

HYDROFILL[®]

USER GUIDE

WARNING

- Do not tamper with, disassemble or puncture the HYDROFILL
- Keep HYDROFILL away from fire, open flame, or heat source
- Keep HYDROSTIK cartridge away from fire, open flame, or heat source
- Keep HYDROFILL away from children
- Keep HYDROFILL in upright position
- Fill de-ionized or distilled water slowly and carefully to avoid overfilling the water tank
- Keep HYDROFILL in a ventilated location during operation
- Remove HYDROSTIK cartridge immediately after charging
- Do not consume the apple acid powder or the ion exchange resin pouch and keep them away from children
- Keep all electrical connections dry at all times

SYSTEM OVERVIEW

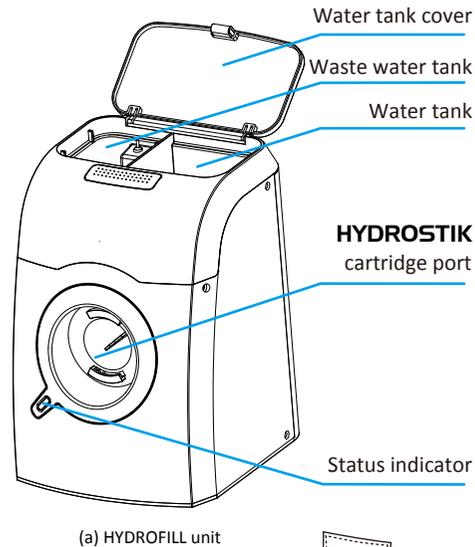
The HYDROFILL system is designed to refill Horizon's HYDROSTIK solid hydrogen cartridges automatically, which uses a proton exchange membrane (PEM) electrolyzer based system. The HYDROFILL separates hydrogen and oxygen from water and stores hydrogen in a safe, solid form using special metal alloys contained in the HYDROSTIK cartridges.

ITEMS LIST

- HYDROFILL unit
- AC-DC adapter
- Apple acid powder
- Ion exchange resin pouch
- Cartridge cover

SYSTEM FEATURES

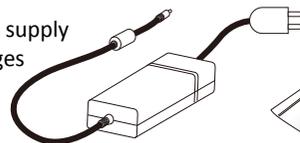
- Quiet, safe and convenient hydrogen supply
- Designed to refill HYDROSTIK cartridges
- Automatic cartridge refilling system
- High hydrogen purity 99.99%
- Optional solar power supply



(a) HYDROFILL unit



(d) Ion exchange resin pouch



(b) AC-DC adapter



(c) Apple acid powder



(e) Cartridge cover

SPECIFICATIONS

Stack type	Proton exchange membrane electrolysis cell
Dimensions (W x D x H)	145x153x208mm (5.7x6x8.2in)
Weight	1.8Kg ±5% (3.97Lbs±5%)
Rated power	≤30W
Water input	Pure or distilled water
Water temperature	20-65°C (68-149°F)
Water consumption	Approx. 20ml/hr (1.2in ³ /hr)
Hydrogen output pressure	0-3.3MPaG (0-478.62PSI)
Hydrogen generation capacity	0-3L/hr (0-183in ³ /hr)
Purity	99.99% (designed for HYDROSTIK)
Outlet specification	Designed for HYDROSTIK
Refilling time for one HYDROSTIK	Max. 6 hours (Depends on ambient temperature.)

The specifications are subject to change without notice.

Status indicator lights

Green	Red	System Status
on		HYDROSTIK cartridge is full
on 1 second, off 1 second		Waiting to fill HYDROSTIK cartridge
	on	HYDROSTIK cartridge is being filled
	on 1 second, off 1 second	Add water or empty waste water tank
green 1 second, red 1 second		See troubleshooting No.8

One year limited warranty.

OPERATION INSTRUCTIONS

1. Open the water tank cover located at the top of the HYDROFILL unit. Pour the entire contents of one bag of apple acid into the water to mix with water completely before using the HYDROFILL (Fig. A). Carefully fill de-ionized or distilled water into the water tank until water reaches the ridge level in the tank (Fig. B). Place the ion exchange resin pouch* (d) into the water tank (Fig. B). Close the cover.

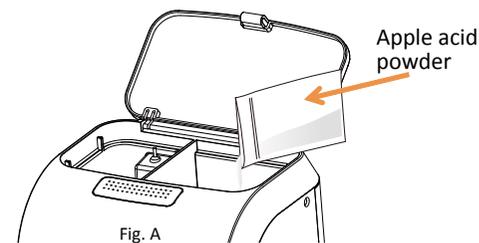


Fig. A

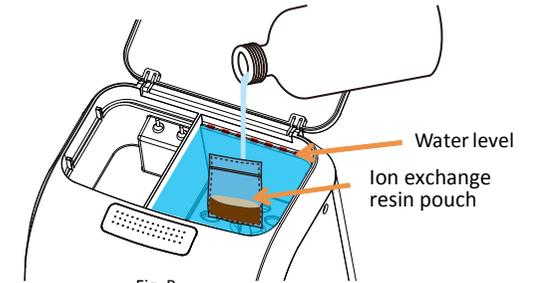


Fig. B

***Note:** DO NOT open the ion exchange resin pouch. Just place it into the water tank.

2. Connect the AC-DC adapter to the unit and an AC power supply (Fig. C). Once connected, a green LED light on the front of the unit should start to flash (Fig. D).

