SMART COVER
Power & Energy Solutions

ECC230- User Manual

HHO Hydrogen on Demand Dual Fuel Generator Systems



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1. Safety Precautions

Read and follow these safety precautions to avoid hazards. Your ECC230 AC machine do not store hydrogen, subsequently there is no fire hazard when used properly. However water electrolysis generates Hydrogen, a explosive gas, which means that you should **never light a match or smoke near or in front of the end of the hose** - the protection bubbler inside the machine could blow up!

Be sure to wear goggles and rubber gloves and only use professional tools; use common sense and general safety procedures used for any work carried out on automotive operations and maintenance.



The electrolyte – Potassium hydroxide KOH - should be handled with extreme care because it´s a corrosive product. Be sure to wear goggles and rubber gloves when adding or removing electrolyte solution from the machine.

2. Components of the machine





3. Setting up the machine

3.1 Filling the main tank for the first time

Please follow these simple steps:

1. Use a plastic container to prepare the electrolyte solution first outside the machine. Be sure to wear goggles and rubber gloves for security reasons;

2. The electrolyte concentration to use is around 15 grs/liter of water. Add the full package (500 grs) provided with the machine to 30 liters of water. You can use any type of water but try to avoid water with bad quality or too many salts (iron or calcium). Tap water will work fine;

3. Connect the battery clamps of the power cable to the terminals of the battery in your car. The lateral fan and a red light, buzzing and blinking, (Minimum Level) will be turned ON;

4. Open the water tank lid and pure gently the mixture inside the water tank avoiding any spell. As the water level raises in the tank the red buzzing light will be turned OFF;

5. Continue adding the electrolyte solution until the green steady light is turned ON. When this light appears please stop adding electrolyte solution;

6. Close the water tank lid making sure it is well tight.

3.2 Refilling the main tank

As you use the machine the water level inside the tank will start to descend. First the green will turn OFF. After around 100 hours of work the red light will start to buzz and blink. It´s time to refill the machine again with electrolyte solution

For refilling please follow these simple steps:

1. Use a plastic container to prepare the electrolyte solution first outside the machine. Be sure to wear goggles and rubber gloves for security reasons;

2. The electrolyte concentration to use is around 5 grs/liter of water. Add around 100 grs of Potassium Hidroxide 90% pure to 20 liters of good quality water.

4. Open the water tank lid and pour gently the mixture inside the water tank avoiding any spell. As the water level raises in the tank the red buzzing light will be turned OFF once again;

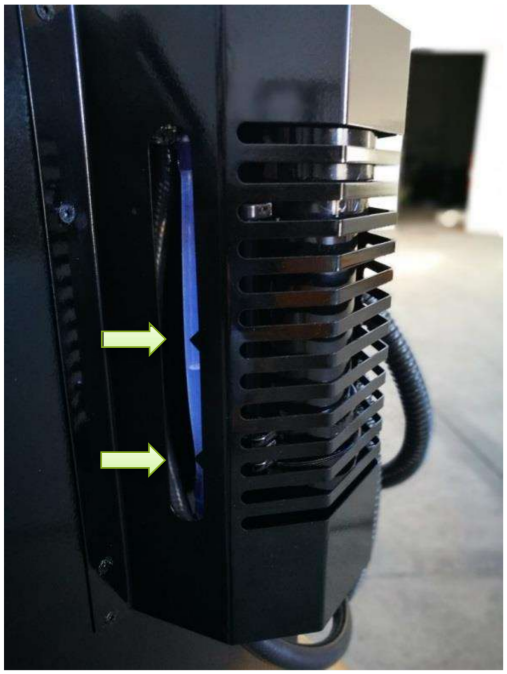
5. Continue adding the electrolyte solution until the green steady light is turned ON. When this light appears please stop adding electrolyte solution;

6. Close the water tank lid making sure it is well tight.

3.3 Security Bubbler

The bubbler is located laterally in the machine and serves two purposes: cleaning the Hydrogen gas and act as a safety barrier against a flame. If a flame reaches the bubbler and ignites the reduced hydrogen accumulated at the top of the bubbler but the water column will prevent the flame to reach the main tank where there is much more hydrogen accumulated.

