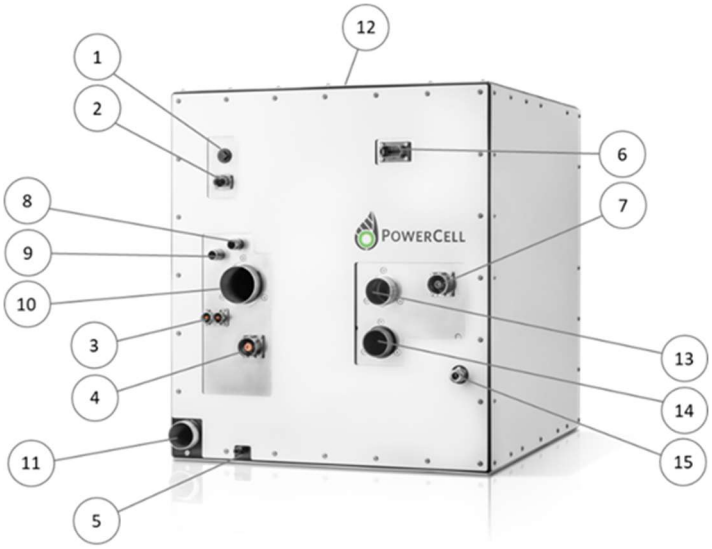
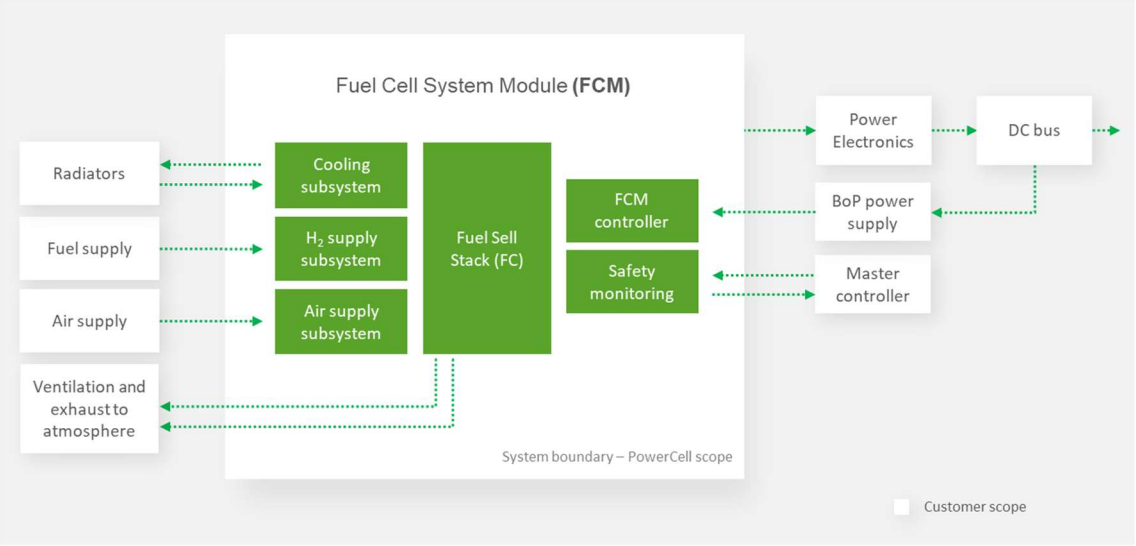
MS-100 Fuel Cell System

Technical description

Interface description



Electrical connections		Mechanical connections	
1	Ethernet	8	Components cooling inlet
2	HV supply	9	Components cooling outlet
3	24V supply	10	Air inlet
4	Negative power output terminal	11	Exhaust
5	Grounding point	12	Degassing port
6	External signal interface	13	Fuel cell stack cooling inlet
7	Positive power output terminal	14	Fuel cell stack cooling outlet
		15	Fuel inlet



Configuration [1] [2]

