1. Terminology

PEM fuel cell:
A PEM (Proton Exchange Membrane) fuel cell is a device that converts hydrogen and oxygen into water and electricity.

A fuel cell stack:
It includes a plurality of plate-like fuel cells arranged along an axis generally parallel to cell thickness with electrically conductive separator plates between each pair of cells.

Reactants:
Reactant is a material used to start a chemical reaction. In the fuel cell the reactants are air and hydrogen by which the electricity will be generated.

Humidification:
A process to humidify the proton exchange membranes for optimal performance.

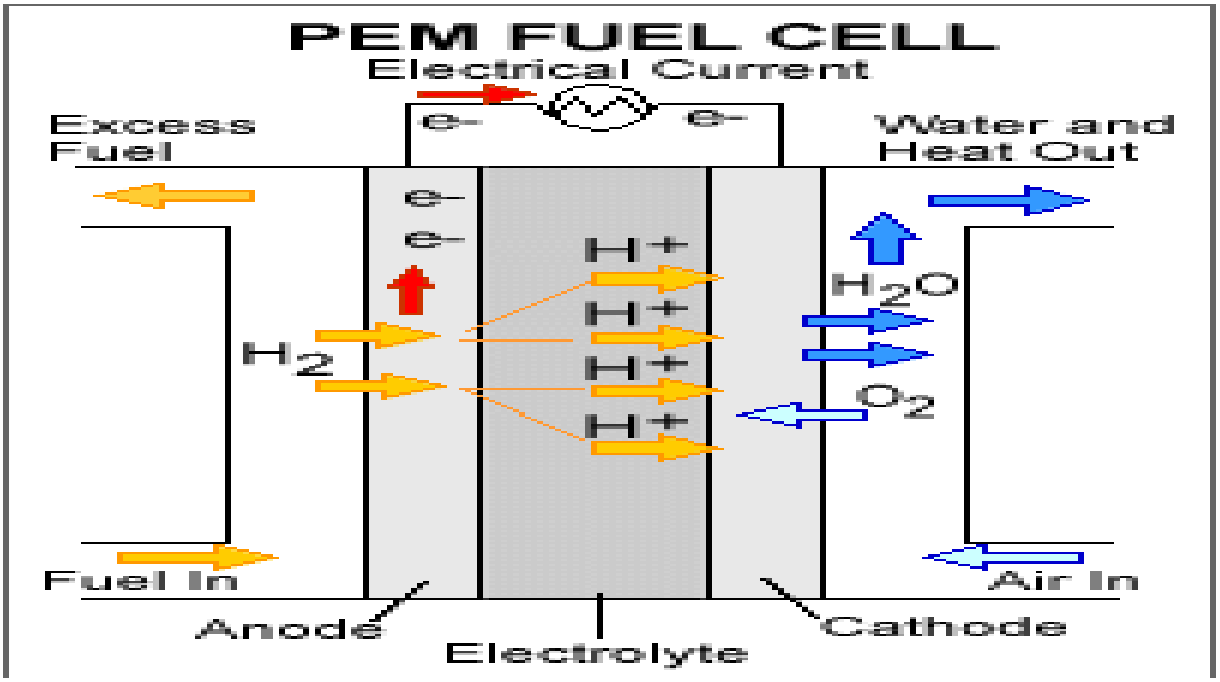
Blower:
Fans attached to fuel cell stack to supply cooling air and process air.

Purging valve:
Excess water and hydrogen will be dispelled from the fuel cell flow channels via purge valve.

