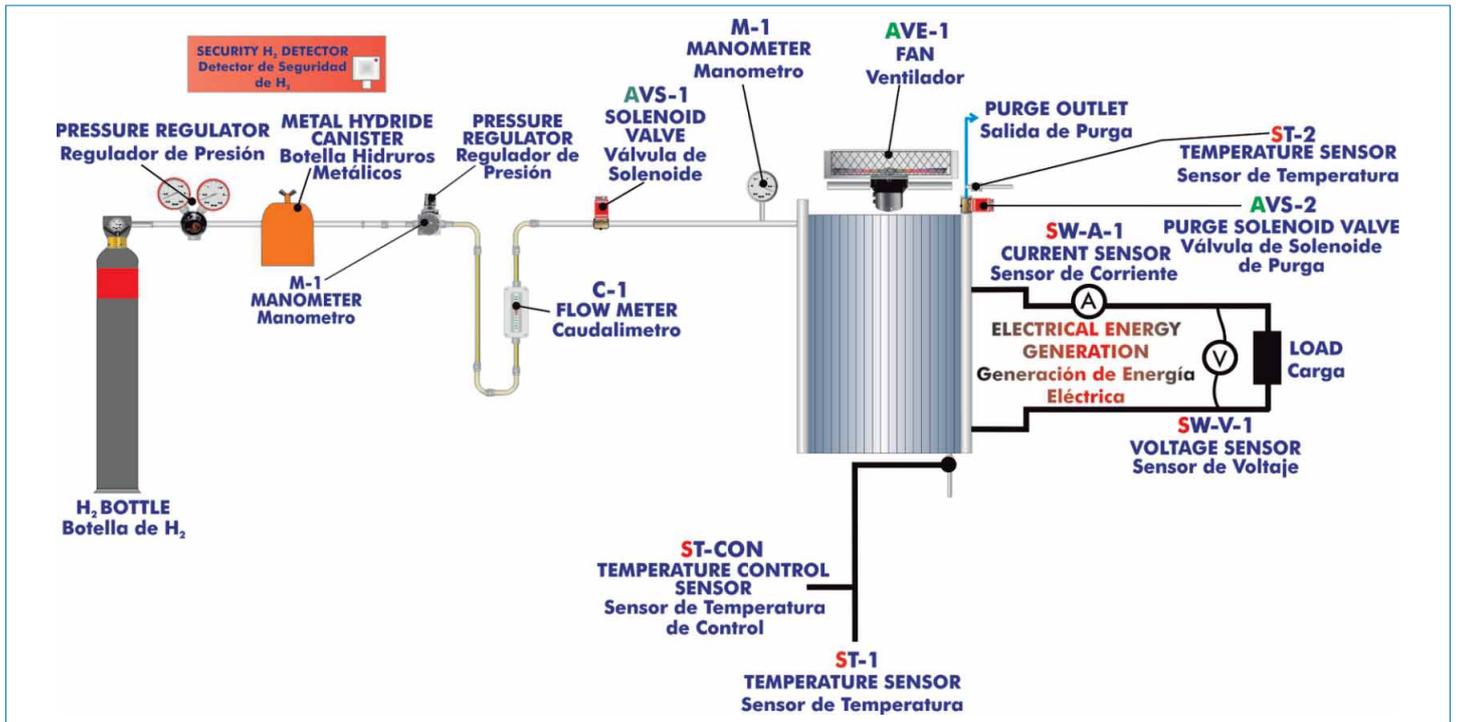


Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



ISO 9000: Quality Management
 (for Design, Manufacturing,
 Commercialization and After-sales service)



European Union Certificate
 (total safety)



Certificates ISO 14000 and
 ECO-Management and Audit Scheme
 (environmental management)



Worlddidac Quality Charter
 Certificate
 (Worlddidac Member)

GENERAL DESCRIPTION

The unit has been designed to give students a good understanding of fuel cells technology. This unit demonstrates a PEM Fuel Cell, generating electrical power from hydrogen.

The "EC5B" unit is supplied with a stack of proton exchange membrane fuel cell (PEM) with a rated power of 100W. The stack is composed of 24 cells with the shape of channelled plates that allow the air flow through the membrane. The membrane facilitates the hydrogen flow, generating the electrons release. There are separating plates which conduct electricity, allowing thus such electrons flow, between each pair of cells.

Cells are self-humidifying and do not require any type of external humidification.

The stack has an integrated fan that is able to provide the required air for proper operation and to maintain the appropriate temperature.

Hydrogen storage represents one of the essential points regarding the hydrogen economy. For that purpose, a cylinder of metal hydride (300NL) is included. Thanks to the absorption of the hydrogen inside, hydrogen is stored in a safe and certified way. Since the discharge pressure of the metal hydride cylinder is 15-20 bar, the EC5B unit also includes two pressure regulators; one of them is prepared to be installed in the H₂ cylinder in order to regulate the outlet pressure at 5-50 bar; the other is placed at the outlet of the metal hydride cylinder in order to regulate the inlet pressure to the stack in a range from 0.50 to 0.55 bar.

