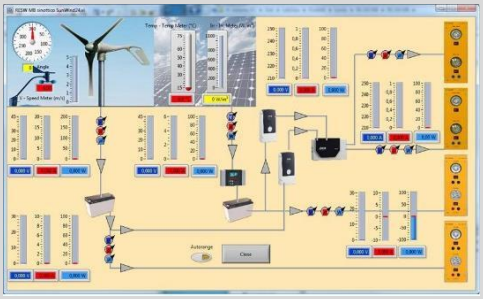
RENEWABLE ENERGIES

HYBRID SOLAR / WIND ENERGY TRAINER

DL SUNWIND-24V3

The main target of a hybrid power system is to combine multiple sources to deliver non-intermittent electric power, trying to take advantage of multiple available renewable energies.



Complete with connecting cables, experiment manual and **software for data acquisition and processing**.

TRAINING OBJECTIVES

Solar energy:

- Measurement of solar irradiance and irradiation
- Graph tracing of the following characteristics of a photovoltaic module:
  - voltage at no-load, function of irradiance
  - short circuit current, function of irradiance
  - current – voltage, function of irradiance
  - voltage and current in overload condition
  - series and parallel connected configurations
- Regulating and charge of the battery
- DC solar plant
- AC installation.

Wind energy:

- Activating the braking action
- Regulating and charging the battery
- DC wind installation
- AC installation: standby function investigation.

Hybrid system:

- AC parallel connected, DC low voltage battery bank feed by different sources.

GENERAL FEATURES

The Trainer is composed of two sub-systems for the conversion to electric energy, one from solar energy through a photovoltaic panel and the other from wind energy through a wind turbine.

In this trainer, two inverters work parallel connected; one acting as master, synchronizes the frequency of the second inverter, acting as slave; this architecture allows creating a connection between the two outputs that operate as a single line with double available power. This configuration can be expanded up to 9 inverters connected.

Average training hours: 12h.

The trainer is composed of:

- Two solar photovoltaic panels (85W, 12V) mounted on a support with wheels and complete with graduated scales for adjustment of the inclination and calibrated cell in the upper part for measuring the solar irradiance and temperature.
- Motor/generator group for the simulation of a wind turbine. Composed of a brushless motor coupled to **24V** AC 3ph generator, motor controller module, anemometer for real wind detection
- Wind turbine electronic regulator for battery charging.
- Two 2400W DC/AC converter modules (2400 W each), with sinusoidal output to generate an electrical network (mains). With a circuit breaker to switch on and off the inverter. It operates as master or slave. Complete with control panel. Integrated MPPT solar charge controller, two 12V batteries.
- Two 24Vdc load modules with two 20W halogen lamps each, with an On/Off control switch.
- Two 24Vdc load modules with two 3W LED lamps each, with an On/Off control switch.
- Two mains voltage load modules with a 35W halogen lamp and a 3W LED lamp each, with an On/Off control independent switch.
- Three-phase bridge rectifier module.
- Two residual circuit breaker modules, 10A, $I_{\Delta n}$ 30mA.
- Variable logarithmic rheostat module, 80Ω, 6A max., to load the photovoltaic panel to detect the voltage-current characteristic curves.
- Instruments module for measuring solar parameters. It displays voltage-current-power, solar irradiance, temperature of the solar panel.
- Instruments module for measuring wind parameters. It displays voltage-current-power, Wind and Rotor data.
- Two sun simulators for solar photovoltaic panel internal use. The intensity of the light can be controlled by the operator locally through a potentiometer and remotely through a DC 0 ÷ 10 V signal or ModBus command.
- Three-level frame for the modules.