

Micro-Fuel cell Science Kit

ASSEMBLY GUIDE



Model No.: FCJJ-44

Warning

To avoid the risk of property damage, serious injury or death:

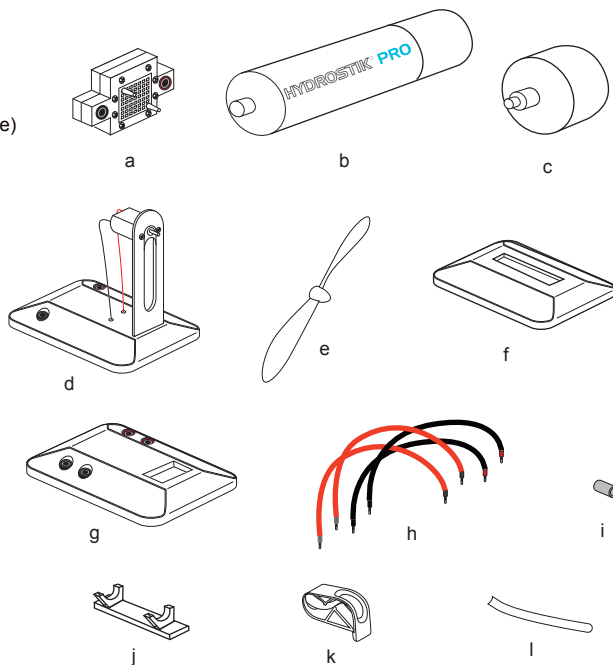
1. Read carefully and fully understand the instructions before assembling this kit.
2. Keep small children and animals away, because this kit contains small parts that could be swallowed.

3. This kit is intended only for use by persons 14 years old and up, and only under the supervision of adults who have read and understood the instructions in this user manual.
4. When assembling this kit, tools may be used. Extra care should be taken to avoid personal injury.
5. Some parts are small and fragile: please be careful when handling and connecting parts to avoid breakage. Handle all parts and components with care.
6. Do not attempt to use any part, item, or component provided in this kit for any other purpose than what is instructed in this manual. Do not attempt to disassemble any part, item or component in this kit.
7. Remove the HYDROSTIK PRO from the pressure regulator immediately after use.

Micro-Fuel Cell Science kit

List of Component

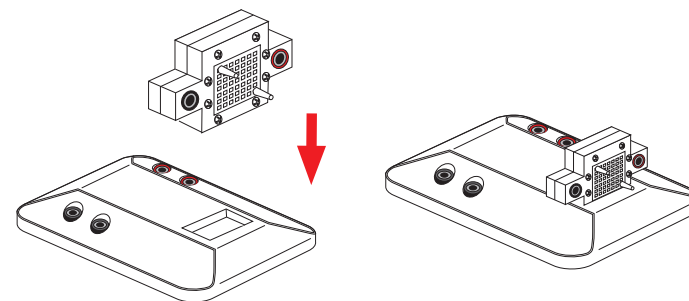
- a. Micro-fuel cell
- b. HYDROSTIK PRO (hydrogen storage)
- c. Pressure regulator
- d. Fan module
- e. Fan blade
- f. HYDROSTIK PRO base
- g. Micro-fuel cell base
- h. Wires
- i. Fan blade adapter
- j. HYDROSTIK PRO support
- k. Clamp
- l. Silicon tubes



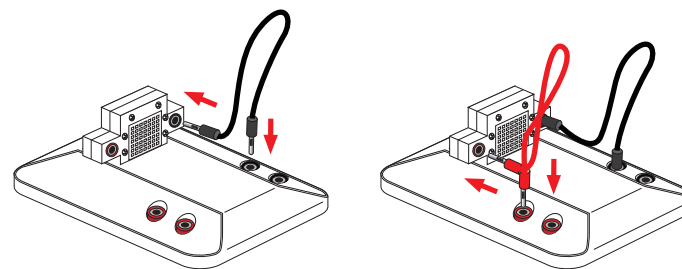
You will also need the following items (not included in this kit):
 - HYDROFILL PRO for charging the HYDROSTIK PRO
 - Scissors

Preparing the micro-fuel cell module

- a. Insert the PEM fuel cell (a) into its slot on the base (g). Make sure the fuel cell fits well in its base.