The bubbler should be filled with a light acid solution, like white vinegar. The level of the vinegar should be kept between the 2 marks in the metallic protection. If the level drops below the inferior mark then you should refill the bubbler.



For filling the bubbler, please follow these simple steps:

1. The solution to use is a light acid, like vinegar (Ph 3);

2. Open the threaded cap positioned on the top of the bubbler;

3. With a small funnel, pure gently the solution and check at the same time the level rising inside the lateral hose of the bubbler;

4. Stop pouring when the level reaches the minimum level mark;

5. Close the threaded cap. If necessary add a little bit of Teflon tape to tight it better.

After some treatments, it´s normal to check that the level of the solution inside the bubbler moved up. When the level reaches the maximum level mark, you should open the valve under the bubbler to remove some fluid. Stop removing fluid when the level reaches the minimum level mark again.

4. Working with the machine

4.1 General use

Please follow these simple steps for the general use of the Engine Carbon Cleaner:

1. Open the air filter box, remove filter element and clean the area inside in order to avoid dust particles from entering the engine;

2. Insert the hose of the machine in the air intake manifold inside the air filter box;

3. Turn engine ON and let it work for some time until it reaches normal working temperature (80-90º);

4. At this point connect the power cable on the back of the machine to the terminals of the battery of the car;

5. Press the first red power control button and check the amperage in the ammeter;

6. Let the engine work idling for the first 20 minutes with only one button working;

7. Every 10 minutes press hard acceleration pedal in order to improve removal of the carbon deposits;

8. After the first 20 minutes of treatment increase the rotations of your engine to 1000 rpm and press second red power control button. Check again amperage in the ammeter;

9. Keep the machine working for one (1) hour to complete engine cleaning;

10. Every 10 minutes make strong acceleration in order to remove faster carbon deposits.

11. Repeat this operation every 10 000 km.

4.3 Cleaning the air filter box

The system is operated by vacuum suction from your engine's air intake which takes the HHO directly to the combustion chamber mixing it with the air/fuel. The injection point must be done right after the air filter box and the MAF/MAP sensor enhancer. Please follow the next steps:

1. Open the air filter box and remove the air filter;
2. In the air filter box please cover the engine air intake with a cloth to prevent dust particles from entering the engine;
3. With an air compressor clean the air filter area so that it stays completely free from dust particles;
4. Remove the cloth and insert the hose in the air intake manifold.



4.3 Working amperage

The amperage and hydrogen production will depend on the electrolyte concentration (15 grs/liter of KOH) and the power of the alternator of the car. Normally there is a relation more or less the same between the engine size and power of the alternator in all cars. In this way the amperage will vary from car to car depending on the engine size and alternator.

5. Diesel Cars and DPF Filter Cleaning

In modern diesel cars it´s always advisable to make the DPF filter diagnosis before the treatment, especially when the car drives only in towns and it is not possible to make the normal regeneration of the DPF. If the diesel car has already a problem with the diesel particulate filter (DPF), then it´s likely that the problem could get more severe with our treatment due to soot coming out of the engine and exhaust system.



If the DPF is clogged then we should clean it using our engine carbon cleaning machine. We the lines below we will explain how do this operation.

The main function of the DPF filter is to reduce the emissions of fine particles (soot) contained in the exhaust gases. The DPF works in two stages, first he collects the particles and after it eliminates them:

First step: The filter traps the particles in suspension in the exhaust gases. A layer of soot then starts forming on the walls of the filter. In long tern this layer of soot will influence the performance of the engine being necessary to start the regeneration process on the second step.