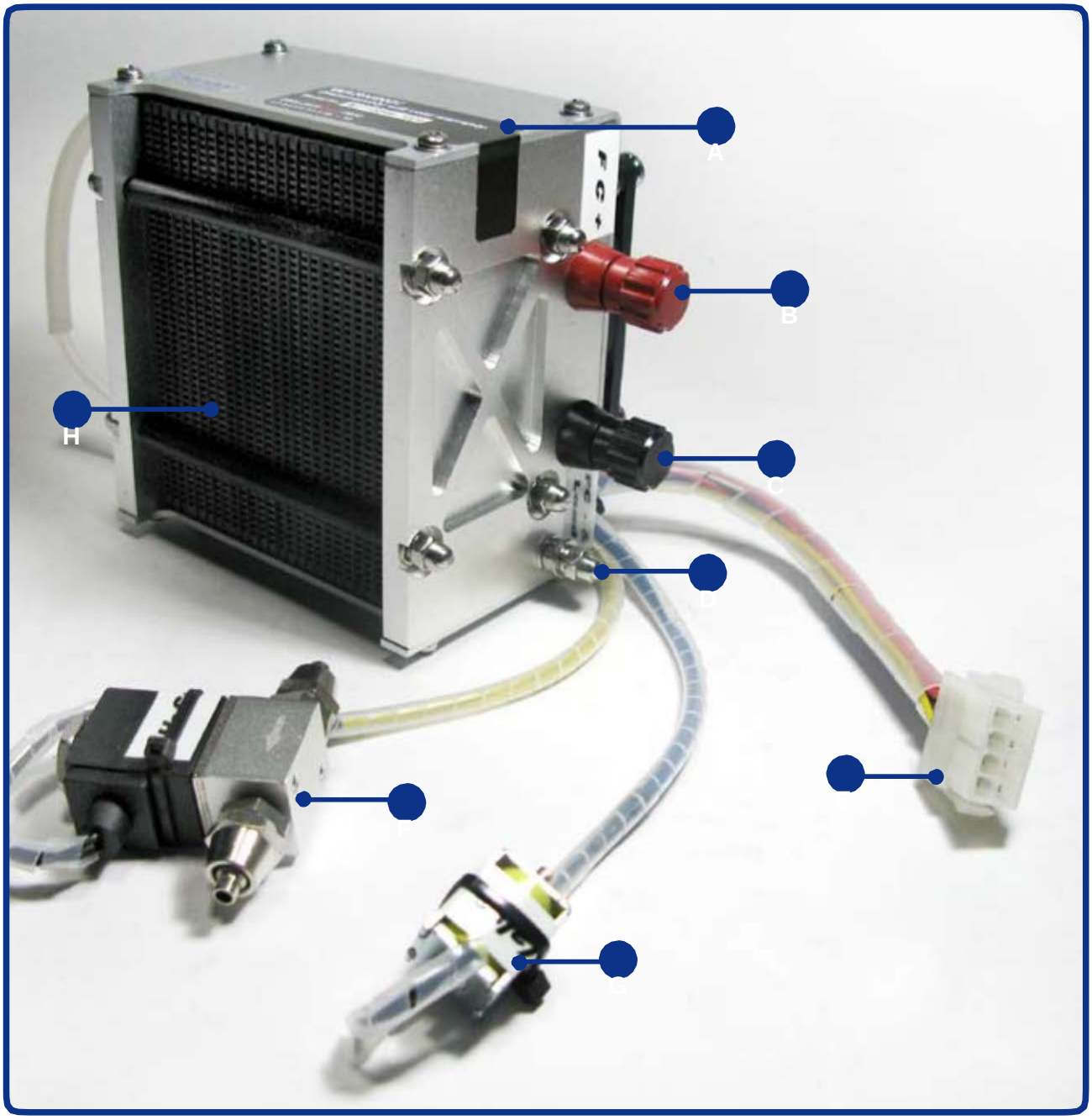
SCU:
Short circuit unit – the short circuit will be controlled for good performance of the stack.

Mass flow per minute:
The amount of hydrogen consumed to run the fuel cell at a certain power.

Fuel Cell Schematics:



Fuel Cell Module Details:



