

ECC230 - Operating manual

HHO hydrogen technology



HAMMER TOOLS

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Schnydersacker 453, 8262 Ramsen





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1. Safety precautions

Read and follow these safety precautions to avoid hazards. Your ECC230 machine does not store hydrogen; according to the original manual, correct use therefore presents no fire hazard. However, water electrolysis produces hydrogen, an explosive gas. Never light a match or smoke near the hose: the machine could explode.

Always wear safety goggles and rubber gloves, and use professional tools only. Use common sense and general safety procedures when operating the equipment and maintaining vehicles.



Handle the electrolyte, potassium hydroxide (KOH), with extreme care because it is corrosive. Always wear safety goggles and rubber gloves when adding electrolyte solution to the machine.

2. Equipment components



Control panel and safety bubbler

Water tank cap: top left

Water level indicators: red and green

Ammeter: digital display

Emergency stop: red on a yellow background

Power controls: two rotary switches at the bottom

Safety bubbler: on the right-hand side



Rear view

Power cable: wound around the holder

Bubbler cap: on top of the side-mounted bubbler

Wheels: underneath the machine

The hydrogen hose is not shown separately in these photographs. Other components: front panel and fan behind the side protective grille.

3. Setting up the equipment

3.1 Filling the water tank

Follow these steps:

1. Prepare the electrolyte solution outside the machine in a plastic container. Always wear safety goggles and rubber gloves.
2. The electrolyte concentration is 17 g/litre. Add the entire supplied packet (500 g) to 30 litres of water. Any type of water may be used, but avoid poor-quality water or water with excessive salts (iron or calcium). Tap water works well.
3. Connect the power cable's battery clamps to the terminals of the vehicle battery. The green light above the switch, the fans and the flashing red low-level light near the water tank, accompanied by a buzzer, will come on.
4. Open the water tank cap and carefully pour in the mixture without spilling it. As the water level rises, the red warning light and buzzer will go off.
5. Continue adding electrolyte solution until the green light comes on.
6. Close the water tank cap securely.
7. Disconnect the battery clamps from the battery.

If both water level indicators (red and green) are on, the tank is overfilled. Remove some water until the red light goes off. See section 6.

3.2 Refilling the water tank

The water level drops during use. First, the green light goes off. After approximately 100 operating hours, the red light comes on, flashes and sounds a buzzer. Refill the machine with electrolyte solution.

1. Prepare the electrolyte solution outside the machine in a plastic container. Always wear safety goggles and rubber gloves.
2. For refilling, the concentration is 5 g/litre: add 150 g of potassium hydroxide (KOH) to 30 litres of water.

3. Setting up the equipment

3.2 Refilling the water tank (continued)

3. Connect the power cable's battery clamps to the vehicle battery terminals. The green light above the switch, the fans and the flashing red low-level light near the water tank, accompanied by a buzzer, will come on.
4. Open the water tank cap and carefully pour in the mixture without spilling it. As the level rises, the red warning light and buzzer will go off.
5. Continue adding electrolyte solution until the green light comes on.
6. Close the water tank cap securely.
7. Disconnect the battery clamps from the battery.

If both water level indicators are on, remove water until the red light goes off. See section 6.

3.3 Safety bubbler

The bubbler on the side of the machine cleans the hydrogen gas and acts as a flame barrier. If a flame reaches and ignites the hydrogen accumulated at the top of the bubbler, the water column prevents the flame from reaching the main tank, where more hydrogen may accumulate.

The bubbler must contain a mildly acidic solution. Keep the level between the two marks on the metal guard. Refill if it falls below the lower mark.

1. Use a mild acid solution, such as vinegar (pH 3).
2. Open the threaded cap on top of the bubbler.
3. Carefully pour in the solution using a small funnel, checking the level in the tube on the side of the bubbler.
4. Stop at the maximum level mark.
5. Close the threaded cap. Add Teflon tape if necessary to secure the seal.



4. Operating the equipment

Follow these steps for normal operation:

1. Open the air filter housing, remove the filter element and clean the inside area to prevent dust entering the engine.
2. Insert the machine's hose into the vehicle's air intake downstream of the air filter.
3. Start the engine and let it run until it reaches normal operating temperature (80-90 °C).
4. Switch on the two black controls and check the current on the ammeter.
5. After the first 20 minutes of treatment, increase engine speed to 1,000 rpm.
6. Press the accelerator every 10 minutes to remove carbon deposits.
7. Run the machine for one (1) hour to complete the engine cleaning.
8. Repeat this procedure every 10,000 km.

