

# MODEL OF HYDROGEN CAR

## Mod. F-AUT/EV

### DESCRIPTION

The model of hydrogen car is equipped with a reversible fuel cell with storage tanks that enables the car to produce hydrogen when an external voltage is applied.

The reversible fuel cell uses a Proton Exchange Membrane (PEM Fuel Cell). The solar panel produces current for the electrolysis process which splits the water and stores hydrogen and oxygen for later use. To power the car, the student connects the fuel cell to the engine. So doing an electrochemical reaction in the fuel cell starts between hydrogen and oxygen. Electricity is produced and can be power the electric motor and the wheels. The solar panel can also be used to power the car directly or in hybrid mode.

Students will explore topics such as energy conversion, properties of matter, chemical reactions, electrolysis, solar energy, fuel cells, hybrid vehicles.

### TRAINING PROGRAM

- Determining current-voltage characteristic, power curve and efficiency of solar module
- Determining the current-voltage characteristic of PEM fuel cell
- Determining Faraday efficiency of PEM fuel cell

### TECHNICAL SPECIFICATIONS:

- Reversible fuel cell with 2 gas cylinders:
  - Electrolyser required voltage: 1.4 - 1.8 Vdc
  - Hydrogen and oxygen storage cylinders volume: 15 ml
  - Fuel cell output power: 0.4 W
  - Fuel cell output voltage: 0.4 - 0.9 V
  - Operating temperature: 10 - 35 °C
  - Dimensions: 72 x 80 x 80 mm
- Solar panel module; used to power the reversible fuel cell in electrolyser mode or to power the car directly
  - Open circuit voltage: 3 Vdc
  - Short circuit current: 245 mA
  - Voltage (at max power point): 2.4 Vdc
  - Current (at max power point): 200 mA
  - Output power: 0.48 W
  - Dimensions: 70 x 120 x 52 mm



- Car chassis with electric motor
  - Required voltage: 0.5 - 3 V
  - Hydrogen consumption with operating engine: 3-5 ml/min
  - Operating time: 3 - 5 min
  - Dimensions: 210 x 110 x 45 mm
- Measurement box
  - Motor operating voltage: 0.2 ... 3 V
  - Motor current consumption: 10 ... 15 mA
  - Lamp operating voltage: 0.6 ... 1.5 V
  - Lamp power consumption: 80 mA
  - Measured resistance ( $\Omega$ ): 1,3,5,10,50,100,200, open and short circuit
  - Ammeter: 0 ... 2 A
  - Voltmeter: 0 ... 20 Vdc
  - Dimensions: 190 x 110 x 60 mm
- Hand generator; it simulates wind power and is alternative to the solar panel:
  - Operating temperature: 10 - 40 °C
  - Capacity: 1 Ah
  - Open circuit voltage: 3.6 V
  - Operating voltage: 1.4 - 1.8 V
  - Weight: 310 g
  - Dimensions: 60 x 52 x 135 mm
- Black and red cables  $\varnothing$  4 mm, 15 A, 50 cm
- Distilled water

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THEORETICAL - EXPERIMENTAL  
HANDBOOK

