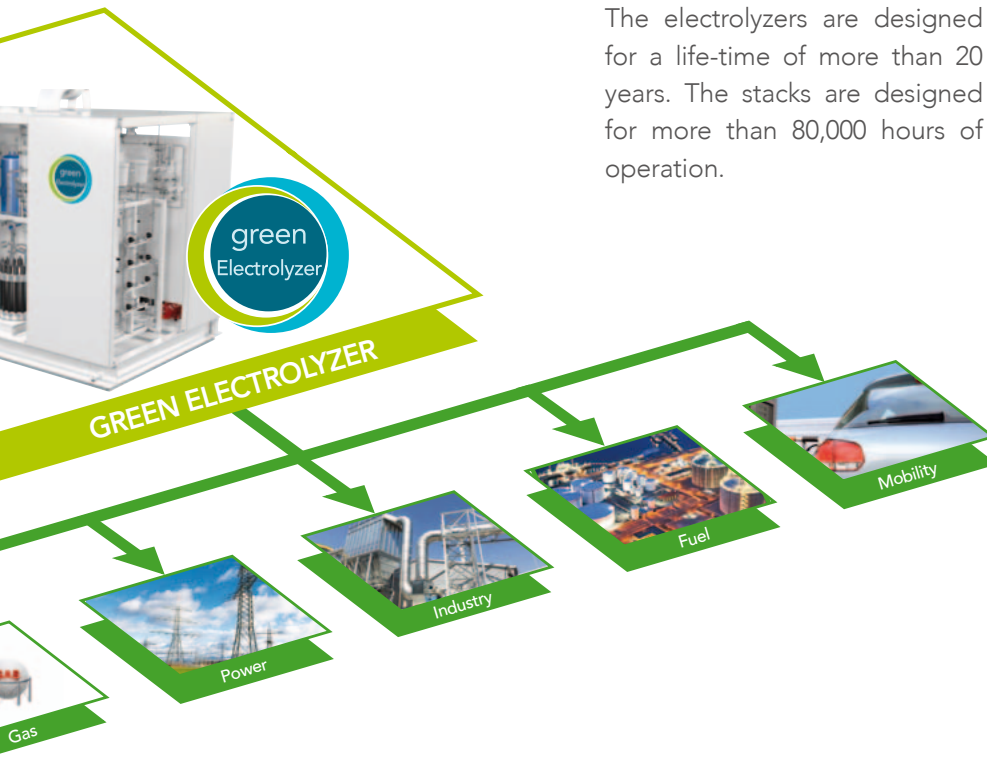
GREEN ELECTROLYZERS are operated at hydrogen pressure of up to 40 bar. Due to the high pressure the hydrogen can be fed directly into a gas grid without further compression.

▶ PROVEN AND INNOVATIVE

The heart of iGas energy's GREEN ELECTROLYZERS are stacks from Giner Inc., technology leader for PEM stacks. They have proven themselves in hundreds of applications and are characterized by efficient operation and high availability.

With innovative approaches Giner achieves an extraordinarily high current density of 3 A/cm^2 , even in continuous operation. This makes it possible to produce very compact stacks with high performance.

With an output of up to $205 \text{ Nm}^3/\text{h}$ hydrogen the stacks achieve a high degree of efficiency. The innovative heat management of the modules and the low energy consumption of the auxiliary units contribute significantly to the high efficiency of the overall system.



Longevity

The electrolyzers are designed for a life-time of more than 20 years. The stacks are designed for more than 80,000 hours of operation.

Purity

The hydrogen produced is clean and contains no hydrocarbons. This is especially important for many of the heat-intensive processes and the chemical industry. Already without gas cleaning the produced hydrogen contains less than 10 ppm residual oxygen, the dew point is $-38 \text{ }^\circ\text{C}$. Gas cleaning reduces it to 5 ppm residual oxygen and a dew point of $-70 \text{ }^\circ\text{C}$.

