nel

Nel Hydrogen Electrolysers

The World's Most Efficient and Reliable Electrolysers

number one by nature®

Empowering generations with clean energy forever is the vision of Nel Hydrogen.

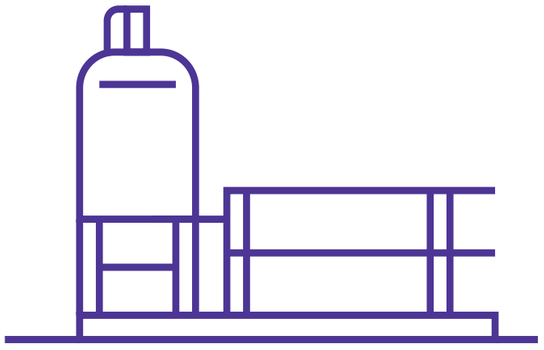
Our technology allows people and businesses to make everyday use of hydrogen, the most abundant element in the universe.

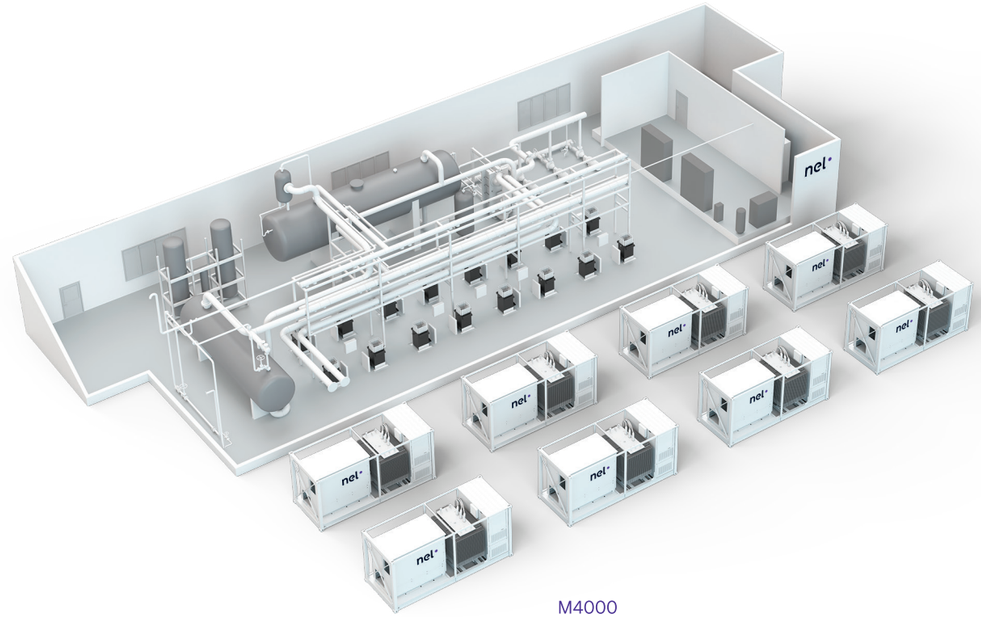
Nel Hydrogen Electrolysers

With more than 3,500 reliable, cost efficient electrolysers installed around the globe, Nel Hydrogen is the recognized industry leader of Alkaline and PEM water electrolysis.

Since our founding in 1927, sustained R&D efforts have contributed to continual improvement of electrolyser technology, setting the benchmark in the market. Our electrolysis technology is today widely respected for its robustness, reliability and energy efficiency.

Our water electrolysers make a superior choice for Industry, Transport and Power-to-X applications. Multiple, scalable, flexible, modular product ranges are set to meet any customer requirements.





