Horizon
Fuel Cell Technologies

2000W Fuel Cell Stack
User Manual

V2.0
Updated 25 Jan 2010

OVERVIEW OF THE STACK

Thank you for choosing our fuel cell stack. The Horizon fuel cell stack is an air-cooled, light weight and compact fuel cell stack.

Please read all instructions carefully prior to product use and keep this manual for future reference.

Further copies can be obtained from Horizon Fuel Cell Technologies or by emailing: support@horizonfuelcell.com

Please refer to the Horizon website for latest information: www.horizonfuelcell.com

Specifications and descriptions in this document were in effect at the time of publication. Horizon Fuel Cell Technologies reserves the right to change specifications, product appearance or to discontinue products at any time.

IMPORTANT

In order for the warranty to come into effect the stack must be registered on the Horizon Warranty Page at: www.horizonfuelcell.com/warranty.htm

Do not attempt, under any circumstance, to disassemble or inappropriately tamper with the fuel cell. There will be no returns, refunds or exchanges should disassembly or tampering occur. If you have questions or need help with regards to the fuel cell and its technology contact: support@horizonfuelcell.com

Table of Contents

1. Terminology

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

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:
humidity that the fuel cells need for running.

Blower:
supply air to the fuel cells and meanwhile decrease the temperature in the stack.

Dead ended valve:
purge valve for the controlling of the gas purging.

Mass flow per minute:
the total amount of the hydrogen flow through the fuel cell every minute, which the hydrogen supply can be calculated.

HFCT:
Horizon Fuel Cell Technologies

2. Technical Specifications

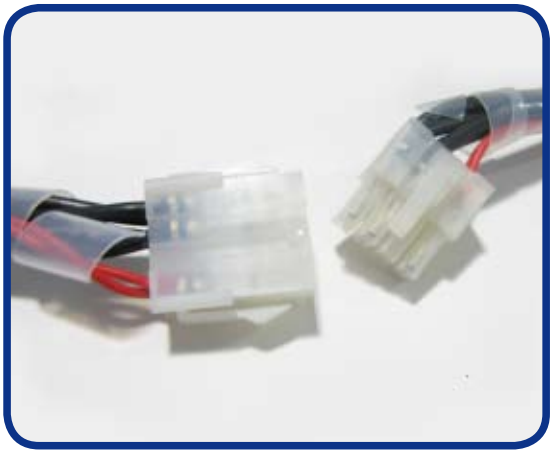
Control electronics included:

Type of fuel cell	PEM
Number of cells	48
Rated power	2000W
Rated performance	29V @ 69A
Reactants	Hydrogen and Air
External temperature	5 to 30°C
Max stack temperature	65°c
H2 Pressure	0.05-0.065Mpa
Humidification	self-humidified
Cooling	Air (integrated cooling fan)
Weight (with fan & casing)	7000 grams
Controller	1000 grams
Dimensions	40cm x 16 cm x 22cm
Flow rate at max output*	28l/min
Start up time	30s in 20°C (store for less than 1 month)
Efficiency of stack	40% @ 28.8V
Low voltage shut down	24V
Over current shut down	90A
Over temperature shut down	65°c
External power supply **	12-14V, 10A
***the flow rate may change with the power output **system electronics need external power supply**	

3. System Set-Up

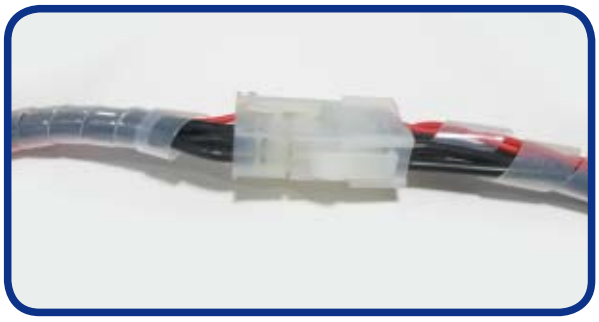
STEP1:

Connect the connectors of the controller and the stack (1A, 1B), to get the blower, the temperature sensor, the hydrogen supply valve and the purge valve under control. The finished connection is shown in 1C.



1A

1B



1C

STEP2:

Connect the controller and the stack as the output power also should be under controlled. Connect controller "FC+" and controller "FC-" to stack "FC-&Load-". The finished connection is shown in 2D.

2A

2B

2C

2D

STEP3:

Connect the stack to a stable power supply through the “DC 13V” connectors (3A), and the voltage of the power supply should be between 12V to 14V.