Current and hydrogen production depend on electrolyte concentration (17 g/litre) and the vehicle alternator's output. There is generally a relationship between engine size and alternator output. Current therefore varies from vehicle to vehicle according to engine size and alternator.

Maximum current: 80 A

5. Diesel vehicles and particulate filter cleaning

In modern diesel vehicles, diagnose the particulate filter before treatment, especially if the vehicle is only driven in urban traffic and normal filter regeneration cannot take place. If the diesel particulate filter (DPF) already has a fault, soot from the engine and exhaust system may worsen the problem during treatment.

For diesel engine cleaning, the original manual also recommends the DXA250 additive made for this equipment. It enables particulate filter regeneration with the engine-cleaning equipment without removing the filter. The additive lowers the ignition temperature of soot trapped in the filter and improves regeneration. The rise in exhaust temperature caused by hydrogen combustion during treatment helps create suitable conditions for regeneration.

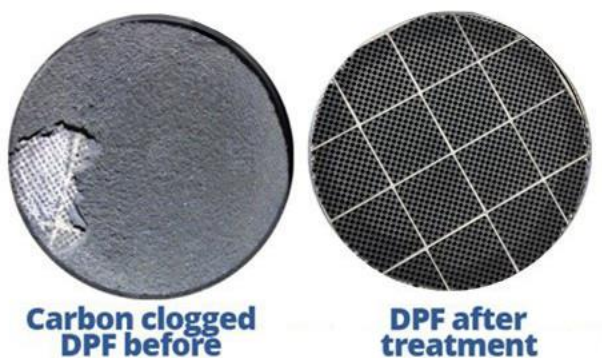
The additive can be used preventively or as a remedial treatment for a heavily clogged filter. Preventive treatment is recommended in countries with low winter temperatures, such as northern Europe, or for vehicles driven only on short urban journeys.

Dosage and treatment

Add one bottle (250 ml) to 20 litres of fuel immediately before engine cleaning.

Duration: 1.5 hours.

Engine speed during treatment: 1,000 rpm for 30 minutes and 2,500 rpm after one hour.



6. Maintenance

6.1 Periodic maintenance

Check the water tank level every week. If it is too low, top up with electrolyte solution so that the current remains within normal operating values.

6.2 Winter maintenance

If the temperature drops below -4 °C, add 20-25% isopropyl alcohol to the aqueous solution to prevent freezing, even at lower temperatures. Do not use another type of alcohol, as it may damage the stainless steel plates.

6.3 Six-monthly maintenance

Depending on operating hours, clean the machine every six months and remove all deposits. Follow these steps:

1. Add 50% isopropyl alcohol (IPA) to the aqueous solution and run the machine for 60 minutes (10 litres of water + 10 litres of IPA).
2. Stop the machine and open the rear maintenance panel. A valve inside the machine allows the water to drain.
3. When all water has drained, close the valve and add fresh water up to the maximum tank level.
4. Run the machine for another 10 minutes.
5. Open the valve again and drain all liquid from the machine.
6. Close the valve and refit the front panel.
7. Repeat all steps in section 3.1.



Technical data and information

Voltage: 230 V AC

Power: 2,000 W

Maximum HHO gas output: 800 l/h

Maximum pressure: 0.2 kg/cm²

Maximum water consumption: 0.20 l/h

Water tank capacity: 20 litres

Continuous operation: 100 hours

Dimensions (L × W × H): 400 × 500 × 700 mm

Weight: 35 kg

Warranty: 48 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 / ISO 7619	DIN IEC 60093	
DIN 53 504 / ISO 37	DIN EN 100 015/1	
DIN 53 505 / ISO 7619	DIN EN ISO 1183/2781	
DIN 53517 / ISO 815	DIN EN ISO 9001: 2000	
DIN 53508 / ISO 188	ASTM 624D	

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:



HHO Plus, Energias Alternativas, Lda.
Nº 1.º Reg.º Merc. 509 055 036
The HHO Plus PNE 002 - E-mail: info@hho-plus.com
Travessa das Serras, 33 - 2430-720 Vieira de Leiria - Portugal

Date: 1st of August 2017

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





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Hammer Tools
Schnydersacker 453
8262 Ramsen

052 345 00 00
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