The unit also includes two solenoid valves. One of them is located before the stack and controls the hydrogen inlet and when the unit is switched off, the valve is closed to avoid any possible hydrogen leakage. The other valve, placed at the stack outlet, purges the excess of water and hydrogen towards the exterior for a proper operation.

The unit has a load regulation system. It enables the study of the generated electrical energy. It includes a variable power rheostat, which enables to vary the generated power.

The unit includes a battery that supplies 12V to the electronic console.

The whole electrical circuit of the stack is protected by a short circuit unit in case of an over current (12A) and low voltage shut down (12V).

It includes a hydrogen leak detector with a detection range from 0 to 2% Vol. and from 0 to 100% L.E.L respectively.

The unit is supplied with the suitable sensors and instrumentation for the most representative parameters measurements and controls (electronic console).

SPECIFICATIONS

Bench-top unit.

Anodized aluminium structure and panels in painted steel.

Main metallic elements in stainless steel.

Diagram in the front panel with similar distribution to the elements in the real unit.

Fuel cell stack with 24 cells, and a rated power of 100W. Cells are self-humidifying and do not require any type of external humidification.

Integrated fan in the stack.

Solenoid valve to supply H₂.

Cylinder of metal hydride for the storage of H₂ of 300NL. of capacity.

Pressure regulator of the metal hydride. Variable inlet adjustable to the hydride and outlet range from 0.50 - 0.55 bar.

Pressure regulator of the H₂ cylinder. Inlet at 200 bar and outlet at 5-50 bar.

Suitable tubes and hoses for their use with H₂ with a high safety factor: up to 210 bar.

Purge solenoid valve.

Load module: Rheostat: 22R 760W.

Hydrogen leakage detector (4-20 mA; Ip65).

Battery and charger (12V).

Failure protection with solenoid valve at the stack inlet.

Over current shut down.

Low voltage shut down.

Over temperature shut down in the stack.

Flow meter to measure the inlet H₂ flow to the stack.

Temperature sensor placed between two bipolar plates of the cell.

Temperature sensor for the purge flow.

Pressure meter (manometer) to measure the H₂ at the stack inlet.

Current and voltage sensors.

Electronic console:

Metallic box.

Temperature sensors connectors.

Selector for the temperature sensors.

Digital display for the temperature sensors.

Voltage digital display and current digital display.

Leds that indicate the operating status of the solenoid valves.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

EXERCISES AND PRACTICAL POSSIBILITIES

- 1.-Study of the fundamental principles of how the PEM based fuel cell operates.
- 2.-Study of the structure and main principles of a metal hydride cylinder.
- 3.-Calculation of a fuel cell efficiency.
- 4.-Study of the influence of air consumption and hydrogen in the efficiency of a fuel cell.
- 5.-Study of the influence of generated power in the efficiency of a fuel cell.
- 6.-Determination of the current density-voltage characteristics of a fuel cell.
- 7.-Power density from a single cell and a stack of cells.
- 8.-Representation of the polarization curve of a fuel cell.
- 9.-Study of the influence of the reagents' flows in the generation of electrical power.
- 10.- Study of the use of reagents and transport phenomena.
- 11.- Investigation into reactant utilisation.
- 12.- Kinetic parameters, thermodynamics.

REQUIRED SERVICES

- Electrical supply: single-phase 220V./50Hz. or 110V./60Hz.

CONSUMABLES REQUIRED

- Cylinder of compressed hydrogen of degree 4.0 (purity of 99.995 %) at a pressure of 150-200 bar.

RECOMMENDED ACCESSORIES

- Edilab - Elec1 : Electrolyzer with a hydrogen production of 3 NL/h.

DIMENSIONS & WEIGHTS

EC5B:

Unit:	-Dimensions: 700 x 400 x 550 mm. approx. (27.56 x 15.75 x 21.65 inches approx.)
	-Weight: 20 Kg. approx. (44 pounds approx.)
Load module:	-Dimensions: 490 x 330 x 310 mm. approx. (19.29 x 12.99 x 12.20 inches approx.)
	-Weight: 10 Kg. approx. (22 pounds approx.)
Electronic console:	-Dimensions: 490 x 330 x 310 mm. approx. (19.29 x 12.99 x 12.20 inches approx.)
	-Weight: 20 Kg. approx. (44 pounds approx.)

AVAILABLE VERSIONS

Offered in this catalogue:

- EC5B . PEM Fuel Cell Unit.

Offered in other catalogue:

- EC5C . Computer Controlled PEM Fuel Cell Unit.

*Specifications subject to change without previous notice, due to the convenience of improvements of the product.



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