3A

STEP4:

Keep the SCU (Short Circuit Unit) switch at "1" normally. Only if the short circuit makes some problems in using.You can switch at "0" to shut off the short circuit.

4A

STEP5:

Connect the Hydrogen supply valve to the stack. The Hydrogen supply valve will prevent damage from the Hydrogen while the stack is off. Notice the direction of the connection of the Hydrogen supply valve. The finished connection is shown in 5G.

5A

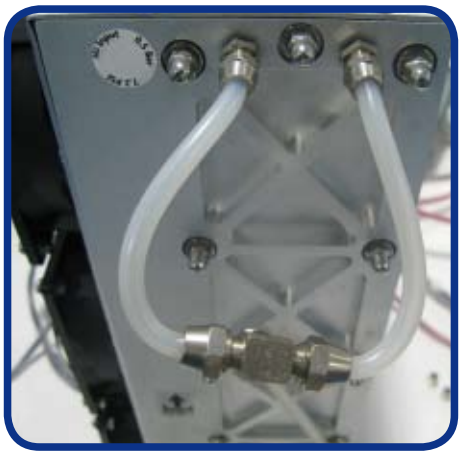
5B

5C

5D

5E

5F



5G

STEP6:

Connect the stack to the purge valve.(6A-6B)Connect the output of the purge valve to a place away from the stack in case of the damage caused by purged hydrogen.

6A

6B

6C

6D

STEP7:

Check all the connection first and connect the load to the system, Load+ is connected to the "load+" at the controller, Load- connected to the "FC- and load-" in the stack shown in 7A.

7A

STEP8:

Connect LCD to the controller as shown in 8A. Provide hydrogen and turn on external power supply then press the ON/OFF(8B) switch to start the system.

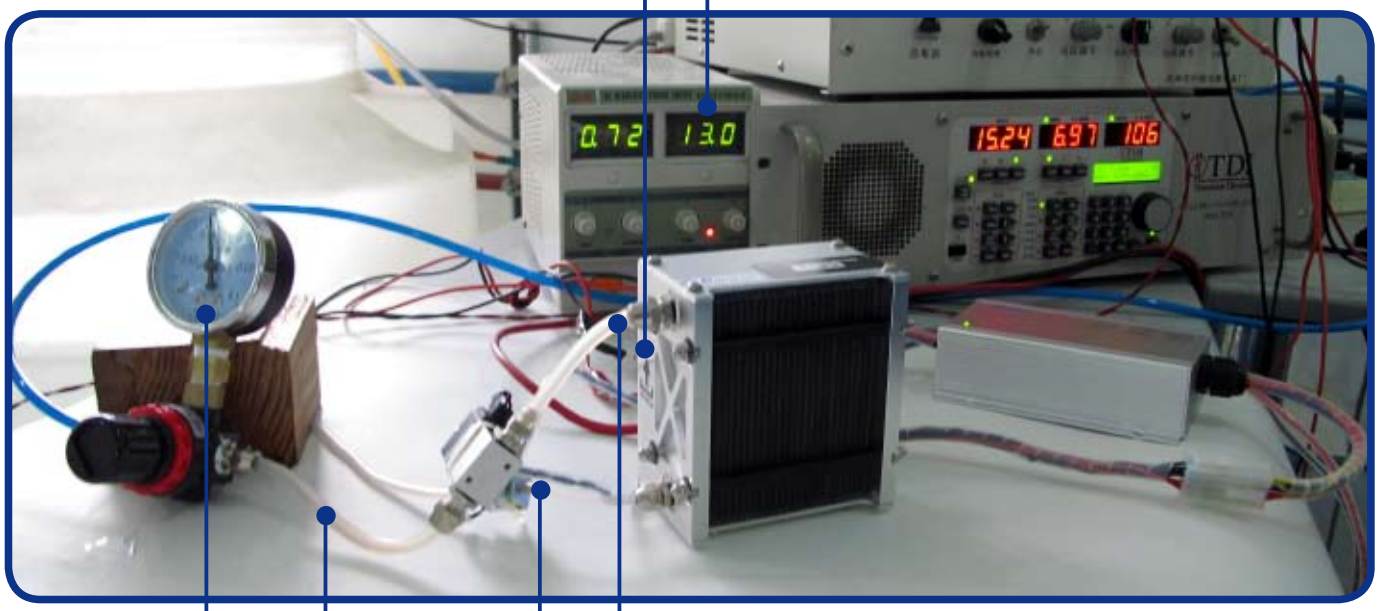
8B

8A

4. Notes for the set-up

Stack should be placed like this position.

