

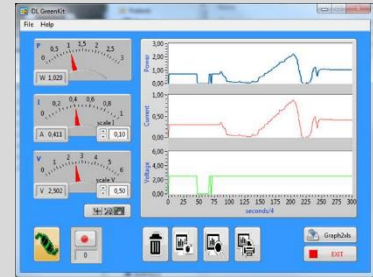


SOLAR-WIND-FUEL CELLS ENERGY TRAINER



DL GREENKIT

This trainer has been designed for the study of renewable energies sources: **solar energy, wind energy and hydrogen fuel cell systems.**



Complete with connecting cables, experiment manual, connection to PC through the RS485 serial port and **software for data acquisition and display.**

COMPONENTS INCLUDED

- Reversible PEM fuel cells
- PEM Electrolyser
- Reversible hydrogen fuel cell to assemble
- Hydrogen and oxygen tanks
- Syringe
- Motor and fan with propeller blade
- 1 Watt solar panel
- 0.75 Watt solar cell
- Mini wind turbine (wind power generator)
 - Blade pitch, blade profile and number of blades can be evaluated
 - Vane aligns the turbine automatically to the direction of the wind
 - Special 3 phase alternator for higher output power
- Vehicle chassis with LED light & motor
- Battery pack with connecting leads
- Three DC instruments: range 10 V, 2 A.
- Decade Resistor
- Double spotlight with 2 halogen lamps.

GENERAL FEATURES

Average training hours: 8h.

Approx. packing dimensions: 0.81x0.61x0.61 m.

Net weight: 29 kg.



TRAINING OBJECTIVES

Study of a solar system

- Voltage and current in a solar panel as a function of light intensity
 - Measuring V_{OC} and I_{SC} characteristics of a solar panel
 - Influence of temperature on solar panels
 - Connecting solar panels in parallel
 - Connecting solar panels in series.
 - Influence of tilt angle on solar panels
 - Effect of shade on solar panels
- Current-Voltage characteristic, power curve and efficiency of a solar panel.
 - Study of solar panel under load. (Tracing the VI and power curve to determine MPP).
 - Solar panel efficiency

Study of a wind system

- The wind energy experiment-study of influence of wind speed and direction
 - Studying and understanding the power from the wind
 - Influence of wind speed on generated power.
 - Influence of wind direction on generated power.
- The study of influence of the wind turbine characteristics on generated power.
 - Influence of the number of rotor blades.
 - Influence of the pitch.
 - Influence of the blades shape.
- The study of current-voltage characteristic of the wind generator; the influence of the load over rotor movement
 - Trace the current-voltage characteristic curve of a wind generator
 - Finding the MPP for different wind speeds (Tuning for max. power)
 - Study the “stability” of the wind turbine when it is influenced by the load (braking mode)

Study of a fuel cell system

- Understanding Fuel Cell General Installation
- Understanding Fuel Cell Structure (Assembling a fuel cell)
- Electrolyser: Producing Hydrogen as an electrical energy storage method
 - Determining the Minimum Voltage for Water Decomposition
 - Determining the flow of gas generated by the electrolyser
 - Determining the characteristic V-I curve of PEM electrolyser.
 - Energy efficiency and faraday efficiency of PEM electrolyser.
- Fuel cell: Producing electrical energy from stored Hydrogen.
 - Determining the V-I characteristic and power curve of a PEM fuel cell.
 - Energy efficiency and faraday efficiency of PEM fuel cell.

Study of a hybrid (Autarkic) system

- Implementing hybrid wind solar power system with hydrogen storage.
- Implementing hybrid fuel cell solar power system: studying the autonomy of a hydrogen powered car.

Note:

DL GREENKIT requires table fan. It is not included in the kit.