



## WIND ENERGY ADVANCED TRAINER



**DL WIND-AT**

Modular trainer for the theoretical and practical study of the electric energy generation from a micro-grid wind turbine. With the Wind Energy Advanced Trainer it is possible to perform experiments to determine the characteristics of a wind generator, study its off-grid operation with a battery charge regulator and its on-grid operation with the connection to the mains network.

### TRAINING OBJECTIVES

#### Study of wind turbine:

- Identification of wind turbine components.
- Operating the Wind Turbine Breaker.
- Calculating wind power.
- Measuring Wind turbine electrical power.
- Study of wind turbine with load.

#### Study of off-grid wind system:

- Dimensioning of an off-grid wind system.
- Battery regulating and charging.
- Supplying DC load with wind power stored in a battery.
- Supplying AC load with wind power and a battery.
- Calculating the system autonomy with different loads.

#### Study of on-grid wind system:

- Measuring the electricity produced by the wind generator, delivered/taken from the mains grid, and the loading of AC lamps.
- Calculating the efficiency of the complete on-grid wind energy system.
- Investigating the response of a wind system to a mains failure.
- Energy balance.

### TECHNICAL SPECIFICATIONS

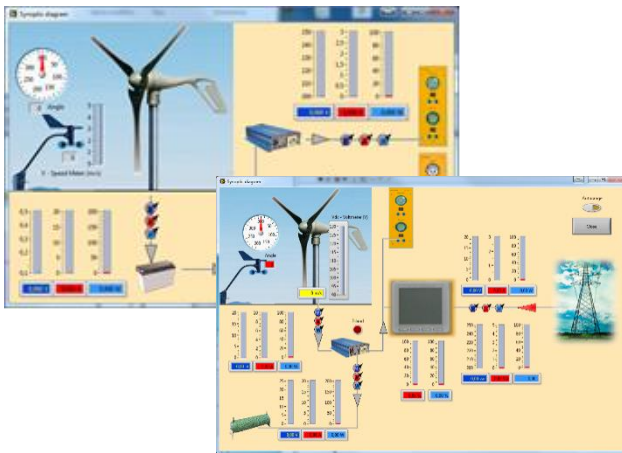
- Three phase rectifier bridge module.
- DC load module. It includes a 20W dichroic lamp and 3W LED lamps, with independent switches.
- A load management module with three independent single-phase outputs for the dynamic study of different load types.
- Network monitor module used to measure electrical parameters in a single phase circuit.
- A circuit breaker module.
- Fixed single phase power source rated at mains voltage with auxiliary 12 Vdc fixed regulated voltage output to power measurement modules.
- 100Ah battery with battery protection module.
- Motor/generator group for the simulation of a wind turbine. Includes a three-phase permanent magnet generator of aprox. 400w.
- Three-phase inverter for asynchronous induction motor drive and speed control. Rated power: 1.5 kW.
- Off-grid inverter module, with pure sine wave output at mains voltage.
- Wind turbine charge controller with brake system.



## Waveform studies with optional DL 9026N module:

- Determining the waveform of the wind generator output voltage and current.
- Determining the waveform of the off-grid inverter's output voltage and current.
- Determining the waveform of the on-grid inverter's output voltage and current.

- Active DC load used in the renewable energies laboratories configurable as constant resistance or constant current.
- Multifunction measurement module for wind applications: It includes four separate instruments to measure all fundamental parameters for the study of a wind-system.
- A grid-tie inverter, with output at mains voltage.
- Three level frame.



A software developed in LabVIEW is supplied with the Wind Energy Advanced Trainer. It is able to communicate with the main components of the modular system, in order to perform a data acquisition and processing

## Optional module:

DL 9026N - Three-phase waveform acquisition module:

- Selectable single-phase AC multi-meter to measure V, I, P, Q, and S.
- Data acquisition board to observe the voltage and current waveforms of the 3 phases simultaneously with isolated input.
- Comes with data acquisition SW developed in Labview for waveform visualization.