A: Warning labels

B: FC+ connector

C: FC- & load- connector

D: Grounding cable connector

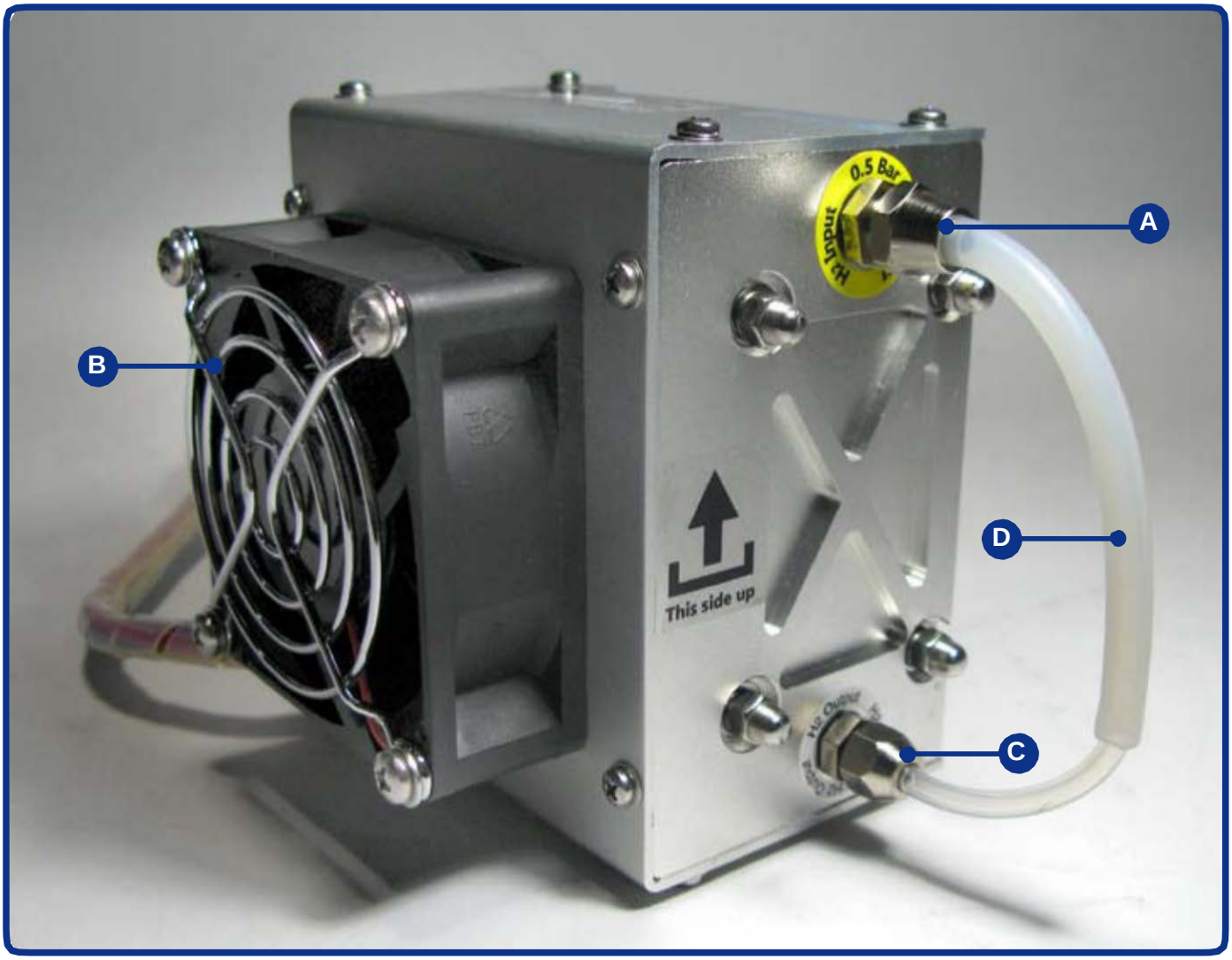
E: Controller multi-connector

F: H2 supply valve

G: H2 purge valve

H: Fuel cell air inlet side

Note: Pictures in the manual are only for reference, takes material object as the standard.



A: H2 inlet connector

B: Blower

C: H2 outlet connector

D: Silicon tube

Note: The silicon tube connected between the hydrogen input and hydrogen output is to keep the membrane humidity to maintain the fuel cell stack in best performance. After the stack is finished using, connect the silicon tube between the input and output for keeping the membrane humidity. See FAQ how to maintain the fuel cell stack.