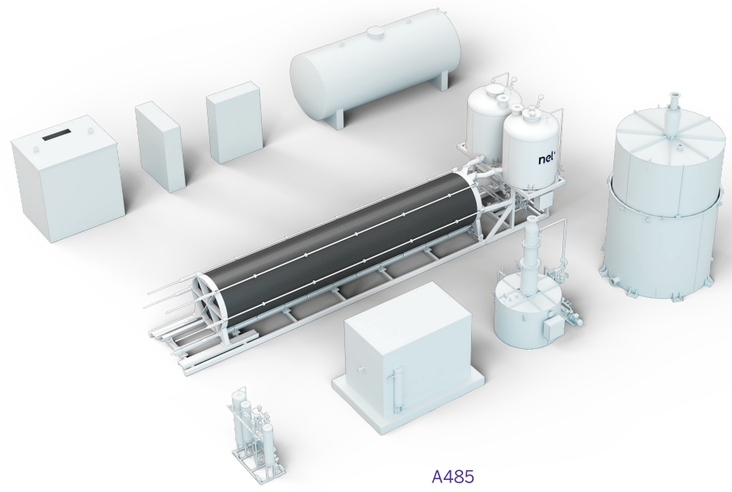
M4000

MC250

C30

H4

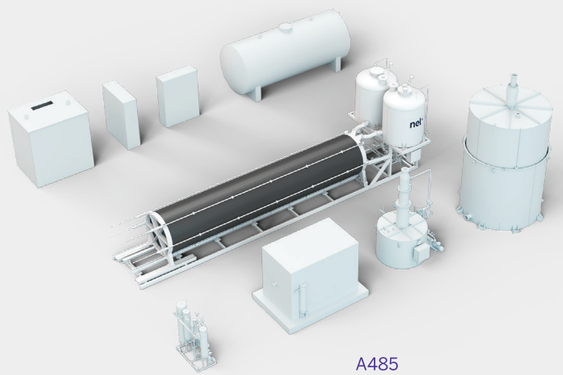
S10



A485

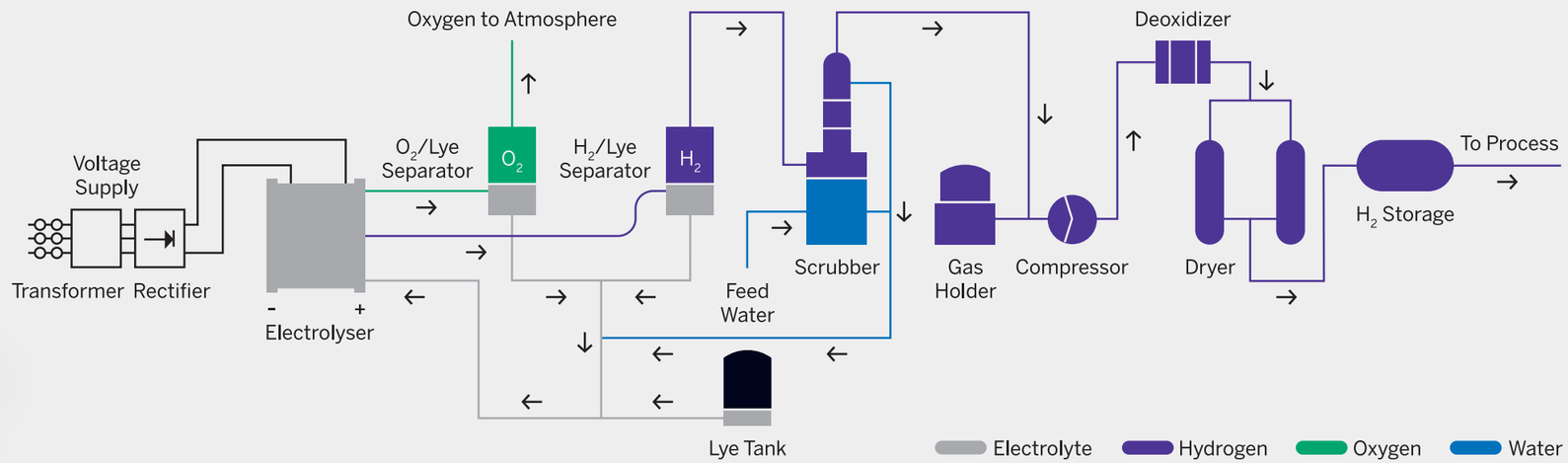
The Atmospheric Alkaline Hydrogen Plant

Nel Hydrogen Atmospheric Alkaline water electrolysers consist of standard modules of proven technology, critical for a hydrogen production process that is efficient, safe and reliable.



A485

Electrolysis is the process of splitting the water molecule into hydrogen and oxygen using electricity. The inputs to this process are simply feed water and the current supplied to the electrolyser.