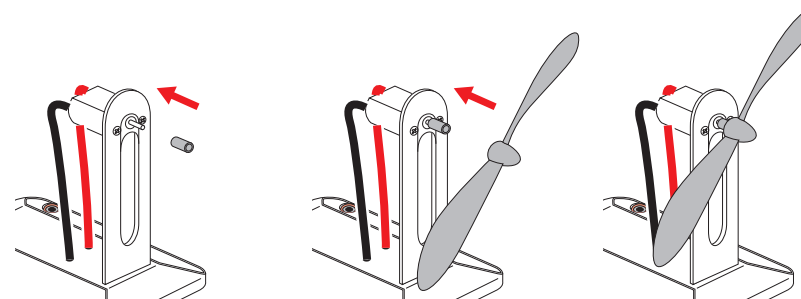


- b. Use the short black & red wires to connect the fuel cell to its base as shown below. Make sure you respect the color code when you plug each wire into the corresponding socket.



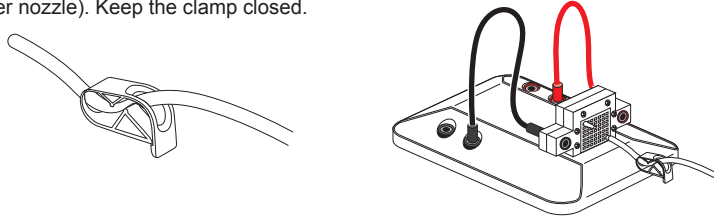
Preparing the fan module

- a. Connect the adapter (i) to the motor axis. Insert the fan blade (e) onto the adapter. Make sure the connection is tight.

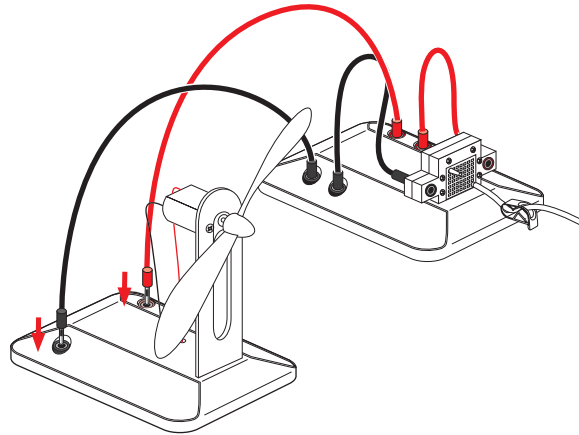


Connect the fan to the fuel cell

a. Cut a 6cm long silicon tube. Let the tube go through the clamp. Connect one end of the tube to the inlet of the fuel cell (lower nozzle). Keep the clamp closed.



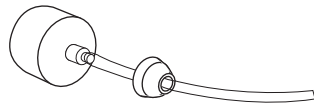
b. Use the black & red wires to connect the fan module to the fuel cell module. Make sure you respect the color code when you plug each wire into the corresponding socket.



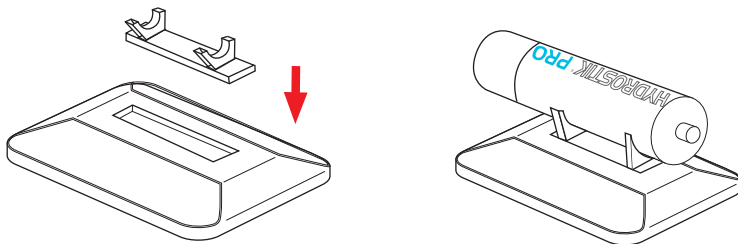
Preparing the hydrogen source

Note: The HYDROSTIK PRO contains no hydrogen when you get it for the first time, you have to fully charge the HYDROSTIK PRO with the refilling station HYDROFILL PRO (not provided) or hydrogen charging tube (not provided).

a. Cut a 15cm long silicon tube. Connect the tube to the pressure regulator.
b. Connect the other end of the tube from the pressure regulator to the remaining nozzle of the fuel cell. Make sure the connection is tight.



c. Place the HYDROSTIK PRO support (j) onto its base (f).
d. Place the HYDROSTIK PRO onto its support.

