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AGE

STEAM EDUCATION
H2 GRAND PRIX PRO

ASSEMBLY GUIDE

HYDROFILL & HYDROSTIK

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H2 GRAND PRIX SERIES

HYDROFILL
World's first personal hydrogen station.

HYDROSTIK
A convenient hydrogen storage solution to fuel your hydrogen powered devices.

Developed for H2 Grand Prix Series.

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SAFETY INFORMATION

PLEASE READ BEFORE PROCEEDING TO THE ASSEMBLY AND/OR USING THE HYDROFILL AND HYDROSTIK.

Remember that both devices are producing or storing highly flammable gas. Operating under unsafe conditions or in improper areas may result in accidents causing injury or property damage.

FOLLOW THE INSTRUCTIONS OUTLINED BELOW TO MAKE SURE YOU PRODUCE AND STORE HYDROGEN SAFELY:

1. Do not tamper with or disassemble the HYDROFILL nor the HYDROSTIK.
2. Keep the devices away from fire, open flame, or any direct heat sources.
3. Keep the devices away from children or uninformed personnel.
4. Keep the HYDROFILL in upright position, unless stated differently.
5. Always use deionized or distilled water with the HYDROFILL.
6. Keep HYDROFILL in a well ventilated location during operation.
7. Always keep all electrical connections dry.
8. Do not try to dissemble, open or repair the HYDROSTIK when broken or worn out.

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SAFETY INFORMATION

PRODUCT DESCRIPTION

The HYDROFILL system uses a proton exchange membrane (PEM) electrolyzer to generate hydrogen and recharge HYDROSTIK metal hydride cartridges automatically.

Thy HYDROSTIK is a reversible storage device that can be discharged and recharged with pure hydrogen efficiently and reliably. HYDROSTIKS are fully operable at an ambient temperatures. Hydrogen gas is stored in solid metal powder under low pressure, which is safer than conventional methods and suitable to an in-school applications.

HYDROFILL	
Stack type	Proton exchange membrane electrolysis cell
Rated power	≤ 23W
Input DC voltage	10V - 19V
Water input	≤3 µS/cm
Water temperature	10 - 40°C (50 - 104°F)
Water consumption	20 ml/hr
Hydrogen output pressure	0 - 3.3 MPa
Hydrogen production	≤3 l/hr
Hydrogen purity	99.99%
Refilling time for one HYDROSTIK (25°C)	4 - 6 hrs

HYDROSTIK	
Weight (empty)	102-105g (the weight can differ due to amount of storage material)
Hydrogen storage material	Metal hydride alloy AB2
Hydrogen storage capacity	≤10 l (0 bar, 25°C)
Operating temperature	0 – 35 °C (32 - 95°F)
Gas purity	99,99%
Gas dew point	≤ -50°C
Discharging flow rate	20-40 ml/m (flow rate is maintained from 90-10% capacity)
Discharging gas temperature	5 – 50 °C (below 5°C the discharging flow rate will be less than specified)

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UNBOXING

STEP BY STEP ACTION

BEFORE YOU START, PLEASE CHECK THAT YOUR PACKAGE IS UNDAMAGED AND CONTAINS ALL THE LISTED COMPONENTS.

THE PACKAGE CONTAINS:

HYDROFILL

A) HYDROFILL (HYDROGEN GENERATOR UNIT)
B) AC-DC ADAPTER
C) AC POWER CARD

HYDROSTIK

D) HYDROGEN CARTRIDGE

DO NOT CONTINUE TO ASSEMBLY IF YOU FIND ANY OF THESE PARTS MISSING AND CONTACT US IMMEDIATELY. LATER COMPLAINTS WILL NOT BE CONSIDERED.

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ASSEMBLY

HYDROFILL

1. Open the water tank cover located at the top of the unit

2. Carefully add water, exactly up to the ridge level inside the water tank and close the cover.
   Note: Use only deionized or distilled water.

3. Connect the AC-DC adapter to the unit. Once plugged in to an AC point, the unit's tatus indicator light should start to flash green.
   Note: The starting period might be longer if the HYDROFILL is used for the first time or after it has been stored for more than 2 months. However, each HYDROFILL should be ready to use within 30 minutes.

4. Fully insert empty HYDROSTIK cartridge into the HYDROFILL unit by turning it clockwise into the cartridge port until firmly secured. During the insertion process the green indicator light may turn red to indicate a connection, but continue turning to make sure the HYDROSTIK is firmly secured. Secure the HYDROSTIK tightly to the unit but be careful not to apply excessice force.

5. While the indicator light is RED, your HYDROSTIK is being filled with hydrogen. When the indicator light turns from RED to GREEN, the HYDROSTIK is fully charged and the process is complete.

6. Disconnect the HYDROSTIK from HYDROFILL by turning it counterclockwise. The indicator light starts flashing GREEN and HYDROFILL is ready again for another empty HYDROSTIK.

7. If more cartridges need to be charged, repeat step 3, or disconnect the HYDROFILL from the AC and empty the water tank if you do not plan to use it within one hour.

