1.Overview

The IC-RW-WE-I09 – Wind Energy Unit is an educational system designed to introduce the principles of wind power generation. It features a miniature wind turbine, a generator, and supporting components that simulate a small-scale wind energy system. This unit offers hands-on experience in understanding wind energy conversion, system components, and power output analysis, making it ideal for renewable energy education and basic research.

Fig:IC-RW-WE-I09

2.Advantages

The wind energy unit allows users to understand the fundamental principles of wind energy conversion and explore the concepts of renewable energy generation. By assembling and operating the kit, learners can observe the conversion of wind energy into electrical energy, learn about turbine aerodynamics, and study the electrical components involved in the process.

The trainer includes the following components:

- Tunnel.
- blower Unit.
- Aerogenerator Kit.
- Sensors.
- SCADA System.

3.Experiments will be done

1- Study of the conversion of kinetic wind energy into electrical energy.

2- Study of the power generated by the aerogenerator depending on the wind speed.

3- Determination of the typical parameters of the aerogenerator (short circuit current, open-circuit voltage, maximum power).

4- Determination of the I-V curve.

5- Study of voltage, current and power in function of different loads.

6-Study of the influence of the load variation on the aerogenerator.

7-Determination of the maximum power output of the aerogenerator.

8-Study of the power generated by the aerogenerator

depending on the incident angle of the air.

9- Study of the characteristic curve of the rotor.
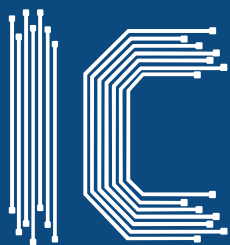
4.Specification

Tunnel:	Stainless steel tunnel of 200 x 50 x 50cm approx., includes transparent windows.
Power Supply	230V .50Hz.
Max flow rate:	10650 m3/h approx
Max. Power:	1.5KW.
Movable apparatus.	

Aerogenerator:

Diameter	510mm approx.
Starting air speed	2.0m/s approx.
Max. Power output	60W
Voltage	12V. Max
Charging current:	5A.
Number of Blades	6 Min.
Number of different shape (design) of Blades	3 Min.

-The blades can be removable and it's possible to set different blade configurations.
-Low friction alternator.
-Change the angle of every blade, as each one embeds its own calibrated protractor.
-Blades Material nylon reinforced with fiberglass.

DC Load Regulator:

DC motor	voltage: 24V power: 5W.

-Metallic box with diagram in the front panel.
-Two lamps of 12V.
-Rheostat of 500W.
-Two manual switches.

Sensors:

-Four position load selector.
-Temperature sensor.
-Air speed Sensor (0.20 – 13m/s.) approx.
-DC voltage and current sensor.
-Force sensor to measure the mechanical torque (0 – 600g) approx.
-Force sensor to measure the thrust force (0 – 3000g) approx.

SCADA SYSTEM:

-Control Interface Box.
- Data Acquisition Board.
-Software for Computer Control Data Acquisition, Data.

Management:

-Desktop computer core I7, and laser printer with two ink cartridge to be supplied with the unit.