At Hydrogenics, we are committed to safety and reliability in everything that we do. Our fuel cell expertise enables us to deliver flexible and customized solutions that meet your business needs.

**ADVANCED HYDROGEN SOLUTIONS**

Hydrogenics merges its stack with a balance-of-plant into one fully integrated unit, resulting in the **HyPM™ Power Module**. Our proven low pressure Proton Exchange Membrane (PEM) fuel cell stack architecture is at the core of HyPM’s superior product offering.

Our HyPM Power Module is designed to deliver superior performance, durability and reliability. We bring our integration experience to help you get the most out of your fuel cell system.

**PROVEN TECHNOLOGY - 65 YEARS IN THE MAKING**

At Hydrogenics we are committed to providing the world with sustainable hydrogen fuel cell energy solutions. Our stack technology is based on the successful HyPM™ Power Module, which is the result of over 65 years of experience in the field. We have delivered equipment for over 55 hydrogen fueling stations to support the growth in hydrogen fuel cell electric vehicles.

In the end it’s all about proven technology. Our global market experience, our expertise with world safety and engineering codes and our best-in-class service personnel, OEMs count on us for a safe and reliable solution every time.

**THE HYDROGENICS ADVANTAGE**

- Our products are designed to meet the highest safety standards.
- We offer a comprehensive warranty program.
- Our service team is available 24/7.
- We provide training and support to ensure smooth operation.
- We continuously improve our products through research and development.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Continuous Power kW</th>
<th>Dimensions (LxWxH) mm</th>
<th>Volume L</th>
<th>Mass kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD 4-200</td>
<td>339 x 250 x 224b</td>
<td>19b</td>
<td>25</td>
</tr>
<tr>
<td>HD 5-200</td>
<td>365 x 250 x 224b</td>
<td>20b</td>
<td>26</td>
</tr>
<tr>
<td>HD 8-200</td>
<td>444 x 250 x 222b</td>
<td>25b</td>
<td>28</td>
</tr>
<tr>
<td>HD 8-500</td>
<td>379 x 406 x 255b</td>
<td>41b</td>
<td>52</td>
</tr>
<tr>
<td>HD 10-200</td>
<td>496 x 250 x 222b</td>
<td>28b</td>
<td>33</td>
</tr>
<tr>
<td>HD 15</td>
<td>494 x 406 x 261b</td>
<td>52b</td>
<td>55</td>
</tr>
<tr>
<td>HD 30</td>
<td>719 x 406 x 261b</td>
<td>76b</td>
<td>75</td>
</tr>
<tr>
<td>HD 90</td>
<td>1582 x 1085 x 346a</td>
<td>594a</td>
<td>360</td>
</tr>
<tr>
<td>HD 180</td>
<td>800 x 375 x 980a</td>
<td>290a</td>
<td>720</td>
</tr>
</tbody>
</table>

Delivered equipment for over 55 hydrogen fueling stations to support the growth in Fuel Cell Electric Vehicles.

Fuel cells for the world’s first hydrogen commuter train.

**We’re ready.**

Hydrogenics Corporation
220 Admiral Boulevard
Mississauga, Ontario
Canada L5T 2N6
Phone: 905 361 3660
powersales@hydrogenics.com

Hydrogenics Europe N.V.
On Site Generation
Nijverheidsstraat 48 c
2260 Oevel, Belgium
Phone: +32(0)14 462 110
hydrogensales@hydrogenics.com

Hydrogenics USA
2870 Whiptail Loop
Suite 106
Carlsbad, California 92010
Phone: +1 858 386 8930
powersales@hydrogenics.com

Hydrogenics GmbH
Power Systems
Am Wiesenbusch 2
Halle 5
45966 Gladbeck, Germany
Phone: +49 2043 944 133

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At Hydrogenics we consistently deliver value for the customers we work with. Our needs typically differ from those of the mass market. This drives us to understand what is most important to your business, and to create hydrogen solutions that are superior to any conventional application. Our flexible power module platform allows us to customize applications based on your needs at a cost that is economically feasible for everyone.

