## PROTON<sup>®</sup> PEM

## **M** Series

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## Hydrogen Generation Systems



MODEL	M100	M200	M400		
Class	0.5 MW	1.0 MW	2.0 MW		
Description	<ul> <li>Fully-automated MW-class on-site hydrogen generator utilizing a modular skid-based design</li> <li>Tri-mode operation (selectable):</li> <li>Command-following mode allows operation based on available input power</li> <li>Load following mode automatically adjusts output 0-100% to match demand</li> <li>Tank filling mode operates with power-conservation mode during standby</li> </ul>				
Electrolyte	Proton Exchange Membrane (PEM) – Caustic-Free				
HYDROGEN PRODUCTION	·				
Net Production Rate Nm <sup>3</sup> /h @ 0°C, 1 bar SCF/h @ 70°F, 1 atm SLPM @ 70°F, 1 atm kg/24 h	103 Nm³/h 3,909 SCF/h 1,845 SLPM 222 kg/24 h	207 Nm³/h 7,857 SCF/h 3,708 SLPM 446 kg/24 h	413 Nm³/h 15,714 SCF/h 7,416 SLPM 892 kg/24 h		
Delivery Pressure – Nominal	30 barg (435 psig); full differential pressure $H_2$ over $O_2$				
Average Power Consumption at Stack per Volume of $\rm H_2$ Gas Produced $^{\rm 1}$	4.53 kWh/Nm <sup>3</sup>				
Average Power Consumed at Stack per Mass of $H_2^{}$ Gas <sup>1</sup>	50.33 kWh/kg				
Purity (Concentration of Impurities)	99.9% [ $H_2O$ < 500 ppm, $N_2$ < 2 ppm, $O_2$ < 1 ppm, all others undetectable]				
Purity (Concentration of Impurities with Optional High Purity Dryer)	ISO 14687-1:1999 Type 1 Grade C / ISO 14687-2:2012 Type 1 Grade D 99.9998% [ $H_2O$ < 2 ppm, $N_2$ < 2 ppm, $O_2$ < 1 ppm, all others undetectable]				
Start-Up Time (from Off State)	<5 min				
Ramp-Up Time (Minimum to Full Load)	<10 Sec				
Ramp Rate (% of Full-Scale)	≥ 15% per sec (Power Input Mode)				
Turndown Range	10-100% (Input Power Mode); 0-100% (H <sub>2</sub> Demand Mode)				
Upgradeability	Field upgradeable in 250 kW (52 Nm <sup>3</sup> /h) increments				
DI WATER REQUIREMENT					
Consumption Rate at Maximum Production	93 L/h (25 gal/h)	187 L/h (49 gal/h )	373 L/h (99 gal/h)		
Temperature	5°C to 40°C (41°F to 104°F)				
Input Water Quality	Required: ASTM Type II Deionized Water, < 1 $\mu$ S/cm (> 1 M $\Omega$ -cm) Preferred: ASTM Type I Deionized Water, < 0.1 $\mu$ S/cm (> 10 M $\Omega$ -cm)				

MODEL		M100	M200	M400		
ELECTRICAL SPECIFICATIONS						
Electrical Requirements		Typical installation: 10 kV and 20 kV, three phase + Neutral, 50Hz/60Hz; for lower voltage connection, consult Nel Hydrogen Applications Engineering Department for specific requirements and options Ancillary equipment powered by customer or optionally powered by Nel Hydrogen				
Power Quality		Designed to German TAB specification				
PHYSICAL CHARACTERISTICS						
Power Conversion Assembly – Includes Rectifiers, Transformer and AC Distribution	Quantity	1	2	4		
Classified Area Dimensions W x D x H	Water Circulation Skid	720 cm x 82 cm x 256 cm (283" x 32" x 101")	720 cm x 82 cm x 256 cm (283" x 32" x 101")	992 cm x 82 cm x 214 cm (390" x 32" x 843")		
	H <sub>2</sub> Gas Management Skid	332 cm x 58 cm x 208 cm (131" x 23" x 82")	332 cm x 58 cm x 208 cm (131" x 23" x 82")	332 cm x 58 cm x 208 mm (131" x 23" x 82")		
Unclassified Area	Power Conversion Assembly (each)	620 cm x 120 cm x 285 cm (244" x 47" x 112")				
Dimensions W x D x H	MCC	203 cm x 55 cm x 221 cm (80" x 22" x 87")				
	Controls	155 cm x 38 cm x 219 cm (61" x 15" x 86")				
Classified Area Weight	Water Circulation Skid (Operating)	5,163 kg (11,382 lbs)	5,481 kg (12,084 lbs)	10,403 kg (22,935 lbs)		
	H <sub>2</sub> Gas Management Skid	909 kg (2,004 lbs)	909 kg (2,004 lbs)	909 kg (2,004 lbs)		
Unclassified Area Weight	Power Conversion Assembly (each)	6,500 kg (14,330 lbs)	6,500 kg (14,330 lbs)	6,500 kg (14,330 lbs)		
	MCC	909 kg (2,004 lbs)	909 kg (2,004 lbs)	909 kg (2,004 lbs)		
	Controls	300 kg (661 lbs)	300 kg (661 lbs)	300 kg (661 lbs)		
ENVIRONMENTAL CONSIDERATIONS - DO NOT FREEZE						
Standard Siting Loc	ation	Indoor, 10-90% RH non-condensing for Classified and Unclassified Equipment Outdoor siting options available				
Storage/Transport	Temperature	5°C to 60°C (41°F to 140°F)				
Ambient Temperatu	Ambient Temperature Range 10°C to 40°C (50°F to 104°F)					
Altitude Range-Sea Level		1,000 m (3,281 ft)				
OPTIONS						
<ul> <li>Factory matched RO/DI water system</li> <li>Factory matched thermal control unit</li> <li>Dew point monitoring</li> </ul>		<ul> <li>High purity hydrogen dryer</li> <li>Air compressor</li> <li>Containerization</li> </ul>				

- Air compressor
   Containerization



Specifications are subject to change based on siting and configuration. Please contact Nel Hydrogen for solutions to best fit your needs.



<sup>1.</sup> Dependent on configuration and operating conditions.

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