2. Stack and System Component Information

1. Stack

Is made up of plate-like cells with air channels to allow the flow of air across the membrane. The membrane facilitates the flow of Hydrogen creating the release of electrons. Electrically conductive separator plates between each pair of cells enable the flow of electrons. The stack aspect is that they are all placed on top of each other and held together by epoxy endplates.

2. H2 Supply Valve

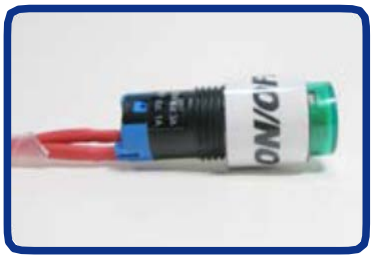
It controls the H2 input. When the controller turns on, also the H2 supply valve does. When system turns off, it is in the off position for preventing hydrogen leakage.

3. H2 Purge Valve

It purges out the water and air gas redundant in the fuel cells.

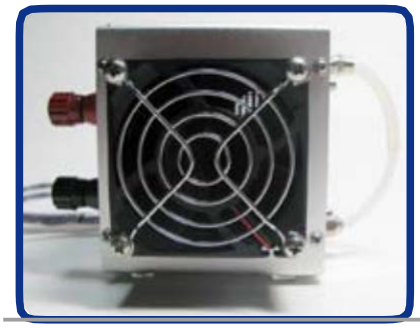
4. Short Circuit Unit

It ensures best performance of the fuel cells.



5. On/Off Switch

Hold it for 2 seconds for either on or off operation.



6. Blower

Supply air to the fuel cells and meanwhile decrease the temperature of the stack.

7. Controller Connector

Connect the stack to the T-sensor/blower/purging valve/ input valve on the controller.

8. Controller

Controls the stack temperature, blowers, hydrogen input, purging and short circuiting of the stack.

9. H2 Input/Output connectors

H2 OUT: connect the tube shown in 11 below.
H2 IN: connect the tube shown in 11 below.

10. Fuel Cell +/Fuel Cell-&Load- Connectors

FC+ of the controller is connected to the fuel cell positive pole.

FC- of the controller is connected to the fuel cell negative pole.

11. Tube for H2 Input and Output

The tube with 6mm outer diameter and 3mm inner diameter is connected to the H2 IN as in 9 above and to the input valve of the hydrogen source. H2 output tube with 4mm outer diameter and 2mm inner diameter is connected to the purging valve on one end and the H2 OUT the other.

