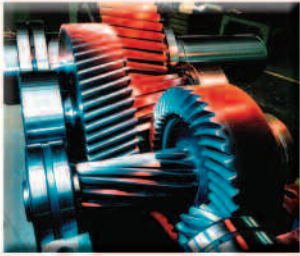


# Brilliant Ideas

## HOGEN<sup>®</sup>

On-Site Hydrogen  
Generation Systems for  
Materials Processing



Enhance Your Bottom Line



**Proton<sup>®</sup>**

A Distributed Energy  
Systems Company

# Brilliant Ideas

Materials processors must optimize their operations to ensure the highest quality parts at the lowest overall cost. The supply of reducing gas is a critical factor:

- Hydrogen Gas & Delivery Expenses
- Ammonia Compliance Costs
- Safety and Security
- DA, Exo & Endo Operational Costs
- Hydrogen Availability
- Personnel Productivity

Gas delivery in cylinders or tube trailers is becoming obsolete. Making hydrogen on-site with a HOGEN® Hydrogen Generator from Proton Energy Systems is the cost-efficient way to meet reducing atmosphere needs. With hundreds of units operating worldwide, Proton Energy is the market leader in the design and production of on-site hydrogen generator systems, providing increased efficiency, reliable purity, enhanced safety and lower total operation cost.

## Atmosphere Critical

A non-oxidizing atmosphere is critical to successful high temperature materials processing. Whether you employ pure hydrogen, a blended atmosphere, or a generated atmosphere based on ammonia or natural gas, you strive for consistency and accuracy in atmosphere composition. HOGEN Hydrogen Generators are a superior approach to hydrogen supply for reducing gas atmospheres.

## Problems

- Delivered hydrogen costs are rising
- Dissociated ammonia is being heavily regulated or not approved at all
- Exo and Endo utilize high maintenance reactors to process expensive natural gas

## Solution

HOGEN Hydrogen Generators produce pure, dry, hydrogen suitable for use in 100% hydrogen atmospheres or for blending into synthetic atmospheres.

**Gain these important advantages with HOGEN On-site Hydrogen Generators:**

- Lower, stable hydrogen cost
- Improved hydrogen purity (99.9995+%)
- No batch to batch hydrogen purity variations
- Blend gas exactly for your process
- Eliminate pressurized hydrogen gas storage
- Eliminate hydrogen deliveries, cylinder handling, ordering, and making and breaking hazardous gas connections
- No gas interruption due to external events



**HOGEN H Series  
Hydrogen Generator**  
76-228 SCF/hr  
(2-6 Nm<sup>3</sup>/hr)

**HOGEN S Series  
Hydrogen Generator**  
20-40 SCF/hr  
(0.5 to 1.0 Nm<sup>3</sup>/hr)



*Proton PEM Electrolysis Stacks,  
the heart of HOGEN Generators*

# Enhance Your Bottom Line

## A Family of HOGEN® Hydrogen Generators Meets Your Materials Processing Needs

Proton Energy's HOGEN product line spans the range of hydrogen demand profiles for materials processing.

- For requirements of 20-228 SCF/hr (0.5-6 Nm<sup>3</sup>/hr, 9-108 SLPM)
- Gang multiple units to serve larger needs
- Flexible design and options for specific needs

HOGEN hydrogen generators improve profit margins by providing ultra high purity hydrogen for a wide variety of important materials processing applications:

- Brazing
- Heat Treating
- Bright Annealing
- Crystal Growth
- Metal & Ceramic Sintering
- Nano Materials
- Electronic Fabrication
- Performance Coatings

## HOGEN Generators Feature:

- Proton Exchange Membrane - electrolysis process for ultra-high purity (99.9995+%) hydrogen
- Hydrogen at Process Pressure - up to 218 psig (15 bar) hydrogen output
- Automated, Unattended Operation
- Remote Monitoring/Alarms plus Ethernet Communication
- Low Maintenance - just 4-6 hours per year
- Fast and Easy Installation



HOGEN Generators on-site installations



## Satisfied Customers

A Colorado-based dental products manufacturer purchased a HOGEN Hydrogen Generator in late 2000 and a second unit shortly thereafter. Today, the HOGEN generators continue to provide high-purity gas, on-site and on demand, saving money and meeting zoning requirements.