▶ TECHNOLOGY

Electrolysers convert electrical energy into chemical energy. The main product is hydrogen which can serve as an energy carrier. In the “Proton Exchange Membrane” (PEM) there is a solid polymer electrolyte – the membrane –, which is embedded in water. Electrical voltage produces protons which migrate through the membrane: hydrogen is formed at the cathode, oxygen at the anode.

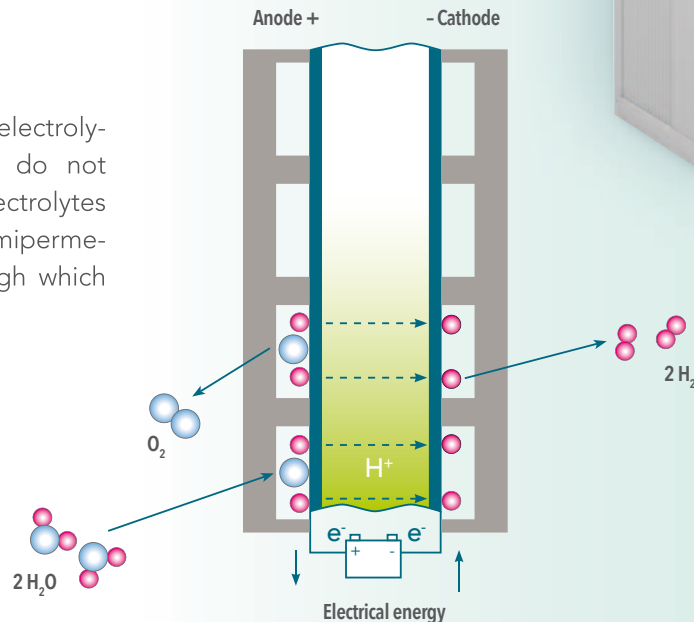
Safe

In contrast to alkaline electrolysis PEM electrolyzers do not contain any liquid electrolytes but merely a solid semipermeable membrane through which the protons migrate.

Another advantage is that the membrane physically separates hydrogen and oxygen from each other.

Environmentally Friendly

PEM stacks do not need potassium hydroxide solution (KOH).



► THE SYSTEM



iGas energy supplies the plants ready to connect including a closed cooling circuit, the entire measuring and control technology and all auxiliary units.

Thanks to the PEM stacks the systems are exceptionally compact and scalable within wide limits.

For open-air use iGas energy integrates “outdoor” systems in containers. On request iGas energy integrates a gas conditioning system which is able to achieve a gas quality of 6.0.

All systems are completely installed in the factory (ready for operation) and are subjected to a thorough functional test before delivery.

	gEI 30-300 PEM MD		gEI 100-1250 PEM MD		gEI 320-1250 PEM MD	
	gEI 10-300 PEM MD		gEI 60-300 PEM MD		gEI 160-1250 PEM MD	
Nominal Active Area [cm ²]	300	300	300	1250	1250	1250
Current Density at Max. Load [A/cm ²]	3	3	3	3	3	3
Hydrogen Production [Nm ³ /h]	10	30	60	100	160	320
Hydrogen Pressure [bar]	40	40	40	40	40	40
Energy Consumption (System) [kWh/Nm ³]	5,4	5,2	5,2	5,4	5,4	5,3
Nominal Electrical Load [kW]	75	205	400	660	1050	2070

Other system configurations on request.



iGas energy develops and manufactures plants that make most efficient use of what is often referred to as lost resources. The essential element of our products is the profound know-how in gas technology.

iGas energy is part of the SK Group. The expertise in automation and rectifier technology as well as in high-pressure technology contributed by the group companies Fest AG and Maximator GmbH ensures that the equipment is sturdy and of low-maintenance design.

● Resource-saving circular economy

Complete recycling of valuable substances and energy from aqueous organic waste into material cycles.

● Hydrogen from renewables

Power-to-X plants for storage of renewables on the basis of energy conversion into hydrogen by high-pressure PEM-electrolysis.

● Innovative gas technology

Plant technology for supplying industrial processes with gases.



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