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<tr>
<th>Continuous Power kW</th>
<th>Dimensions (LxWxH) mm</th>
<th>Volume L</th>
<th>Mass kg</th>
<th>Operating Current Adc</th>
<th>Operating Voltage Vdc</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD 4-200</td>
<td>339 x 250 x 224b</td>
<td>19b</td>
<td>25</td>
<td>0...200</td>
<td>20...40</td>
</tr>
<tr>
<td>HD 5-200</td>
<td>365 x 250 x 224b</td>
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<td>26</td>
<td>0...200</td>
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<td>HD 8-200</td>
<td>444 x 250 x 222b</td>
<td>25b</td>
<td>28</td>
<td>0...200</td>
<td>40...80</td>
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<tr>
<td>HD 8-500</td>
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<td>52</td>
<td>0...380</td>
<td>20...40</td>
</tr>
<tr>
<td>HD 10-200</td>
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<td>28b</td>
<td>33</td>
<td>0...200</td>
<td>50...100</td>
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<tr>
<td>HD 15</td>
<td>494 x 406 x 261b</td>
<td>52b</td>
<td>55</td>
<td>0...425</td>
<td>32...64</td>
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<tr>
<td>HD 30</td>
<td>719 x 406 x 261b</td>
<td>76b</td>
<td>75</td>
<td>0...500</td>
<td>60…120</td>
</tr>
<tr>
<td>HD 90</td>
<td>1582 x 1085 x 346a</td>
<td>594a</td>
<td>360</td>
<td>0 to 500</td>
<td>180…360 (2x)</td>
</tr>
<tr>
<td>HD 180</td>
<td>1582 x 1085 x 700a</td>
<td>1200a</td>
<td>720</td>
<td>0 to 1000</td>
<td>180…360 or 360…720</td>
</tr>
<tr>
<td>Celerity</td>
<td>800 x 375 x 980</td>
<td>290a</td>
<td>275</td>
<td>0 to 200</td>
<td>300…640</td>
</tr>
</tbody>
</table>

Delivered equipment for over 55 hydrogen fueling stations to support the growth in fuel cell electric vehicles.

**Fuel cells for the world's first hydrogen commuter train.**

The industry benchmark for durable, zero emission mobility.
WHY CHOOSE HYDROGENICS HYPM-HD?

Tried, tested and proven solutions for zero-emission mobility.

- Liquid-cooled advanced MEA PEM stack
- Integral Balance of Plant
- Advanced onboard controls and diagnostics
- Low pressure cathode air delivery
- -40°C sub-zero shutdown capability
- Rapid start-up and dynamic response
- Unlimited start-stop cycling
- No water required (for humidification)
- No nitrogen purge requirement
- Designed for ease of UL and CE system certifications

HyPM-HD includes additional ‘inside the box’ features (typically integrator-supplied):

- Anti-flooddry protection
- Air delivery sub-systems
- Integrated H₂ regulation

And useful options:

- Overall system controller
- USB controller kit
- Thermal management sub-system

HIGH QUALITY STANDARDS

Manufacturing of the HyPM is done in several stages, each ending in a quality monitor or “gate”. No HyPM moves to its next stage without sign-off from our quality personnel, very much to ensure that leaves our factory has been tested over its full operating range.

Hydrogenics complies with ISO 9001 and our HyPM products are designed to meet all applicable world engineering codes and standards, including CE, UL, CSA and relevant components of NEBS.

ENCLOSED SYSTEM

Enclosed System

Uses a closed cooling loop architecture to help prevent corrosion and extend the life of your fuel cell.

FULLY INTEGRATED SYSTEM

One compact fuel cell system allowing for easier, more seamless integration. Additional components are not needed to complete the system.

WATER-FREE OPERATION

Water-Free Operation

No onboard water or dedicated hardware required for humidification. With no residual water, there’s no risk of freezing or moisture issues.

LOW TEMPERATURE STARTS

Low Temperature Starts

Can be stored and operated in temperatures as low as -40°C degrees without fear of damage or failure.

UNLIMITED START/STOP CYCLES

Unlimited Start/Stop Cycles

Hydrogenics’ fuel cells can be turned on and off as many times as needed without degradation. Current technology on the market typically maxes out at 6,000 cycles.

COMPACT SIZE

Compact size for space constrained applications
WHY CHOOSE HYDROGENICS HYPM-HD?

- Tried, tested and proven solutions for zero-emission mobility.
- Liquid-cooled advanced MEA PEM stack
- Integral Balance of Plant
- Advanced onboard controls and diagnostics
- Low pressure cathode air delivery
- -40°C sub-zero shutdown capability
- Rapid start-up and dynamic response
- Unlimited start-stop cycling
- Robust, rugged and reliable
- No water required (for humidification)
- No nitrogen purge requirement
- Designed for ease of U3 and * system certifications

HyPM-HD includes additional *inside the box* features (typically integrator-supplied):
- *Anti-Åooddry protection*
- *Air delivery sub-systems*
- *Integrated H 2 regulation*

And useful options:
- Overall system controller
- *USB* *contactor kit*
- *Thermal management sub-system*

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Manufacturing of the HyPM is done in several stages, each ending in a quality monitor or "gate". No HyPM moves to its next stage without signoќ from our quality personnel, very /y7M that leaves our factory has been tested over its full operating range.