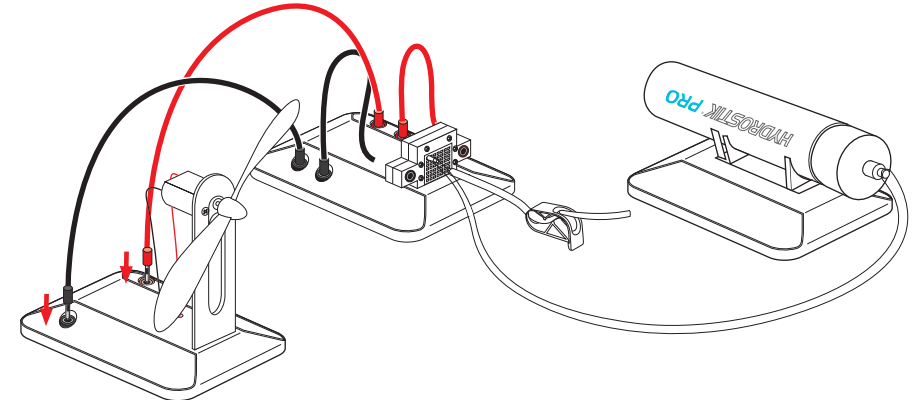


Power the fan with the hydrogen energy

a. Screw the HYDROSTIK PRO to the pressure regulator tightly.
b. Open the clamp to purge some amount of hydrogen out and then quickly close. The fan will immediately start to run.

Note:

1. If the fan does not run at this time, it may need to be flicked with your finger to start.
2. After every 10 minutes, it is suggested open the clamp to release some amount of hydrogen out to ensure the good performance of the fuel cell.



Now you can use a multi-meter or Horizon's REM product Ref. FCJJ-24 to measure the output voltage & current produced by the fuel cell or do various experiments.

HYDROSTIK PRO SAFETY INFORMATION

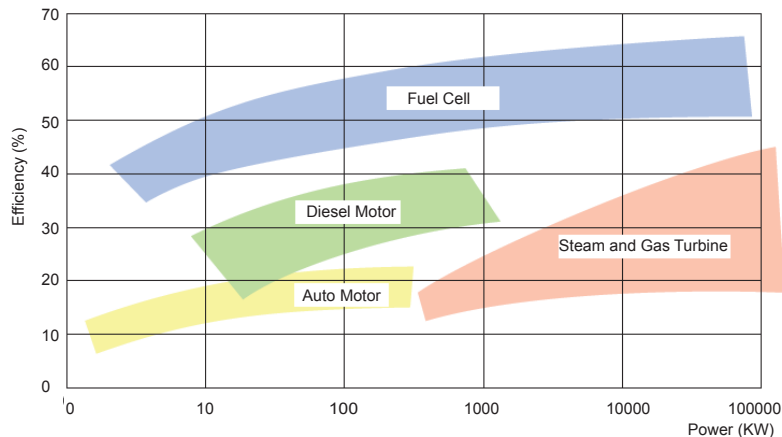
- DO NOT try to disassemble, open or repair the cartridges when broken or worn out!
- DO NOT store cartridges under direct sunlight.
- Keep it away from fire. Fire Hazard!
- Keep in a safe place.
- Keep in a dry, cool place.
- Keep away from temperatures above 50°C while filling, storage and using.
- Provide adequate ventilation and refrain from placing items on or around the appliance during operation. Refrain from placing the appliance in enclosures or causing the appliance to not vent freely.
- Keep away from alkaline and acidic environment.
- This is not toy – keep away from children.
- The cartridge must be placed horizontally when it is being charged otherwise the cartridge can crack!
- HYDROSTIK PRO contents are flammable. Do not disassemble.
- Avoid contact with HYDROSTIK PRO contents.
- Remove the HYDROSTIK PRO from the pressure regulator immediately after use.
- When using the appliance, basic safety precautions should always be followed to reduce risk of fire, or personal injury.
- Hydrogen shall be stored, handled and used with caution so life and health are not jeopardized and the risk of property damage is minimized.
- This appliance is not tested for use with medical devices.
- Save these instructions and review frequently during use.

Why Fuel Cells and Hydrogen?

Fuel cells can be thought of as alternative energy devices. They convert chemical energy into electrical energy. Hydrogen fuel cells do this very cleanly, with no toxic emissions, and with a better efficiency. Fuel cells do not generate energy out of thin air. They use hydrogen. Hydrogen is an outstanding carrier of energy. Hydrogen is non-toxic, renewable, easily obtained, and packed with energy. When it combusts with oxygen, it turns into water. This water can again be split into hydrogen and oxygen via electrolysis. The generated hydrogen can be combusted once again, thus undergoing a limitless cycle without toxic emissions. With a fuel cell, you can convert hydrogen into electric current without combustion.