The voltage of external power supply is between 12V - 14V, the current range is different based on the different stack.

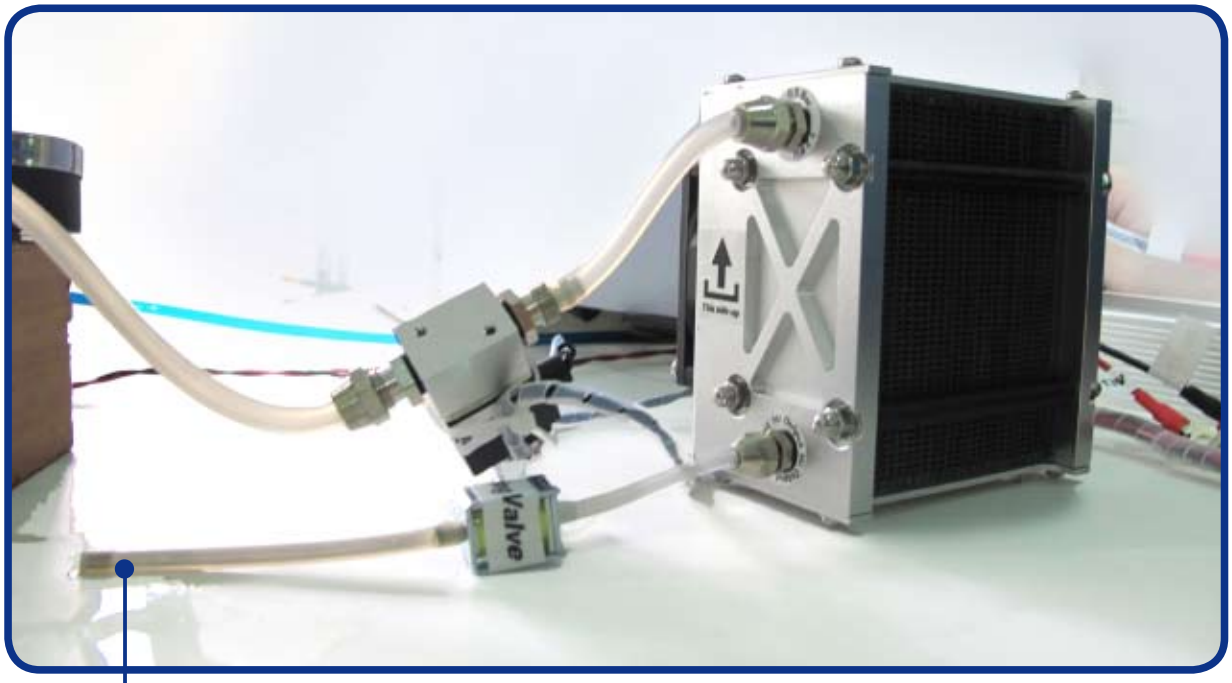


It should be as short as possible between stack and valve.

The tube length should be less than 0.3M between the pressure regulator and the stack.

