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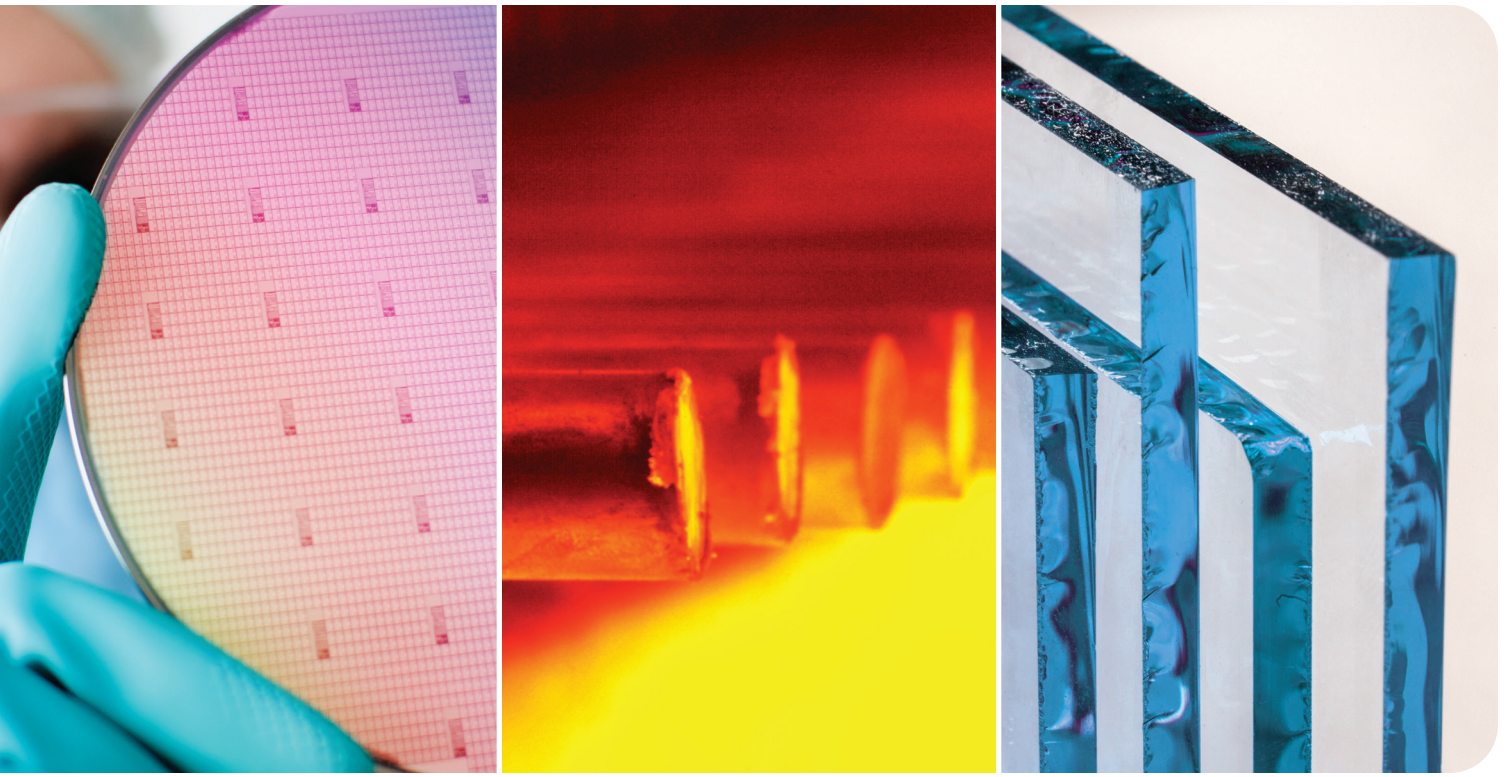
Hydrogen Generators