TRANSFORMER/RECTIFIER

The transformer and rectifier convert the AC voltage supply into DC current input at the required voltage.

ELECTROLYSER

The electrolyser is of the filter press type with bipolar electrodes separated by non-asbestos diaphragms. Hydrogen gas is generated at the cathode and the oxygen gas at the anode.

ELECTROLYTE SYSTEM

This module consists of two gas separators and the electrolyte recirculation system. The electrolyte is recovered in the separators, then chilled and recycled into the cell block.

SCRUBBER

The scrubber has three main functions:

- Remove residual traces of electrolyte
- Cool down the hydrogen
- Feed water tank

GAS HOLDER

The gas holder is a buffer tank installed between the electrolyser and the compressor or the process at site.

COMPRESSOR

If required, a compressor is installed to compress the gas from atmospheric pressure in the gas holder to the pressure required for the process or the storage vessel.

DEOXIDIZER

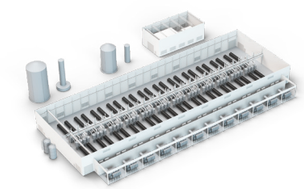
Hydrogen generated in the electrolyser is a very pure gas, saturated with water, and its oxygen content doesn't exceed 0.2%. If higher purity is required, the last molecules of oxygen can be removed by catalytic reaction in a deoxidizer.

DRYER

The dryer will dry the gas to reach the suitable dew point. It consists of twin towers filled with a regererative desiccant to absorb the water.

H_2 STORAGE

The optional gas storage provides a back-up solution or ensures the hydrogen make-up for batch applications with uneven gas consumption.

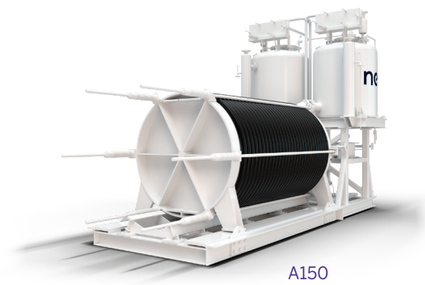


A Series

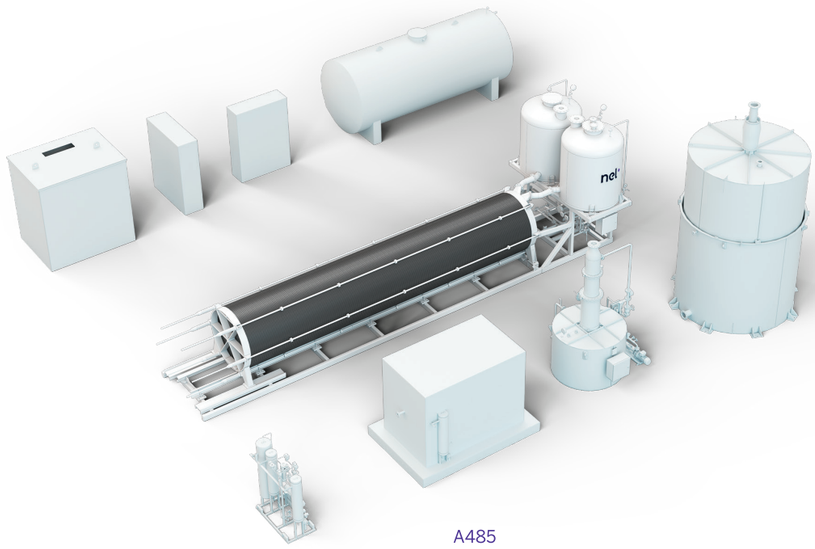
The world's most energy efficient electrolysers, the A Series is based on our proven 2.1 MW cell stack design, with a power consumption from 3.8 to 4.4 kWh/Nm^3 of hydrogen gas produced depending on the load. Nel has the capability to build a complete plant around this core technology, working on standardized platforms reaching up to 19,400 Nm^3/h, or 42 tons per day, representing a plant of around 100 MW.

