

## » PEM Fuel Cell Product Portfolio

Ballard Power Systems offers a comprehensive portfolio of PEM (proton exchange membrane) fuel cell products designed to meet the needs of a wide range of motive and stationary power applications. Contact us at [marketing@ballard.com](mailto:marketing@ballard.com) to discuss your requirements.

PRODUCTS ▲	FCvelocity™-9SSL		FCvelocity™-HD6		FCgen™-1020ACS		Dantherm Power DBX2000 & DBX5000		FCgen™-1300		CLEARgen™	
												
COMMERCIAL INFORMATION	Market	Material Handling	Bus	Backup Power				Distributed Generation				
	Application	Forklift trucks – Classes I, II and III	Buses	Telecom Network Outages				Multi-MW Power Generation				
												
	Durability/ Lifetime Target	Up to 10,000 hrs.	Up to 12,000 hrs.	Up to 4,000 hrs.				Up to 20,000 hrs. ■	Up to 20 years			
	Primary Benefits (versus incumbent solution)	Positive economic payback through higher productivity; environmental benefits	Reduction in greenhouse gas emissions; operating efficiency gains	Positive economic payback through higher reliability; environmental benefits				Zero-emission power supply featuring dynamic response, high efficiency, robust and reliable operation				

PHYSICAL CHARACTERISTICS	Length	92 – 302 mm	1530 mm	110 – 495 mm	628 & 555 mm	233 – 473 cm	13.7 m ●
	Width	760 mm	871 mm	103 mm	446 & 500 mm	490 mm	2.4 m ●
	Height	60 mm	495 mm	351 mm	355 & 611 mm	180 mm	2.9 m ●
	Weight (dry)	7.1 – 17 kg	350 – 404 kg	4 – 15 kg	40 & 75 kg	8.3 – 22.2 kg	30,000 kg ●
	Number of Cells (min/max)	20 – 110	Not applicable	10 – 80	Not applicable	27 – 120	Not applicable

PERFORMANCE	Rated Power (beginning of life)	3.8 – 21.0 kW	75 and 150 kW	0.45 – 3.6 kW	1.7 kW & 5.0 kW (net)	2.4 – 10.5 kW	500 kw to multi-megawatt (net)
	Rated Current	300 Amps	300 Amps	65 Amps	Not applicable	135 Amps	Not applicable
	Voltage	12.8 – 70.2 volts DC	230 – 730 volts DC	6.8 – 55 volts DC	45 – 57 & 45 – 55 volts DC	17.5 – 77.6 volts DC	380 – 480 volts AC
	Cell Efficiency (beginning of life LHV)*	51 – 69%	60 – 71%	51 – 67%	Not applicable	54 – 64%	System efficiency 46 – 50%

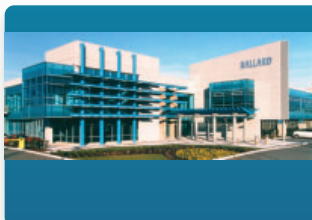
- NOTES:
- ▲ Ballard also manufactures FCvelocity™-1100 fuel cell stacks for select automotive customers
  - Dependent on duty cycle
  - Applicable for 1MW system
  - ♦ LHV=Lower Heating Value & represents the energy available in hydrogen fuel. To compare, diesel engine efficiency is typically ~20%. Fuel cell system efficiency will be lower than stack efficiency because of parasitic losses – expect an additional 5-10% loss in efficiency.

# BALLARD®

SMARTER SOLUTIONS FOR A CLEAN ENERGY FUTURE

PRODUCTS <sup>▲</sup>	FCvelocity-9SSL		FCvelocity-HD6		FCgen-1020ACS		Dantherm Power DBX2000 & DBX5000		FCgen-1300		CLEARgen	
												
OPERATING CONDITIONS	Fuel Composition <sup>+</sup>	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen	Hydrogen
	Fuel Consumption (max continuous power)	~42-230 sL/min	1.3 – 2.5 g/s	~5 – 40 sL/min	0.87 & 0.95 Nm/kWH	26.7 – 119 sL/min (w/H <sub>2</sub> recirculation)	63 kg/hr <sup>▲</sup>					
	Fuel Pressure	1.2 (bar)g	16 (bar)g	0.16 – 0.56 bar(g)	5.5 bar(g)	0.3 bar(g)	10 psig					
	Fuel Pressure Drop	0.26 bar	Not applicable	Not applicable	Not applicable	0.1 bar	Not applicable					
	Fuel Humidity	75% RH	Dry	Dry	Dry	>90% RH	0 – 100% RH					
	Oxidant Composition	Air	Air	Air	Air	Air	Air					
	Oxidant Pressure	1.0 bar(g)	1.2 bar(g)	Ambient	Ambient	0.3 bar(g)	Ambient					
	Oxidant Pressure Drop	0.46 bar(g)	1.16 bar(g)	~150 Pa @ max ambient temperature	Not applicable	0.18 bar(g)	Not applicable					
	Oxidant Humidity	120%	Ambient	0 – 100% RH (ambient)	0 – 100% RH (ambient)	>90% RH	0 – 100% RH (ambient)					
	Coolant	De-ionized Water and/or Ethylene Glycol mix	De-ionized Water/ Ethylene Glycol mix	Air	Air	De-ionized water, ethylene glycol and/or propylene glycol	Water, ethylene glycol and/or propylene glycol					
	Cooling Inlet Temperature	49° – 60°C	50° – 66°C	-40° – +52°C	Not applicable	40° – 72°C	<55°C					
	Maximum Coolant Pressure Drop	1.1 bar	1.4 bar	Same as oxidant pressure drop	Not applicable	Dependent on coolant type	Not applicable					
	Ambient Temperature (operating)	-25° – +75°C	-40° – +50°C	-40° – +52°C	-20° – +40°C	-5° – +70°C	-40° – +40°C					
	Minimum Stack Startup Temperature	>2°C	>75°C	>-10° to +52°C	Not applicable	≥5°C	≥5°C					
Additional Features	Meets automotive shock & vibration requirements	CANbus control Interface; IP53 enclosure	Simplified system design – open cathode stack	Optional cold weather kit								

NOTES: <sup>+</sup> For hydrogen applications, Ballard recommends hydrogen purity of 99.99% or better  
<sup>▲</sup> Ballard also manufactures FCvelocity®-1100 fuel cell stacks for select automotive customers



Ballard Power Systems, Inc. is recognized as a world leader in the design, development, manufacture and sale of clean energy fuel cell products. Our family of stationary and motive power products offer important business benefits not available from traditional power sources.

Learn how to put fuel cells to work, contact us: [marketing@ballard.com](mailto:marketing@ballard.com) or call (+1) 604.454.0900.

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Specifications and descriptions in this document were in effect at the time of publication. Ballard Power Systems, Inc. reserves the right to change specifications, product appearance or to discontinue products at any time (5/2011)

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