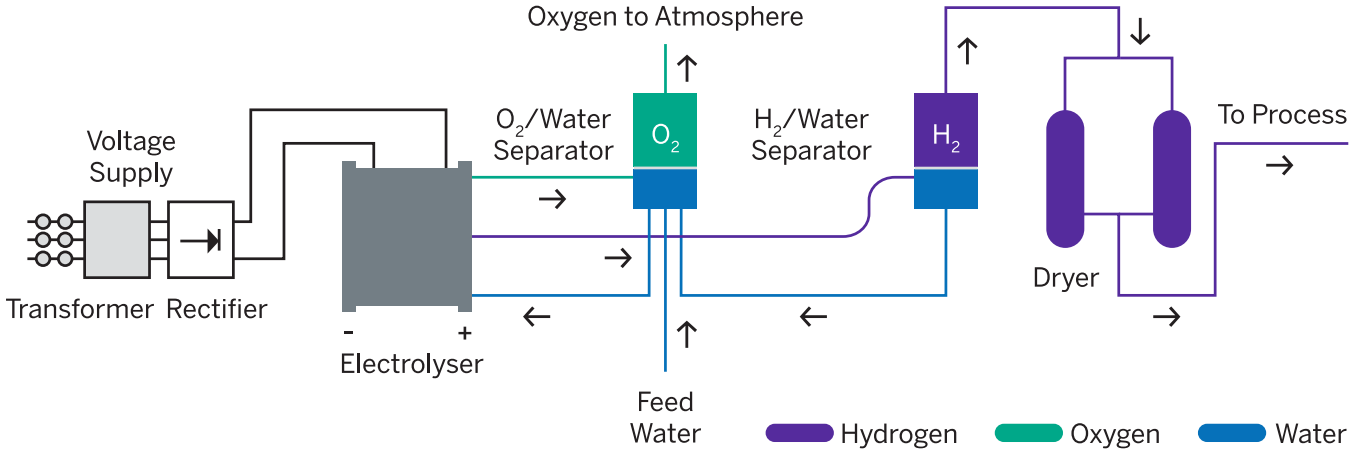


For High Purity Industrial Applications

number one by nature®

The Proton Exchange Membrane (PEM) Hydrogen Plant

Nel Hydrogen PEM water electrolysers are designed to meet the specific needs of high purity industrial applications. They provide fast response times and production flexibility. These state-of-the-art units offer turnkey solutions for the growing need for reliable, cost-effective, manufacturing 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.

ELECTROLYSER

The electrolyser is based upon proton exchange membrane technology. Hydrogen gas is generated at the cathode at customer convenient pressures. 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.

Compact Scale Hydrogen Plants

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

- Pure hydrogen at process pressure – up to 30 barg (435 psig) hydrogen and 99.9995% or 99.9998% purity, depending on unit
- Economical hydrogen supply – tracks electric costs
- Increased safety – no caustic chemicals
- Virtually zero stored hydrogen – eliminates the risk of flooding the space
- Small footprint – fraction of space needed compared to cylinders or trailers
- Reliable supply of hydrogen – field-proven reliability
- Fast and easy installation – virtually anywhere in a facility
- Automated – safe, unattended operation
- Low maintenance – requires as little as 4 hours of maintenance per year

C Series

C Series electrolysers produce up to 30 Nm^3/h of hydrogen gas at 99.9998% purity. They are ideal for a variety of industrial applications. These units replace the need for hydrogen tube trailers or liquid hydrogen storage, reducing operational safety risks associated with delivered hydrogen. They are easy to install in general purpose area.

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 on facility floor space and are easy to maintain.

S Series

S Series electrolysers produce up to 1.05 Nm^3/h of hydrogen gas at 99.9995% purity, They 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.

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	6.0 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 (435 psig)	30 barg (435 psig)	30 barg (435 psig)
Dimensions			
Electrolyser Enclosure – L x W 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 – L x W 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	7.0 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 – L x W 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