Tailored Solutions

The A Series represents the most reliable and efficient electrolysers in the world. Our modular concept enables us to deliver customized indoor hydrogen solutions for any application, configuration and size – anywhere. Nel Hydrogen tailors each delivery to any customer requirement, from complete installation of the entire electrolyser plant, to delivery of specific modules according to customer preferences.



A150



A485

SPECIFICATIONS	A150	A300	A485
Net Production Rate	50 to 150 Nm^3/h	150 to 300 Nm^3/h	300 to 485 Nm^3/h
Production Capacity Dynamic Range[1]	15 to 100% of flow range	15 to 100% of flow range	15 to 100% of flow range
Power Consumption at Stack[2]	3.8 to 4.4 kWh/Nm^3	3.8 to 4.4 kWh/Nm^3	3.8 to 4.4 kWh/Nm^3
Purity – with optional purification	99.99 to 99.998%	99.99 to 99.998%	99.99-99.998%
O_2-Content in H_2	< 2 ppm v	< 2 ppm v	< 2 ppm v
H_2O-Content in H_2	< 2 ppm v	< 2 ppm v	< 2 ppm v
Delivery Pressure	1 to 200 barg	1 to 200 barg	1 to 200 barg
Dimensions/Footprint	~150 m^2	~200 m^2	~225 m^2
Ambient Temperature			
Process Room	2 to 40ºC	2 to 40ºC	2 to 40ºC
Rectifier Room	2 to 35ºC	2 to 35ºC	2 to 35ºC
Electrolyte	25% KOH solution	25% KOH solution	25% KOH solution
Feed Water Consumption	~1 l/Nm^3	~1 l/Nm^3	~1 l/Nm^3

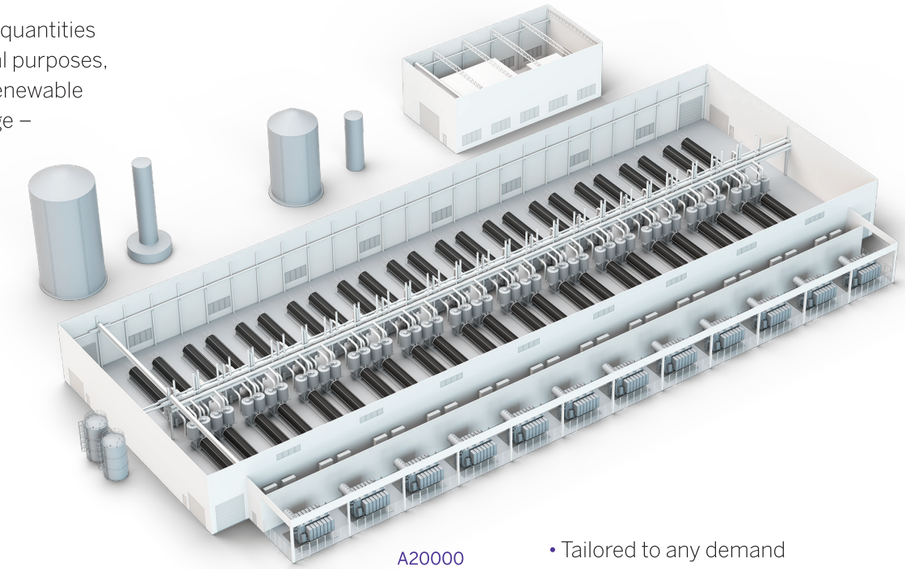
For reference only – specifications are subject to change. Please contact Nel Hydrogen for solutions to best fit your needs.
[1] Production capacity dynamic range may vary with rectifier solution and local grid requirements.
[2] Total power consumption will be higher and dependent upon system configuration.

Large Scale Hydrogen Plants

Whether you need large quantities of hydrogen for industrial purposes, or utilization of excess renewable energy for energy storage – we have experience in both fields!

Nel Hydrogen is the acknowledged expert in large scale electrolysers. The very nature of the A Series is seamless capacity upsizing from medium to large scale hydrogen plants based on water electrolysis technology.

Our experience in large scale plants is exemplified through historical plants exceeding 30,000 Nm^3/h, as well as the recent addition of new plants with an energy capacity of more than 100 MW.