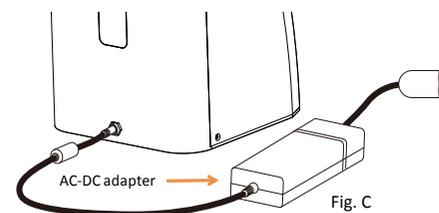
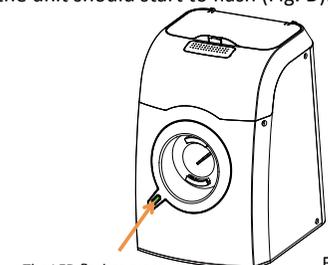


Fig. C



The LED flashes green

Fig. D

3. Insert the HYDROSTIK into the cartridge port. Use one hand to hold the HYDROFILL, and with the other hand, fully insert the HYDROSTIK cartridge by turning it clockwise into the cartridge port. Check and make sure that the HYDROSTIK is fully inserted. Once fully inserted, position and push the cartridge cover into the protruding HYDROSTIK. Turn the cover clockwise until it locks into place. See Fig. E and F.



Fig. E



Fig. F

4. Once the cartridge is inserted, the LED indicator light on the front of the unit switches from green to red (Fig. G). Your HYDROSTIK cartridge is now being filled with hydrogen. When the indicator light turns green, the HYDROSTIK cartridge is fully charged (Fig. H). Disconnect the cartridge cover, then the HYDROSTIK cartridge from the HYDROFILL (turn both anti-clockwise to disconnect).

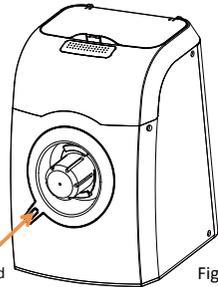


Fig. G

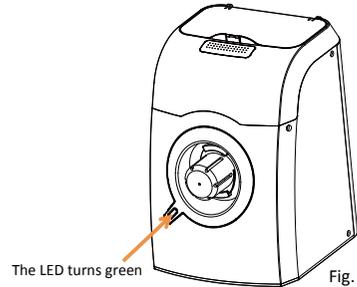


Fig. H

5. Once the procedure is completed, disconnect the HYDROFILL from the AC. If more cartridges need to be charged, repeat steps 3-5.

USEFUL INFORMATION / MAINTENANCE

- Use de-ionized or distilled water, do not use the tap water or drinking water containing minerals.
- Pour the entire contents of one bag of apple acid into the water to mix with water completely before using the HYDROFILL. It takes about 4 - 6 hours to fully charge a cartridge.
- Put the ion exchange resin pouch into the water tank before using the HYDROFILL.
- Keep the ion exchange resin pouch within de-ionized or distilled water for humidification when not in use.
- When waste tank is full, pour waste water out and refill water tank. Keep the ion exchange pouch into the water tank. Add one bag apple acid every time when water is refilled.
- If the LED light alternates between red for 1 second and off for 3 seconds, carefully add the entire contents of one apple acid bag (4g) (c) into the water tank allowing it to mix with the water without disconnecting the cartridge. Allow the HYDROFILL to hold the cartridge in place for more than 1 hour in order to keep it charging, this will not affect the HYDROFILL' operation and filling time. The contents of the bag will help to maintain the performance of the HYDROFILL.
- The HYDROFILL can still run and generate hydrogen even if the LED light alternates between red for 1 second and off for 3 seconds, but the hydrogen generating efficiency is lower.
- After using the apple acid, you may find some black particles on the inner wall of the water tank. You can wipe the black particles off with a tissue.

TROUBLESHOOTING

1. **The LED light does not flash green after the power supply cord is connected.**
SOLUTION: Check the connection between the AC-DC adapter and the power supply.
2. **The LED light does not turn red after the HYDROSTIK is connected to the HYDROFILL.**
SOLUTION (a): Disconnect the HYDROSTIK and re-connect it again slowly. Make sure the connection is smooth and the HYDROSTIK is fully inserted into the thread.
SOLUTION (b): Check that the water level in the tanks are correct (see operating instructions)
SOLUTION (c): Remove and re-connect the AC-DC adapter.