Fossil fuels are converted into usable energy through combustion. The energy released during combustion is inherently difficult to capture and inefficient. It also produces carbon dioxide, which cannot easily be converted back into a usable fuel. A fossil fuel combustion engine at a power plant is only about 30 to 40% efficient. This means it converts only 30 to 40% of the energy in the fossil fuels to usable energy (electricity). Engines in a car are even less efficient, and reach the level of 15 to 20% of efficiency. Where does the rest of the energy go? It escapes as heat, vibration, and noise.

On the other hand, fuel cells can operate at 40 to 65% efficiency. This means that they can convert 40 to 65% of the energy contained in hydrogen into electricity.



FAQ

1. What are the refill options for HYDROSTIK PRO cartridges?
 - a. HYDROSTIK PRO can be recharged using Horizon's HYDROFILL cartridge refilling solution.
 - b. You may contact your local Horizon service provider for HYDROSTIK PRO refill support at sales@horizonfuelcell.com
 - c. If needed HYDROSTIK PRO can be disposed after use, they are fully recyclable and do not contain any harmful materials.
2. I want to purchase more HYDROSTIK PRO Metal Hydride Cartridges, should I have received a (gas pressure) regulator of any kind with it?

No, pressure regulators are not included as standard you will need to order those as well. You can purchase one online visiting the Horizon Online Store or contact info@horizonfuelcell.com.
3. I would like to exchange my cartridge for a different size, can we do this at any Horizon related outlet?

No, for now we only distribute a single size HYDROSTIK PRO Metal Hydride Cartridge.
4. Can I take Metal Hydride cartridge HYDROSTIK PRO abroad?

No more than two spare metal hydride cartridges may be carried by a passenger in carry on baggage, in checked baggage, or on the person.

5. Does the HYDROSTIK PRO lose its energy content over time, if I don't use it?

Hydrogen remains stored as a hydride in the HYDROSTIK PRO. The cartridge will not lose its energy or latent hydrogen content if the cartridge is not being used.
6. Can we refill HYDROSTIK PRO with our own electrolyzer?

No, the HYDROSTIK PRO can only be recharged using the HYDROFILL or Horizon approved refilling stations.
7. How many hours of electricity are provided by a HYDROSTIK PRO Metal Hydride Cartridge?

The HYDROSTIK PRO Metal Hydride Cartridges contain up to 11Wh of electricity. So if drawing 1W from the fuel cell, it will run for 11hours.
8. How can I monitor how much gas is left in a cylinder?

This can be measured by weight, measuring the empty weight gives you the benchmark level and then you can work out the total amount of hydrogen by that 11Liters of Hydrogen =1gram so make sure your scales can work in 1/10th of 1/100th of a gram to get accurate readings. Pressure cannot be used as a measurement of the amount of Hydrogen in the canister as the pressure is almost the same between 10%-90% full.
9. Can I store HYDROSTIK PRO in cars parked in full sun?

HYDROSTIK PRO is advised to be stored in maximum 50C temperatures, but cars parked in full sun can reach inside temperatures which exceed 60C. HYDROSTIK PRO is still safe at these temperatures; however we do not recommend storing HYDROSTIK PRO in such conditions.
10. Where do I recycle a spent or damaged HYDROSTIK PRO?

Contact your local consumer waste recycling center or return the HYDROSTIK PRO to a Horizon Fuel Cell Technologies vendor. Typically, HYDROSTIK PRO can be recycled where rechargeable batteries are recycled.

Recycle Procedures The materials in the HYDROSTIK PRO are 100% recyclable, and so in order to get the HYDROSTIK PRO metal hydride cartridges recycled properly, return the cartridges to your local outlet or distributor.

Normal Disposal Procedures

The HYDROSTIK PRO metal hydride cartridges do not contain any dangerous substances for the environment, we would recommend that they still be disposed of in a similar way you would dispose of a standard battery.

Troubleshooting

1. The fan does not run after the HYDROSTIK PRO supplies hydrogen to the fuel cell.
 - a. The fan may need to be flicked with your finger to start.
 - b. Recharge the HYDROSTIK PRO fully.
 - c. Open the clamp to purge a little bit amount of hydrogen out of the system.
 - d. Make sure the HYDROSTIK PRO is connected to the pressure regulator tightly.
2. The fan runs slower than before.
 - a. Recharge the HYDROSTIK PRO fully.
 - b. Open the clamp to purge a little bit amount of hydrogen out of the system.

If none of these tips helped solve the problem, go through the instructions from the beginning and make sure you follow each step completely.

If the fan still does not work, contact Horizon technical support at support@horizoneducational.com.