Second step: When we have the right conditions, the filter force the temperature of the exhaust gases to rise enough to burn the soot layers. The regeneration process will not work properly when temperatures are low in winter (for example in Northern Europe) or when the cars only drive in towns or small distances.

When cleaning diesel cars we recommend also the use of the special **DXA250 additive** produced for our machines. This additive allow the regeneration of diesel particulate filters using our engine carbon cleaning machines without removing the DPF. This additive lowers the ignition temperature of the soot collected in the DPF, optimizing the regeneration process. The increase of exhaust gases temperature provided by the combustion of hydrogen during the treatment will allow the right conditions for the regeneration of the FAP.



This additive can be used as a preventive treatment or as a repair treatment if the DPF filter is very clogged. Preventive treatment should take place in countries where temperatures are low in winter (for example in Northern Europe) or when the cars only run in cities and small distances.

Dosage: We add a bottle (250 ml) of the additive in 20 liters of fuel just before starting the treatment with our machine.
Duration: 2 hours
Engine revolutions during treatment: Engine at 1000 rpm for one and after one hour at 2500 rpm.

5. Maintenance

Regular Maintenance

Depending on the weekly working hours, you should check the water level inside the water tank. If the level is too low, refill the tank with electrolyte solution to allow amperage to be at normal operational values.

Winter Maintenance

If temperatures drop below -4ºC then you should add 20-25% isopropyl alcohol to the water solution in order to avoid water from freezing, even with the more severe temperatures. Don´t use another type of alcohol or you risk damaging the stainless steel plates.

Bi-annual Maintenance

Depending on the working hours of the machine, you should clean the machine and remove all deposits every six months. Please follow these simple steps:

1. Add 50% isopropyl alcohol to the water solution and leave it in the machine without working for 24 hours;

2. Next day start the machine and let it work for 20 minutes;

3. Stop the machine and open the frontal panel. Inside the machine you will find 2 valves to help you flush the water;

4. Once all water is out, please close the valves a add fresh water until you reach the maximum water level in the tank;

5. Open the 2 valves again and let it flush all the liquid inside the machine;

6. Close the valves and put in place the frontal panel;

7. Repeat all steps mentioned in point 3.1.

Technical Information

Voltage: 230V AC
Max Power: 1200 kW

HHO Gas Output Max: 800 l/h
Max. Pressure (kg/cm2): 0,2
Max. Water Consumption (L/h): 0,20

Water refilling: manual
Water Tank Capacity: 20 liters
Autonomy: 100 hours

Dimensions - L x l x h (mm): 400 x 500 x 700 mm
Weight: 35 kg
Warranty: 24 months

EC Declaration of Conformity

In accordance with EN ISO 17050-1:2004

We HHO Plus, Energias Alternativas, Lda (PT509055036)

Based in: Travessa das Serras, nº33, 2430 -720 Vieira de Leiria, Portugal

in accordance with the following Directive(s):

2006/95/EC	The Low Voltage Directive
2004/108/EEC	The Electromagnetic Compatibility Directive

hereby declare that:

Equipment	Engine Carbon Cleaner ECC230
Model number	ECC230

is in conformity with the applicable requirements of the following documents

DIN 16901	DIN ISO 4649	FMVSS302
DIN 53 545	DIN ISO 34-1	ISO/TS 16949
DIN 53 509	DIN ISO 1817	ISO 17025
DIN 53 503 / ISO7619	DIN IEC 60093	
DIN 53 504 / ISO 37	DIN EN 100 015/1	
DIN 53 505 / ISO 7619	DIN EN ISO1183/2781	
DIN 53517 / ISO 815	DIN EN ISO 9001: 2000	
DIN 53508 / ISO 188	ASTM 624 D	

