RENEWABLE ENERGIES

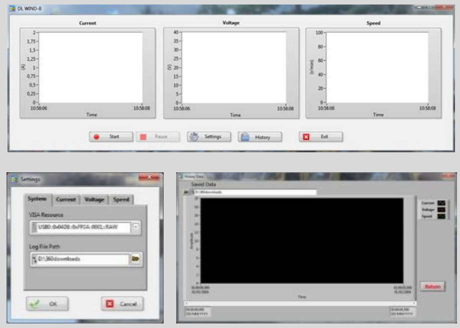
DE LORENZO

WIND POWER TRAINER WITH WIND TUNNEL

DL WIND-B

Trainer for the theoretical and practical study of a wind turbine and generation of electricity from wind kinetic energy.

With this trainer it is possible to change the flow of the air that reaches the wind turbine and to study its operation under no-load and load conditions.



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

TRAINING OBJECTIVES

- Understanding wind tunnel simulator
- Measuring wind speed using an anemometer
- Wind turbine starting. Defeating inertia
- Characterization of a horizontal axis wind turbine.
  - Varying the number of blades.
  - Varying orientation.
- Turbine interaction with wind tunnel

Average training hours: 4h.
Air tunnel dimensions: 1900 x 600 x 1400 mm.
Net weight: 110 kg.

TECHNICAL SPECIFICATIONS

- A wind tunnel in which the following components are installed:
  - A three-phase industrial fan.
  - Flow straightener.
  - An anemometer for wind speed measurement.
  - A six blade 52 V, 40 W wind turbine, with a mechanism for changing its orientation with respect to the wind source.
- A stand to mount the anemometer outside.
- An control module including:
  - Three phase inverter to control the fan generating the air flow in the tunnel.
  - Instruments, (wind speed meter, RPM meter, voltage meter, current meter and power meter).
  - 0-10V analogue output from each instrument.
  - A lamp and variable resistive load.
  - Protected with emergency pushbutton.
  - Serial communication using Modbus RTU.

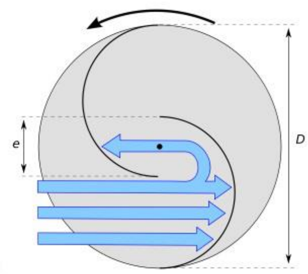
NOTE

The blades of the wind turbine can be removed for efficiency tests with variable number of blades or to allow their replacement with blades designed by the student and made with a 3D printer.




OPTIONS: VERTICAL AXIS TURBINES

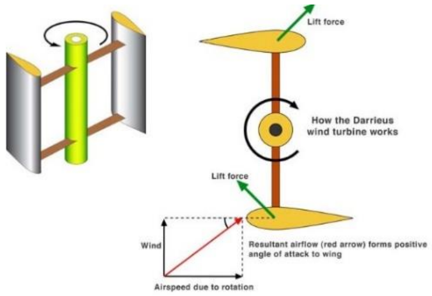
SAVONIUS TURBINE



This turbine belongs to the category of resistance turbines, where the resistance to the force of the wind causes the rotation of the axis.
The greatest handicap of vertical axis turbines, which limits their performance, consists in the fact that a part of them will rotate in the opposite direction to the wind and a part in favor. The Savonius turbine, to avoid this problem, is made of two half-shells (in the simplest version) which are not joined to the rotor of the turbine, but arranged so that a part of the half-shells lets the thrust air flow also through the upwind part.

DL VAWT

GIROMILL TURBINE



This turbine belongs to the category of lift turbines. The lift is the force that acts on a wing profile because of a pressure difference, given by the different speeds which takes the fluid when "lapping" the surfaces of the profile.
With the increase of the speed of rotation, the upwind blade acts as a brake and limits and stabilizes the speed of rotation.
Another important aspect to be monitored is related to the resistances that oppose the start of the movement. It may happen, in fact, that these are greater than the forces of rotation impressed by the wind to the machine. This is why some wind turbines of this type can be started only with strong winds or through auxiliary starting motors.

DL GMLL