ADDITIONAL INFORMATION: The Hydrofill works with pressure changes, you might experience sudden „pressurized“ noises during the operation:

A) it will be normal to hear short bursts or puffs during the refilling procedure, due to water being purged from the system

B) it will be normal to hear gas/air being released when the HYDROSTIK is disconnected from the HYDROFILL

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OPERATION

HYDROFILL

UNDERSTANDING THE LIGHT INDICATOR ON THE HYDROFILL, WILL HELP YOU TO UNDERSTAND THE ONGOING PROCESS ON THE HYDROFILL.

As stated earlier the HYDROFILL generates hydrogen and oxygen by electrolysis of ultrapure water. While the oxygen is being vented out during the process, the hydrogen is dried out in the moisture separator and a small PSA unit and then connected to the pressure regulator unit from which it is being filled into the HYDROSTIK cartridge.

The LED control indicator on the front the side of the HYDROFILL will inform you about the status of the refilling process, all possible situations are described chronologically in the following table:

GREEN LED	RED LED	STATUS	SOLUTION
FLASHING	OFF	HYDROFILL is ready to use	Gently screw in EMPTY HYDROSTIK into HYDROFILL
OFF	ON	HYDROSTIK cartridge is being filled	The operation usually takes 4-6 hrs, do not disconnect the device from electricity
ON	OFF	HYDROSTIK cartridge is filled	Unscrew the FULL HYDROSTIK and repeat the refuelling process or turn off the device.
OFF	FLASHING	HYDROFILL is not working properly	Add distilled or deionized water or empty waste water tank

ADDITIONAL INFORMATION:

To ensure proper operation and maximize the lifetime of the HYDROFILL always use pure water. Any dissolved compounds and salts will caulk up and destroy the Hydrofill internals.

A) Use only distilled, deionized or ultra-pure water. Make sure to store in cool dry place away from direct sunlight.

B) When in doubt, check the conductivity of the water it must not exceed 3 µS/cm to ensure that your water still meets the quality standards.

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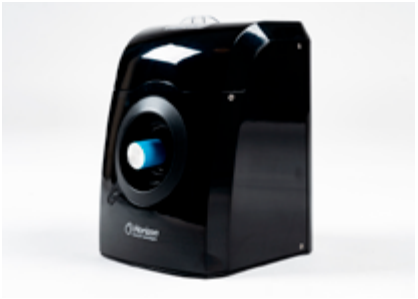

USEFUL INFORMATION

HYDROFILL

If the indicator light starts flashing RED, check the water level of the water tank and wastewater tank.

A) Remove water from the wastewater tank if needed.
B) Add water to the water tank.

The refilling operation of HYDROSTIK will normally last 4-6 hours.
A) Always refill empty HYDROSTIKS only, if not sure, use pressure regulator to release remaining hydrogen before new procedure.
B) It is normal to find HYDROSTIKS warmer after refilling, do not heat up/cool down HYDROFILL or HYDROSTIKS during the process.

HYDROSTIK

Use a decimal scale to determine the status of HYDROSTIK, pressure cannot be used as measurement of Hydrogen in the cannister as the pressure is almost the same between 10%-90% full.

A) The average weigh increase can range from 0,6 – 1,0 g, it is necessary to use a precision scale with at least one or two decimals preferably. If the difference is less than 0,4 g the HYDROSTIK was most likely not fully empty prior to refilling.

B) Make it a rule to weigh and label each HYDROSTIK right after the unboxing, this will ensure you-have a clear information about its initial (empty) weight .

Keep tracking the information about HYDROSTIKS, we recommend to label each HYDROSTIK and write down the weight difference (empty-full), number of cycles, uses, etc...

A) Label each HYDROSTIK with a permanent marker on the bottom or use electrical tape. Remember that adding tape will also change the weight of the cartridge.

B) Tracking will help you to „save“ the best ones only for races and to use the rest for practice or demonstration.

Always keep the HYDROSTIKS clean and dust free after use and during storage. Especially pay attention to keep the thread and pressure regulator clean prior to every use in HYDROFIL or H-Cell 2.0.

A) Presence of any dirt or dust on the thread can result in leakage and unwanted loss of hydrogen.

B) Remember that any dirt or dust can travel up to H-Cell 2.0 and worsen its performance and decrease its lifetime.

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USEFUL INFORMATION

SAMPLE HYDROSTIK ORGANIZATION AND MAINTANANCE TABLE

HYDROSTIK ID	HYDROSTIK WEIGHT		HYDROSTIK PERFORMANCE		HYDROSTIK HISTORY	
number/letter	empty (g)	full (g)	H2 amount (g)	race time (min)	(re) filling	races
A1	104,2	105,1	0,9	16	////	/
A2	103,9	104,7	0,8	16	////	/

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TROUBLESHOOTING

1. The LED status indicator 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 status indicator 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 6,5 hours, but the LED 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 a fuel cell product to confirm there is hydrogen in the cartridge .

Note: one way to check the volume of hydrogen inside the cartridge, is to weigh the HYDROSTIK before and after filling it using a precision scale. The weight difference between a full and an empty HYDROSTIK is around 0.9 grams.

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

SOLUTION: Try to add 40°C to 70°C water into the water tank.

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.

6. The LED light turns green (the cartridge has been charging for 6.5 hours), but no or little hydrogen is filled.

SOLUTION A: Check the HYDROSTIK to ensure it is connected tightly.

SOLUTION B: Check the water temperature (see 4. SOLUTION)

If you are still experiencing problems, please contact us at: support@h2gp.com

TIME FOR HYDROGEN EDUCATION

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