A20000

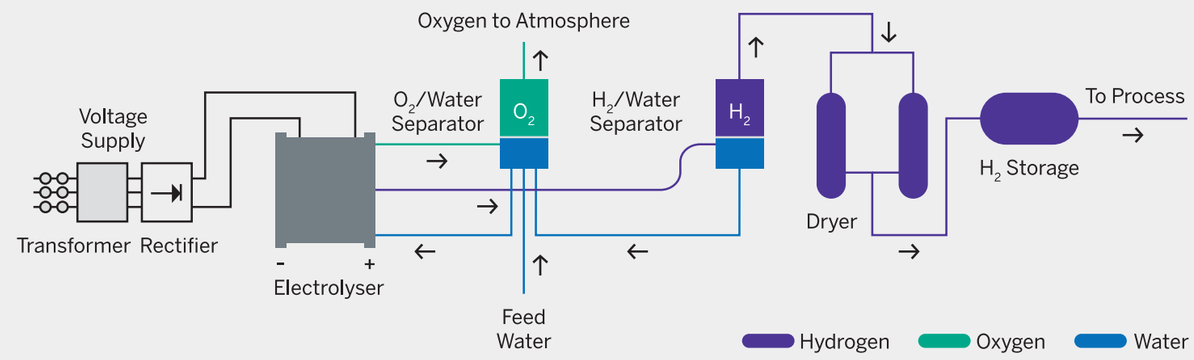
- Tailored to any demand
- Turnkey solutions
- Large capacity at minimum footprint
- High pressure for storage and distribution
- Scaled to any capacity
- More efficient than any other electrolyser

A1000	A2000	A4000	A20000
600 to 970 Nm^3/h	1,200 to 1,940 Nm^3/h	2,400 to 3,880 Nm^3/h	15,520 to 19,400 Nm^3/h
15 to 100% of flow range	7.5 to 100% of flow range	3.75 to 100% of flow range	1 to 100% of flow range
3.8 to 4.4 kWh/Nm^3	3.8 to 4.4 kWh/Nm^3	3.8 to 4.4 kWh/Nm^3	3.8 to 4.4 kWh/Nm^3
99.99 to 99.998%	99.99 to 99.998%	99.99 to 99.998%	99.99 to 99.998%
< 2 ppm v	< 2 ppm v	< 2 ppm v	< 2 ppm v
< 2 ppm v	< 2 ppm v	< 2 ppm v	< 2 ppm v
1 to 200 barg	1 to 200 barg	1 to 200 barg	1 to 200 barg
~225 m^2	~350 m^2	~770 m^2	Depends on configuration
2 to 40ºC	2 to 40ºC	2 to 40ºC	2 to 40ºC
2 to 35ºC	2 to 35ºC	2 to 35ºC	2 to 35ºC
25% KOH solution	25% KOH solution	25% KOH solution	25% KOH solution
~1 l/Nm^3	~1 l/Nm^3	~1 l/Nm^3	~1 l/Nm^3

The Proton Exchange Membrane (PEM) Hydrogen Plant

Nel Hydrogen PEM water electrolysers are designed to meet the specific needs of high purity industrial applications. These state-of-the-art units offer turnkey solutions for the growing need for stable, cost-effective, high volume hydrogen supply.

Electrolysis is the process of splitting the water molecule into hydrogen and oxygen using electricity. The inputs to this process are simply feed water and the current supplied to the electrolyser.



TRANSFORMER/RECTIFIER

The transformer and rectifier convert the AC voltage supply into DC current input at the required voltage.

ELECTROLYSER

The electrolyser is based upon proton exchange membrane technology. Hydrogen gas is generated at the cathode at elevated pressures up to 30 barg. Oxygen gas is produced at the anode at pressures close to ambient. The near infinite bubble point of the membrane prevents oxygen from entering the hydrogen stream. The full differential pressure design provides for safe, simple operation.

H_2/WATER SEPARATOR

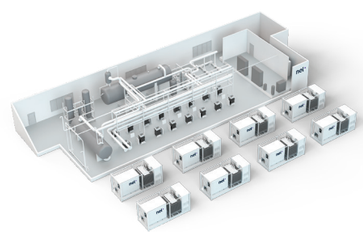
The H_2/Water Separator removes liquid water from the high pressure hydrogen and safely recycles it back to the system water tank.