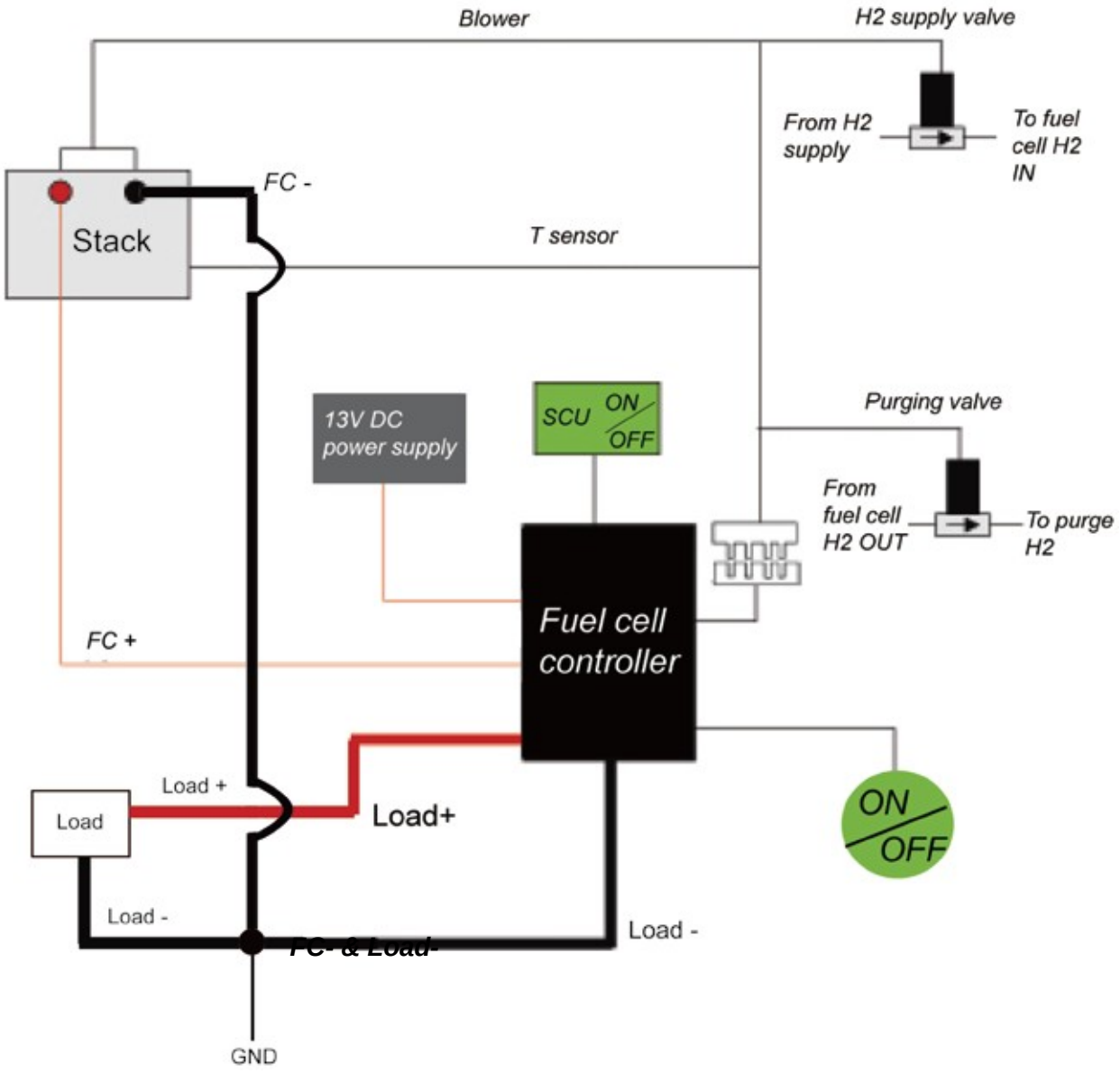
12. Grounding cable

Make stack grounded.
Note: After the fuel cell stack is finished using, disconnect the grounding cable.

4. Technical Specification

Type of fuel cell	PEM
Number of cells	20
Rated Power	100W
Performance	12V @8.3A
H2 Supply valve voltage	12V
Purging valve voltage	12V
Blower voltage	12V
Reactants	Hydrogen and Air
External temperature	5 to 30ºC
Max. stack temperature	65ºC
H2 Pressure	0.45-0.55bar
Hydrogen purity	≧99.995% dry H2
Humidification	self-humidified
Cooling	Air (integrated cooling fan)
Stack weight (with fan & casing)	1290 grams(±50grams)
Controller weight	400 grams(±30grams)
Dimension	11.8cm x 10.4cm x 9.4cm
Flow rate at max output*	1.3 L/min
Start up time	≦30S at ambient temperature
Efficiency of stack	40% @ 12V
Low voltage shut down	10V
Over current shut down	12A
Over temperature shut down	65℃
External power supply**	13V (±1V), 5A