3. **The cartridge has been charging for more than 6 hours, but the indicator light is still red.**

SOLUTION (a): Disconnect the cartridge and re-connect it tightly and correctly.
SOLUTION (b): Disconnect the cartridge and connect it to the application you wish to supply to confirm there is hydrogen in the cartridge.

4. **The LED light alternates between red for 1 second and off for 3 seconds.**

SOLUTION (a): It is suggested the water temperature in the water tank is between 40°C and 70°C.
SOLUTION (b): Pour the entire contents of one apple acid bag (4g) (c) into the water tank allowing it to mix with the water without disconnecting the cartridge. Allow the HYDROFILL to charge the cartridge for more than 1 hour. The powder contained inside will help to maintain the performance of the electrolyzer (Fig. I).

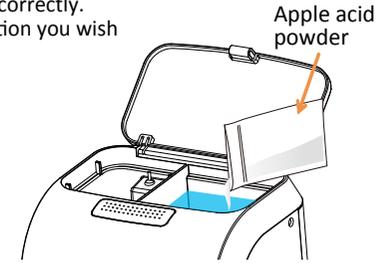


Fig. I

5. **The LED light alternates between red for 1 second and off for 1 second.**

SOLUTION: Check the water level of the water tank and waste water tank is correct. Either add water to the water tank or remove water from the waste water tank as required (Fig. J).

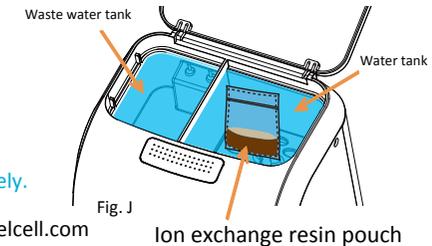


Fig. J

6. **The LED light is red for 1 second and green for 1 second alternately.**

SOLUTION (a): Remove and re-connect the AC-DC adapter.
SOLUTION (b): Contact customer services at support@horizonfuelcell.com

7. **The light LED turns green (the cartridge has been charging for 6 hours), but no or little hydrogen is filled.**

SOLUTION (a): Check the HYDROSTIK being connected tightly with no leakage.
SOLUTION (b): Check the water temperature (It is suggested the water temperature is between 40°C and 70°C).
SOLUTION (c): If the hydrogen generating efficiency is low, pour 1 bag of apple acid into the water tank allowing it to mix with water and have the system charging the cartridge for more than 1 hour. The contents of the bag will help to maintain the performance of the HYDROFILL. If problem continues repeat this process once more.
* A quick way to check the volume of hydrogen inside the cartridge is to weigh the HYDROSTIK before and after filling it respectively. The weight difference is around 0.9 grams, which shows the HYDROSTIK filled is over 10L.

8. **The LED light is green 1 second, red 1 second at the same time.**

SOLUTION: Pour the water out from both tanks. Add one bag of apple acid into the water tank. And then pour 50°C water into the water tank for 3 minutes. After 3 minutes repeat that process 2 times.
If you still experience problems, please contact support@horizonfuelcell.com for help.

FREQUENTLY ASKED QUESTIONS

Q: How is hydrogen stored?

A: The hydrogen is stored in small cartridges (HYDROSTIK) at low pressure. When refueling, hydrogen gas is sent at high pressure into the cartridge, and the gas is adsorbed onto the surface area of a special metal alloy which is contained inside the cartridges, becoming a solid (hydride). This is the safest form of hydrogen storage since it is not stored at high pressure. When connected to the fuel cell, the small hydrogen tanks slowly releases hydrogen using a heat exchange process with the ambient temperature.

Q: How can I refill the HYDROSTIK cartridges with hydrogen?

A: All you need to do is add water into the tank, connect the AC-DC adapter and the empty HYDROSTIK cartridge. The HYDROFILL will split the oxygen and hydrogen from the water, sending hydrogen into your HYDROSTIK cartridge. It will take 4-6 hours to fully fill a HYDROSTIK cartridge.

Q: What is the purity level for hydrogen produced by the HYDROFILL?

A: The purity of hydrogen produced by the HYDROFILL is 99.99% under room temperature. The metal hydrides contained in the cartridges first adsorb hydrogen, then releases it at a high purity (99.999%) into the fuel cell.

Q: What is the apple acid powder and what does it contain?

A: The powder contained inside the apple acid bag is apple acid. Metal ions will strongly affect and poison the electrolyzer stack inside the HYDROFILL over time. Many acidic solutions have the ability to neutralize the ions and help to recover the performance of the HYDROFILL. Apple acid, a food additive, is very safe and can be used for system maintenance with no negative effect. Keep away from children and do not consume.

Q: Is it possible to produce renewable hydrogen fuel using solar or wind power?

A: Yes. The HYDROFILL uses a DC power input and a solar power accessory that can be adapted to the HYDROFILL to use as an initial power source. The result is a zero carbon fuel from production to consumption.