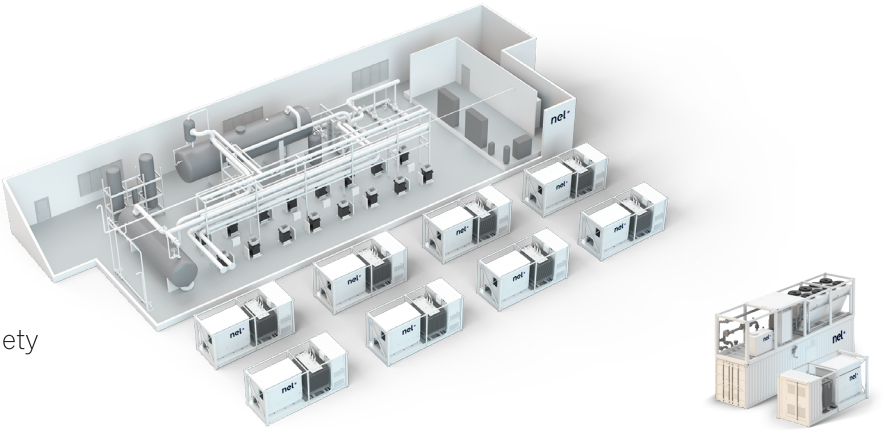
SPECIFICATIONS	S10	S20	S40
Nominal Production Rate	0.27 Nm^3/h	0.53 Nm^3/h	1.05 Nm^3/h
Production Capacity Dynamic Range	0 to 100%	0 to 100%	0 to 100%
Power Consumption by System	6.1 kWh/Nm^3	6.1 kWh/Nm^3	6.1 kWh/Nm^3
Purity	99.9995%	99.9995%	99.9995%
O_2-Content in H_2	< 1 ppm v	< 1 ppm v	< 1 ppm v
H_2O-Content in H_2	< 5 ppm v	< 5 ppm v	< 5 ppm v
Delivery Pressure	13.8 barg (200 psig)	13.8 barg (200 psig)	13.8 barg (200 psig)
Dimensions – L x W 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/5-50ºC 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.

Large Scale Hydrogen Plants

Nel Hydrogen is the acknowledged expert in large scale electrolysers. The M Series modular skid based platform enables flexible plant configuration and installation for medium to large scale hydrogen plants based on water electrolysis technology.

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 that can be containerized, these systems offer solutions that are well-suited for a variety of industrial applications.



SPECIFICATIONS	MC250	MC500
Net Production Rate	246 Nm^3/h	492 Nm^3/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		
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

SPECIFICATIONS	M2000	M3000	M4000	M5000
Net Production Rate	1,968 Nm^3/h	2,952 Nm^3/h	3,936 Nm^3/h	4,920 Nm^3/h
Production Capacity Dynamic Range	10 to 100%	10 to 100%	10 to 100%	10 to 100%
Average Power Consumption at Stack[1]	4.5 kWh/Nm^3	4.5 kWh/Nm^3	4.5 kWh/Nm^3	4.5 kWh/Nm^3
Purity – with optional high purity dryer	99.9995%	99.9995%	99.9995%	99.9995%
O_2-Content in H_2	< 1 ppm v	< 1 ppm v	< 1 ppm v	< 1 ppm v
H_2O-Content in H_2	< 5 ppm v	< 5 ppm v	< 5 ppm v	< 5 ppm v
Delivery Pressure	30 barg	30 barg	30 barg	30 barg
Footprint	Dependent upon configuration	Dependent upon configuration	Dependent upon configuration	Dependent upon configuration
Ambient Temperature	10-40ºC	10-40ºC	10-40ºC	10-40ºC
Electrolyte	Proton Exchange Membrane	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	0.9 l/Nm^3

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[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..

Find the Right Fit for Your Application

With more than 2,700 systems installed in over 75 countries and on all seven continents, our PEM water electrolysers are creating value around the world. These hydrogen generators offer clear advantages over older, conventional methods of hydrogen delivery. Our industrial customers are able to realize a rapid payback while dramatically improving plant safety by minimizing storage and handling. Whether your need is for a large scale hydrogen plant or a compact system, our engineers will custom tailor a solution to match your application.

Markets We Serve

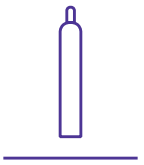

Additive manufacturing


Ammonia and fertilizer


Cement

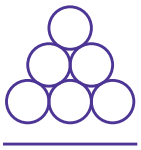

Chemical


Crystal growth


Distributed gasses


Food and drug

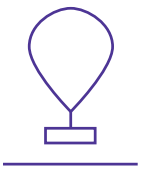

Glass


Iron and steel

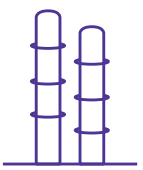

Laboratory

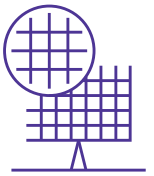

Leak detection

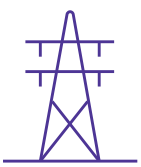

Lower flammability limit detectors


Meteorology


Mining


Petrochemical and refining


Polysilicon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