DRYER

The dryer will dry the gas to reach the suitable dew point. It consists of multiple beds filled with a regenerative desiccant to absorb the water.

H_2 STORAGE

The optional gas storage provides a back-up solution or ensures the hydrogen make-up for batch applications with uneven gas consumption.



M Series

With minimal maintenance and siting requirements, M Series electrolysers can produce up to 4,920 Nm^3/h of hydrogen gas at 99.9995% purity on-demand. Featuring a scalable modular design, these systems offer solutions that are well-suited for a variety of industrial, fueling and renewable energy applications.

MC Series

In situations where plant space is at a premium, customers may want to site their electrolysers outside. At other times customers may want to configure an electrolyser for a more turnkey operation. To satisfy those needs, we suggest containerization. MC Series units are delivered and sited in free standing containers for maximum flexibility.

C Series

The C Series electrolysers are ideal for a variety of industrial applications. Producing up to 30 Nm^3/h of hydrogen gas at 99.9998% purity, these units replace the need for hydrogen tube trailers or liquid hydrogen storage. They are easy to install in general purpose areas.

H Series

H Series electrolysers offer turnkey solutions for small-scale applications requiring up to 6 Nm^3/h of hydrogen gas at 99.9995% purity. These units make a minimal impact to facility floor space and are easy to maintain.

S Series

Producing high purity hydrogen of 99.9995% at up to 1.05 Nm^3/h, S Series electrolysers replace the need for hydrogen cylinders in a variety of industrial processes. Each unit is low maintenance, compact, quiet, and can be installed virtually anywhere in a facility.

Tailored Solutions

Nel's PEM electrolysers provide fast response times and production flexibility making them ideal for hydrogen generation utilizing renewable power sources. Featuring a full range of electrolysers, generating from 0.27 to 5,000 Nm^3/h of hydrogen, they can be scaled to fit any customer requirement and application.

Turnkey Solutions

The MC250 and MC500 electrolysers deliver megawatt scale performance in a containerized form for easy outdoor installations. Nel's PEM Technology makes for a reliable and turnkey solution with minimal maintenance. Typical applications include renewable energy storage, industrial process gas, and hydrogen fueling.

SPECIFICATIONS	MC250	MC500
Net Production Rate		
Nm^3/h	246 Nm^3/h	492 Nm^3/h
kg/24 h	531 kg/24 h	1,061 kg/24 h
Production Capacity Dynamic Range	10 to 100%	10 to 100%
Average Power Consumption at Stack[1]	4.5 kWh/Nm^3	4.5 kWh/Nm^3
Purity – with optional high purity dryer	99.9995%	99.9995%
O_2-Content in H_2	< 1 ppm v	< 1 ppm v
H_2O-Content in H_2	< 5 ppm v	< 5 ppm v
Delivery Pressure	30 barg	30 barg
Dimensions		
Footprint	NA	NA
Process Container – W x D x H	12.2 m x 2.5 m x 3 m	12.2 m x 2.5 m x 3 m
Rectifier/Transformer Container – W x D x H	6.1 m x 2.5 m x 2.6 m	12.2 m x 2.5 m x 3 m
Ambient Temperature[2]	-20 to 40ºC	-20 to 40ºC
Electrolyte	Proton Exchange Membrane	Proton Exchange Membrane
Feed Water Consumption	0.9 l/Nm^3	0.9 l/Nm^3

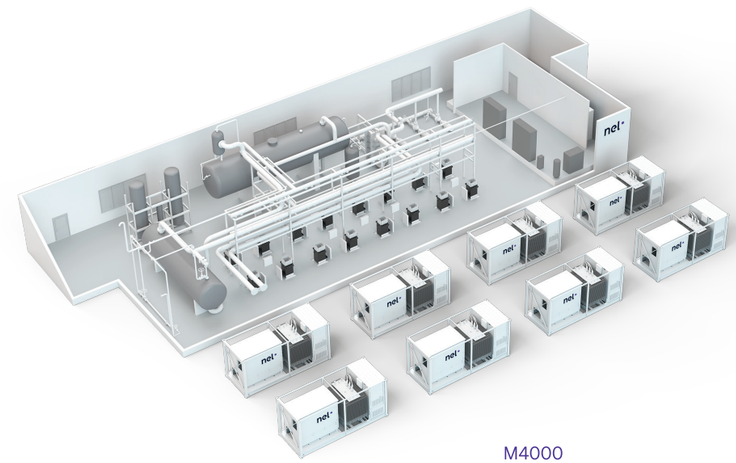
For reference only – specifications are subject to change. Please contact Nel Hydrogen for solutions to best fit your needs.
[1] Total power consumption will be higher and dependent upon system configuration.
[2] Additional low ambient and high ambient temperature options available for MC units.