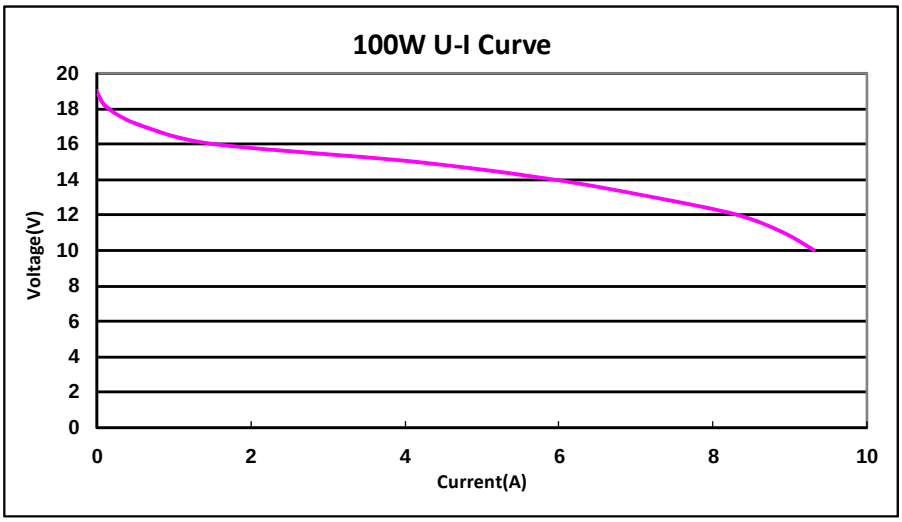
6. System Setup Diagram

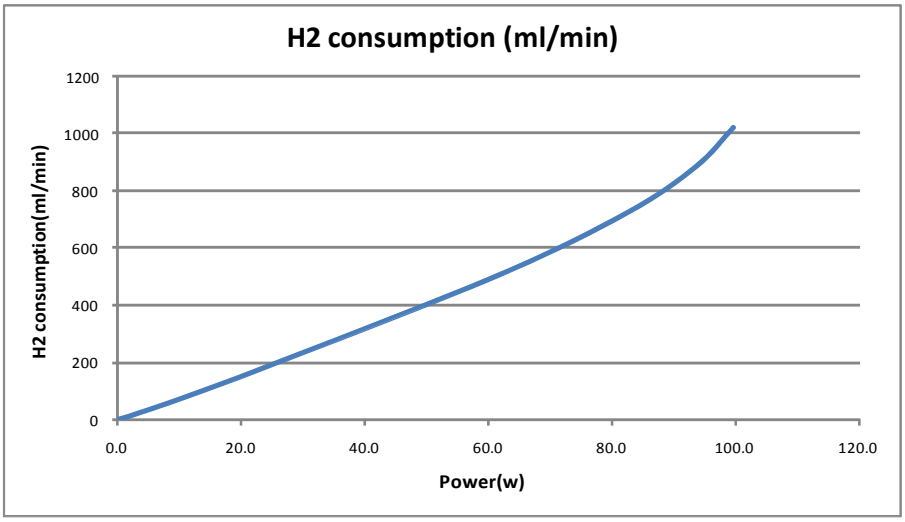


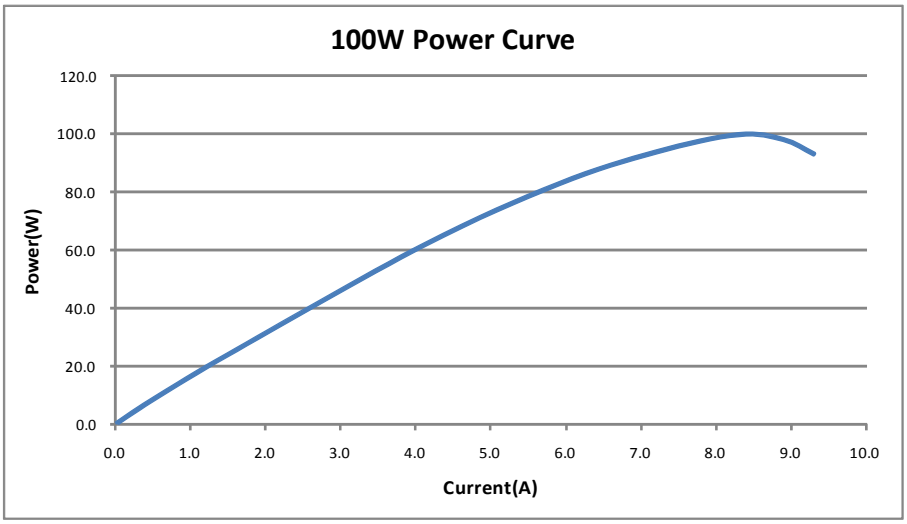
SCU: Short Circuit Unit
GND: Grounding

9. Performance Characteristics

Performance characteristics of the stack are presented. All performance data is given for baseline operating conditions, defined at sea-level and room ambient temperature.







13. FUEL CELL DRAWING