*"Our HOGEN Generator has saved us a lot of money. Because we are not zoned to house an on-site cylinder inside city limits, it has helped us comply with safety standards. In fact, our fire marshal did an inspection after we installed the HOGEN and had a big smile on his face when he saw the self-contained hydrogen unit."*

Hollis Jones, Maintenance Technician  
Rocky Mountain Orthodontics Inc., Denver, CO

An East coast metallurgical production facility historically relied on ten deliveries per month of hydrogen cylinders to supply their plants' four sintering furnaces. They now rely on a HOGEN H 6m Hydrogen Generator to meet their demanding hydrogen needs.

*"Our plant analyzed the cost/benefit of delivered hydrogen gas, delivered liquid hydrogen and Proton Energy Systems' HOGEN H 6m Hydrogen Generator. The HOGEN system won on ease, reliability, portability and cost. Anyone setting up or reconfiguring their production facilities should consider a HOGEN Hydrogen Generator. Unlike dedicated cylinder storage areas or liquid hydrogen tank pads, Proton's portable HOGEN systems can easily accommodate evolving site plans."*

Mark Eisenmann, President  
Chand Eisenmann Metallurgical,  
Burlington, CT and Caribou, ME

# Technical Specifications

	HOGEN® S Series Generators		HOGEN® H Series Generators		
	S 20	S 40	H 2m	H 4m	H 6m
<b>HYDROGEN PRODUCTION</b>					
<b>Net Production Rate</b> Nm3/hr @ 0° C, 1 bar SCF/hr @ 70° F, 1 atm SLPM @ 70° F, 1 atm kg per 24 hours	0.53 Nm3/hr 20 SCF/hr 9.4 SLPM 1.14 kg/24hr	1.05 Nm3/hr 40 SCF/hr 18.8 SLPM 2.27 kg/24hr	2 Nm3/h 76 SCF/hr 35.8 SLPM 4.31 kg/24hr	4 Nm3/hr 152 SCF/hr 71.7 SLPM 8.63 kg/24hr	6 Nm3/h 228 SCF/hr 107.6 SLPM 12.94 kg/24hr
<b>Delivery Pressure</b>	13.8 barg 200 PSIG		15 barg 218 PSIG		
<b>Purity</b>	99.9995%				
<b>DI WATER REQUIREMENT</b>					
<b>Consumption Rate</b>	0.47 L/hr 0.13 gal/hr	0.94 L/hr 0.25 gal/hr	1.83 L/hr 0.50 gal/hr	3.66 L/hr 0.96 gal/hr	5.50 L/hr 1.42 gal/hr
<b>Pressure</b>	1.5 to 4 barg 21.8 to 58.0 PSIG				
<b>SYSTEM FEATURES</b>					
<b>Dimensions (W x D x H)</b>	79 cm x 97 cm x 106 cm 31" x 38" x 42"		180 cm x 81 cm x 198 cm 71" x 32" x 78"		
<b>Weight</b>	215 kg 475 lbs		700 kg 1500 lbs	747 kg 1600 lbs	794 kg 1700 lbs
<b>Electrical Specification</b>	205 to 240 VAC, single phase, 50 or 60 Hz		380 to 480 VAC, 3 phase, 50 or 60 Hz		
<b>Cooling</b>	Air-Cooled		Liquid-Cooled		
<b>Standard Features</b>	Fully automated, push button start/stop. E-stop. On-board H2 detection. Automatic fault detection and system depressurization.				
<b>Standard Siting Location</b>	Indoor, level ± 1°, 0 to 90% RH non-condensing, Non-hazardous/non-classified environment.				
<b>Ventilation</b>	Proper ventilation must be provided from a non-hazardous area.				
<b>SAFETY AND REGULATORY CONFORMITY</b>					
	cTUVus (UL and CSA equivalent), CE (PED, ATEX, LVD, Mach. Dir., EMC)				
<b>OPTIONS</b>					
	Proton offers a wide range of options to tailor your HOGEN hydrogen generation system to your specific operational requirements. Please contact your local Proton Energy representative to discuss options available to best fit your needs.				

Specifications subject to change. For full technical specifications contact Proton Energy Systems.

**Proton Energy Systems' HOGEN Hydrogen Generators are in place worldwide at plants requiring 76-228 SCF/hr(2-6 Nm<sup>3</sup>/hr) of hydrogen supply. Please contact us for a current reference list.**



# Proton®

10 Technology Drive  
Wallingford, CT 06492, USA  
203.949.8697 ▪ 203.949.8016 fax  
customerservice@protonenergy.com  
[www.protonenergy.com](http://www.protonenergy.com)



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