Large Scale Hydrogen Plants

Large scale renewable energy storage, grid management or industrial applications that demand fast response times or compressor-less operation should consider our M Series PEM hydrogen plants for their hydrogen production needs.

Nel Hydrogen is the acknowledged expert in large scale electrolysers. Featuring 1.25 MW cell stacks and shared balance of plant with a modular design, the M Series enables flexible configurations and installations for medium to large scale hydrogen plants based on water electrolysis technology.

- Tailored to any demand
- Turnkey solutions
- Large capacity at minimum footprint
- Hydrogen produced at pressure
- Scaled to any capacity
- PEM technology



M2000	M3000	M4000	M5000
1,968 Nm^3/h	2,952 Nm^3/h	3,936 Nm^3/h	4,920 Nm^3/h
4,247 kg/24 h	6,371 kg/24 h	8,495 kg/24 h	10,618 kg/24 h
10 to 100%	10 to 100%	10 to 100%	10 to 100%
4.5 kWh/Nm^3	4.5 kWh/Nm^3	4.5 kWh/Nm^3	4.5 kWh/Nm^3
99.9995%	99.9995%	99.9995%	99.9995%
< 1 ppm v	< 1 ppm v	< 1 ppm v	< 1 ppm v
< 5 ppm v	< 5 ppm v	< 5 ppm v	< 5 ppm v
30 barg	30 barg	30 barg	30 barg
Depends on configuration	Depends on configuration	Depends on configuration	Depends on configuration
NA	NA	NA	NA
NA	NA	NA	NA
10 to 40ºC	10 to 40ºC	10 to 40ºC	10 to 40ºC
Proton Exchange Membrane	Proton Exchange Membrane	Proton Exchange Membrane	Proton Exchange Membrane
0.9 l/Nm^3	0.9 l/Nm^3	0.9 l/Nm^3	0.9 l/Nm^3

Compact Scale Hydrogen Plants

The C, H and S Series electrolysers feature state-of-the-art PEM technology in compact forms. They are easy to site in general purpose areas.

SPECIFICATIONS	C10	C20	C30
Nominal Production Rate	10 Nm^3/h	20 Nm^3/h	30 Nm^3/h
Production Capacity Dynamic Range	0 to 100%	0 to 100%	0 to 100%
Power Consumption by System	6.2 kWh/Nm^3	6 kWh/Nm^3	5.8 kWh/Nm^3
Purity	99.9998%	99.9998%	99.9998%
O_2-Content in H_2	< 1 ppm v	< 1 ppm v	< 1 ppm v
H_2O-Content in H_2	< 2 ppm v	< 2 ppm v	< 2 ppm v
Delivery Pressure	30 barg	30 barg	30 barg
Dimensions			
Electrolyser Enclosure – W x D x H	2.5 m x 1.2 m x 2 m	2.5 m x 1.2 m x 2 m	2.5 m x 1.2 m x 2 m
Power Supply Enclosure – W x D x H	1.7 m x 1 m x 2 m	1.7 m x 1 m x 2 m	1.7 m x 1 m x 2 m
Ambient Temperature	5 to 40ºC	5 to 40ºC	5 to 40ºC
Electrolyte	Proton Exchange Membrane	Proton Exchange Membrane	Proton Exchange Membrane
Feed Water Consumption	0.9 l/Nm^3	0.9 l/Nm^3	0.9 l/Nm^3