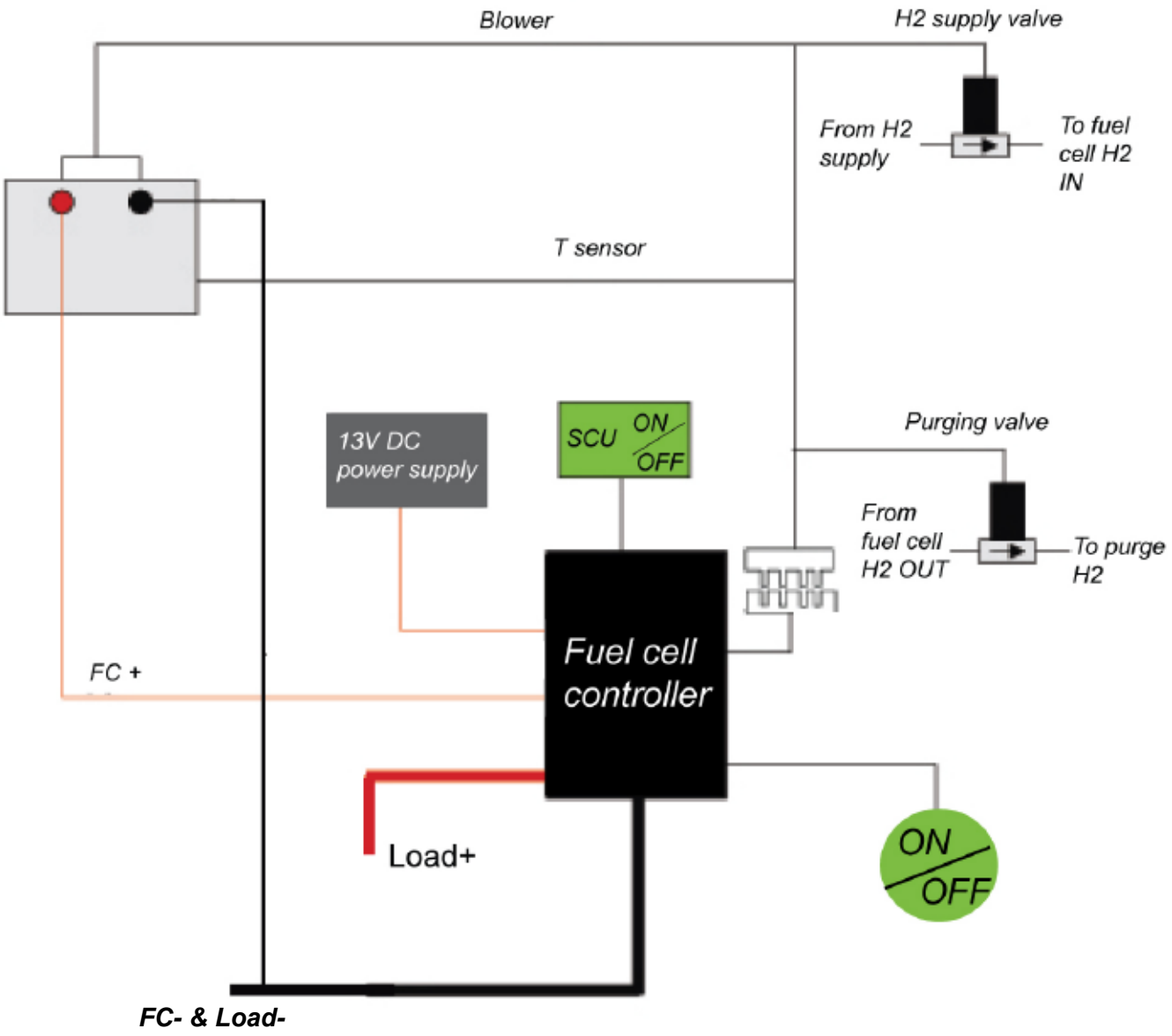
The pressure of the hydrogen is between 0.4--0.6Bar (0.04 -- 0.06Mpa).

The load connecter, load+, is connected to the "load +"in the controller. Connected the load- to "FC- & Load-" in the stack.