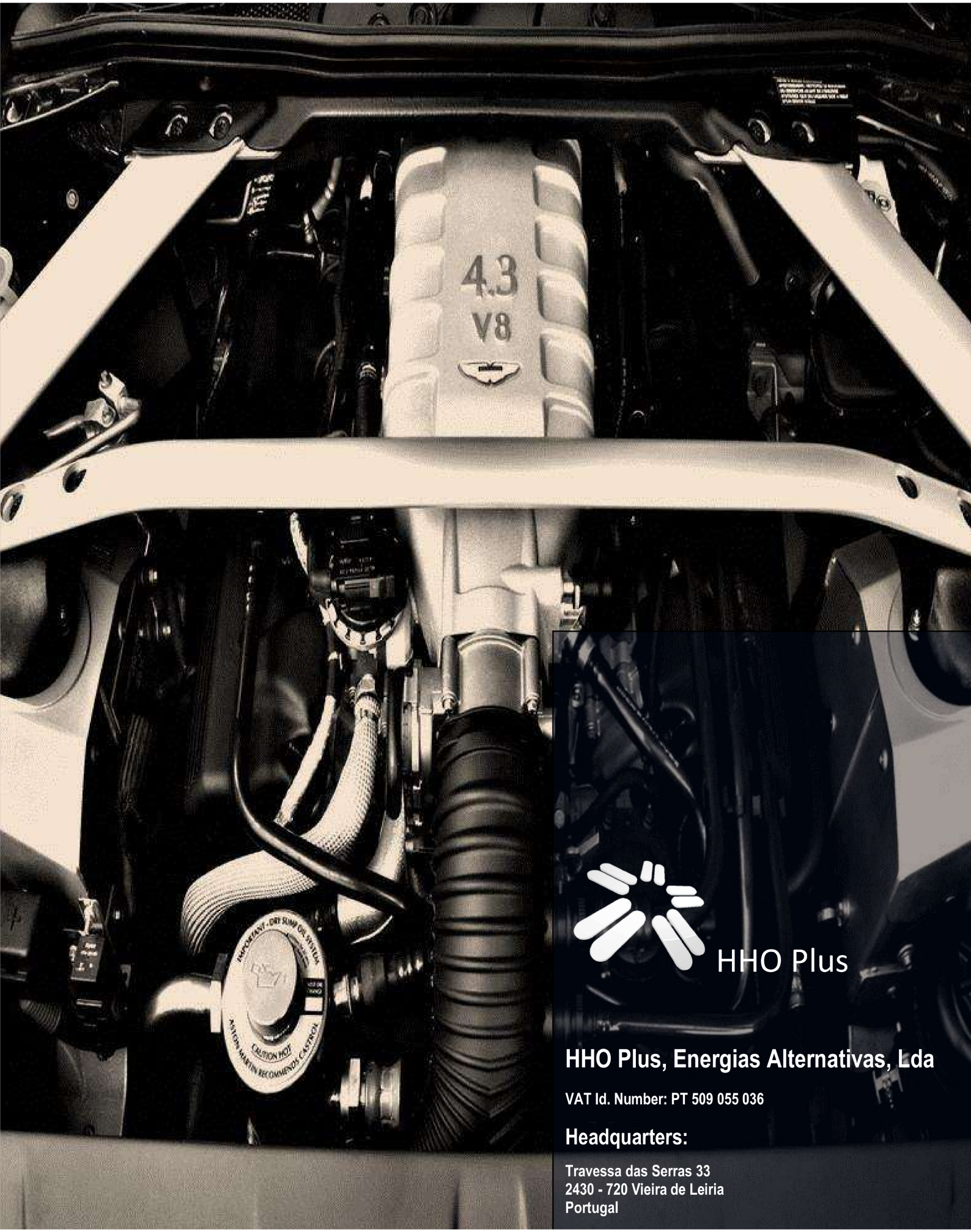
I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives. Our products are designed and manufactured in compliance with technical standards and industrial manufacturing of such products.

Signed by:



Date: 1st of August 2017

Name:	Eng. Frederico Ribeiro
Position:	CEO
Done at	Leiria Portugal



HHO Plus

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