SPECIFICATIONS	H2	H4	H6
Nominal Production Rate	2 Nm^3/h	4 Nm^3/h	6 Nm^3/h
Production Capacity Dynamic Range	0 to 100%	0 to 100%	0 to 100%
Power Consumption by System	7.3 kWh/Nm^3	7 kWh/Nm^3	6.8 kWh/Nm^3
Purity	99.9995%	99.9995%	99.9995%
O_2-Content in H_2	< 1 ppm v	< 1 ppm v	< 1 ppm v
H_2O-Content in H_2	< 5 ppm v	< 5 ppm v	< 5 ppm v
Delivery Pressure	15 barg/30 barg option	15 barg/30 barg option	15 barg/30 barg option
Dimensions – W x D x H	1.8 m x 0.8 m x 1.9 m	1.8 m x 0.8 m x 1.9 m	1.8 m x 0.8 m x 1.9 m
Ambient Temperature	5 to 50ºC	5 to 50ºC	5 to 50ºC
Electrolyte	Proton Exchange Membrane	Proton Exchange Membrane	Proton Exchange Membrane
Feed Water Consumption	0.9 l/Nm^3	0.9 l/Nm^3	0.9 l/Nm^3

SPECIFICATIONS	S10	S20	S40
Nominal Production Rate	0.27 Nm^3/h	0.53 Nm^3/h	1.05 Nm^3/h
Production Capacity Dynamic Range	0 to 100%	0 to 100%	0 to 100%
Power Consumption by System	6.1 kWh/Nm^3	6.1 kWh/Nm^3	6.1 kWh/Nm^3
Purity	99.9995%	99.9995%	99.9995%
O_2-Content in H_2	< 1 ppm v	< 1 ppm v	< 1 ppm v
H_2O-Content in H_2	< 5 ppm v	< 5 ppm v	< 5 ppm v
Delivery Pressure	13.8 barg	13.8 barg	13.8 barg
Dimensions – W x D x H	0.8 m x 1 m x 1.1 m	0.8 m x 1 m x 1.1 m	0.8 m x 1 m x 1.1 m
Ambient Temperature	5 to 40ºC/5 to 50ºC option	5 to 40ºC	5 to 40ºC
Electrolyte	Proton Exchange Membrane	Proton Exchange Membrane	Proton Exchange Membrane
Feed Water Consumption	0.9 l/Nm^3	0.9 l/Nm^3	0.9 l/Nm^3

For reference only – specifications are subject to change. Please contact Nel Hydrogen for solutions to best fit your needs.

Are You Next?

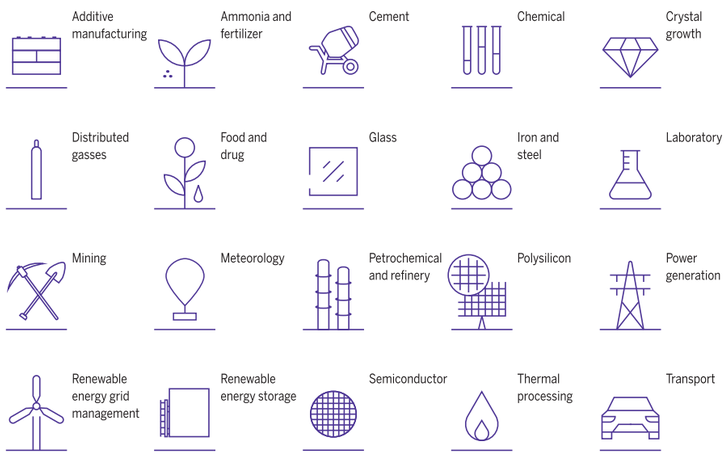
Hydrogen Business Development

Moving into hydrogen implies new territory and many opportunities. Investing in renewable hydrogen infrastructure requires solid solutions for operation, maintenance, ownership and financing. We realize technological advancement takes place in a wider context in which we can give advice, facilitate and play different roles.

Committed to the success of every customer, Nel Hydrogen has valuable experience across categories, covering most aspects of hydrogen entrepreneurship.

Nel Hydrogen builds hydrogen production facilities of all sizes and configurations. Our largest hydrogen plants to date: 135 MW. Challenge us, and we will be happy to discuss what solutions will fit your needs.

Markets we serve



Our world of electrolysers

www.nelhydrogen.com

PD-0600-0125 Rev D