Hydrogenics complies with ISO 9001 and our HyPM products are designed to meet all applicable world engineering codes and standards, including CE, *O/: U3*: A A:M, and relevant components of NEBS.

Our HyPM-HD Power Module is cost effective and reliable for battery electric mobility applications:
- *Enclosed System*
  - Uses a closed cooling loop architecture to help prevent corrosion and extend the life of your fuel cell.
- *Fully Integrated System*
  - One compact fuel cell system allowing for easier, more seamless integration. Additional components are not needed to complete the system.
- *Water-Free Operation*
  - No onboard water or dedicated hardware required for humidification. With no residual water, there's no risk of freezing or moisture issues.
- *Low Temperature Starts*
  - Can be stored and operated in temperatures as low as -40°C degrees without fear of damage or failure.
- *Unlimited Start/Stop Cycles*
  - Hydrogenics' fuel cells can be turned on and off as many times as needed without degradation. Current technology on the market typically maxes out at 6,000 cycles.
- *Compact size* for space constrained applications.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Hydrogenics’ HyPM-HD</th>
<th>Competitor Leading</th>
<th>Competitor Leading</th>
<th>Competitor Leading</th>
<th>Competitor Leading</th>
<th>Competitor Leading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact size</td>
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<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
</tr>
<tr>
<td>Can be stored and operated</td>
<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
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<tr>
<td>Zero-emission mobility</td>
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<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
</tr>
<tr>
<td>No residual water or moisture issues</td>
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<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
</tr>
<tr>
<td>Free of onboard water requirement</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
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<tr>
<td>Unlimited standby-to-run cycles per hour</td>
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<td>️</td>
<td>️</td>
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<td>Able to remove power immediately on shutdown</td>
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<td>️</td>
<td>️</td>
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<tr>
<td>Low pressure cathode air delivery</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
</tr>
<tr>
<td>Advanced onboard controls and diagnostics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
</tr>
<tr>
<td>Unlimited start-stop cycling</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
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<td>️</td>
</tr>
<tr>
<td>Robust, rugged and reliable</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
<td>️</td>
</tr>
<tr>
<td>Rapid start-up and dynamic response</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
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</tr>
<tr>
<td>-40°C sub-zero shutdown capability</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
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<tr>
<td>Low pressure cathode air delivery</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
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<tr>
<td>Integrated H₂ regulation</td>
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<td>✓</td>
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<tr>
<td>Anti-flood dry protection</td>
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<td>️</td>
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<td>️</td>
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<tr>
<td>No nitrogen purge requirement</td>
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<td>✓</td>
<td>✓</td>
<td>️</td>
<td>️</td>
<td>️</td>
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<tr>
<td>No water required (for humidification)</td>
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<td>✓</td>
<td>✓</td>
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<td>Enclosed System</td>
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<td>✓</td>
<td>️</td>
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</tr>
<tr>
<td>Uses a closed cooling loop architecture</td>
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<tr>
<td>Implemented start-up temperature</td>
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<td>✓</td>
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<tr>
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<tr>
<td>Integral balance of plant</td>
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<td>✓</td>
<td>✓</td>
<td>️</td>
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<tr>
<td>Non-zero downtime</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Shipping/storage temperature range</td>
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<td>✓</td>
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</tr>
<tr>
<td>✓ -40°C to +65°C</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>️</td>
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<tr>
<td>Tested, tried and proven solutions</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Zero-emission mobility</td>
<td>✓</td>
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<td>️</td>
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<td>✓</td>
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<td>✓</td>
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<td>✓ -40°C to +65°C</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>️</td>
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<td>️</td>
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For more information please visit www.hydrogenics.com

We're ready.

Powersales@hydrogenics.com
Phone: 905 361 3660
Canada L5T 2N6
Mississauga, Ontario
220 Admiral Boulevard
Hydrogenics Corporation

hydrogensales@hydrogenics.com
Phone: +32(0)14 462 110
2260 Oevel, Belgium
Nijverheidsstraat 48c
Hydrogenics Europe N.V.

Hydrogenics GmbH
Phone: +49 2043 944 133
45966 Gladbeck, Germany
Halle 5
Am Wiesenbusch 2
Power Systems

powersales@hydrogenics.com
Phone: +1 858 386 8930
Carlsbad, California 92010
Suite 106
Hydrogenics Corporation

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