Max net power	100 kW
Dimensions	606 x 696 x 674 mm
Volume	284 l
Weight	170 kg

Performance

Gross output at rated power	292 V / 380 A
Voltage output (peak power EOL to OCV[3] BOL)	250 - 500 V, max 570 VDC
Current output	60 - 420 A [4]
Ramp-up speed	50 A/s and 13 kW/s
System heat output	up to 140 kW + 10 kW [5]
Coolant outlet temperature	80°C
Fuel quality	Pure hydrogen: ISO 14867-2 and SAE J2712
Fuel inlet pressure	8-12 bar(g)[6]
Fuel consumption	1250 NLPM [7]
Efficiency (peak, BOL)	58% [8]
Efficiency (rated power, BOL)	45% [8]
Start-up time	Off to standby: 10s, Standby to run: 10s
Lifetime	20 000 h [9]
Communication and control	CAN bus 500 kpbs

Environment

Altitude	0 to 2000 meters
Location	Pollution degree 3 or better
Temperature	-30 to 45°C [10]
Humidity	30 to 95% relative humidity; non-condensing
Regulation and standards [11]	E/ECE/324/Rev.2, /Add.99/Rev.2, FMVSS 305-01, ISO 23273:2013, SAE J1766:201401, SAE J2578:201408
IP classification	IP54

[1] Target values, the actual value is application dependent.
[2] Customized configurations can be made, feasibility evaluated at request.
[3] OCV = Open Circuit Voltage (i.e. in no load condition, 0 A).
[4] Other limitations might apply from external power electronics.
[5] Fuel cell stack and BoP components (cathode compressor + intercooler).
[6] 3-8bar(g) is feasible, but low hydrogen feed pressure affects system performance.
[7] Hydrogen consumption at 100kW Beginning of Life.
[8] Excluding losses from DCDC and external cooling system (e.g. radiator fans etc.).
[9] Expected lifetime.
[10] Start-up from sub-zero degrees requires external power assistance.
[11] Designed with respect to the following standards.

Technical specifications

Fuel	
Fuel composition	Pure hydrogen, ISO 14687:2019 and SAE J2719_201511 [1]
Supply pressure	8-12 bar(g), rated 10 bar(g) [2]
Supply temperature	5 – 70°C, rated 10°C
Fuel consumption	60 – 1500 NLPM

Cathode inlet	
Quality	Filtered air
Pressure	Atmospheric pressure
Temperature	-30 - 45°C
Flowrate	900 - 6800 NLPM [3]
Contaminants	See *PowerCell S3 Extended Data.*

Exhaust	
Pressure	Atmospheric pressure [4]
Temperature	< 90°C, rated 80°C
Flowrate	< 6800 NLPM [3]

Cooling	**Component cooling**	**Fuel cell stack cooling**
Flowrate	< 60 l/min	< 170 l/min
Quality	50/50% Water/Glycol [5]	Glysantin® FC G20-00/50 [5]
Inlet pressure	< 1 bar(g)	< 1.4 bar(g)
Inlet temperature	< 60°C	5 – 65°C
Outlet temperature	< 70°C, rated 26°C	< 90°C
Heat exchanger capacity	11 kW [6]	< 140 kW

Electrical	
HV supply	340 – 849 VDC, max. current = 50 Arms, < 20 kW
24 V supply	< 3 kW
Load requirements	
Forward leakage current	< 1 µA
Reverse current	< 1 µA
Ripple current	< 8 A, peak to peak
Classification	
Appliance class	Max. class II [7]
Pollution degree	Max. 2 [8]
Overvoltage category	Max. 2 [9]

[1] The fuel quality requirements comply with ISO 14687-2, SAE J2719 and T/CECA-G 0015 2017.
[2] Customized configurations can be made, feasibility evaluated at request, stable pressure required.
[3] Normal conditions at 0°C and 1 atm.
[4] Piping shall be done in a way that atmospheric pressure is not exceeded by 50 mbar at the given flowrate.
[5] The material compatibility in the external cooling loop needs to be verified.
[6] Capacity depends on set-up of external cooling loop, incl. cooling for DCDC converter.
[7] IEC 61140
[8] IEC/EN 60950-1
[9] IEC/EN 60950-1