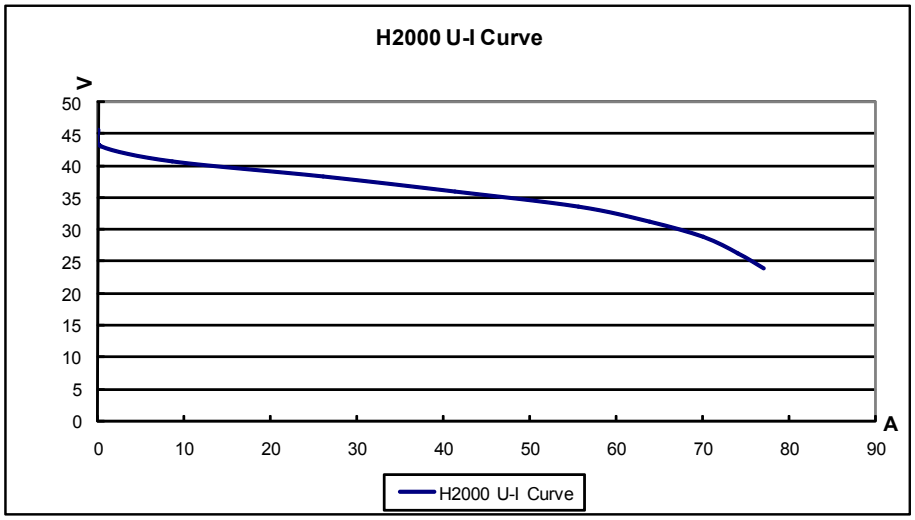


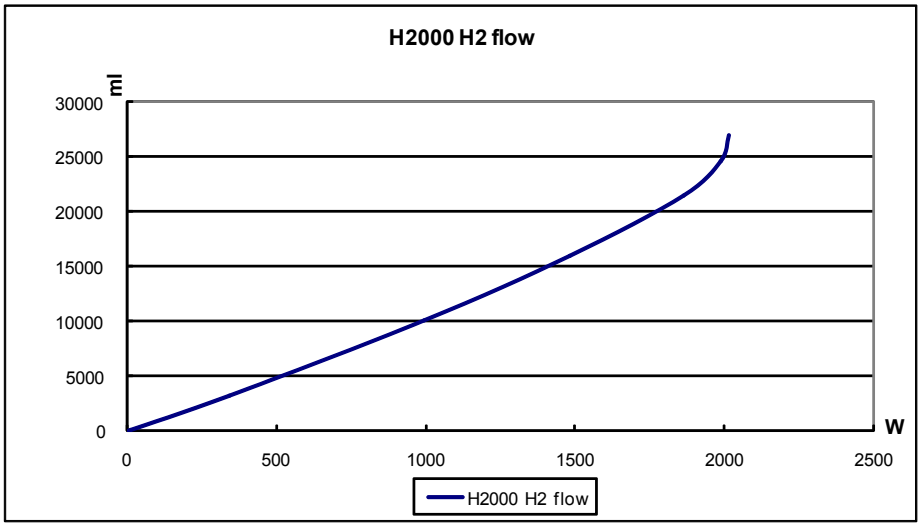
The outlet of the purge valve should be far away from the stack. Don't let the hydrogen from purge valve flow back to the stack, otherwise it would damage the stack.

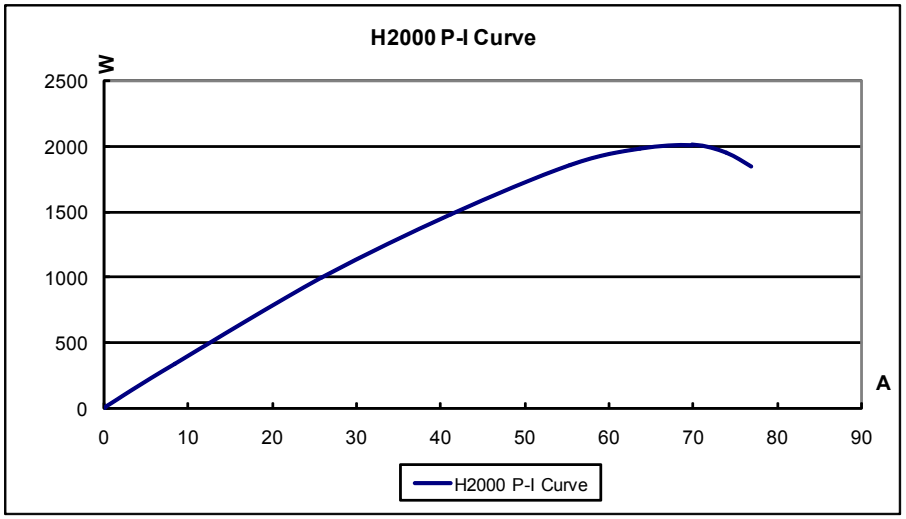
5. System setup diagram



6. Polarization curves







7. Operating instructions

Step 1: Set up the fuel cell system according to the diagram above, make sure that:
- The external DC power supply voltage is between 12V to 14V.
- The pressure is between 0.05 to 0.065Mpa.

Step 2: Connect the load to the “FC- & load-” and “Load +”.
Step 3: Start the power supply and Hydrogen supply.
Step 4: Press ON button and the fuel cell system is ready to use.

8. Trouble Shooting & Suggestions

If the stack is not used for a long time (months), it will take a little time to get the rated power, it needs 5-30 minutes.

If the system shuts down by itself check the following details:

1. Make sure you have connected all wires according to the diagram.
2. Make sure the external voltage is 12V -14V. The current range is 10A.
3. Make sure you have a hydrogen supply.
4. Make sure the load is below 2000W, because the controller will protect the stack from drawing too much current.
5. Check whether the fuel cell temperature is below 65^{o}C, the system will shut off if it is above 65^{o}C.

Note:

1. Disconnect the hydrogen supply completely if the fuel cell stack is not in operation for more than 4 hours.
2. Use a tube to connect the fuel cell stack hydrogen inlet to the outlet if the fuel cell stack is not in operation.
3. Ensure that the Hydrogen purity is above 99.9%. Using humidifiers may cause irreparably damage.
4. The hydrogen outlet must be 20cm away from the fuel cell stack, because the MEA will be damaged permanently if there is hydrogen and oxygen available simultaneously.

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