

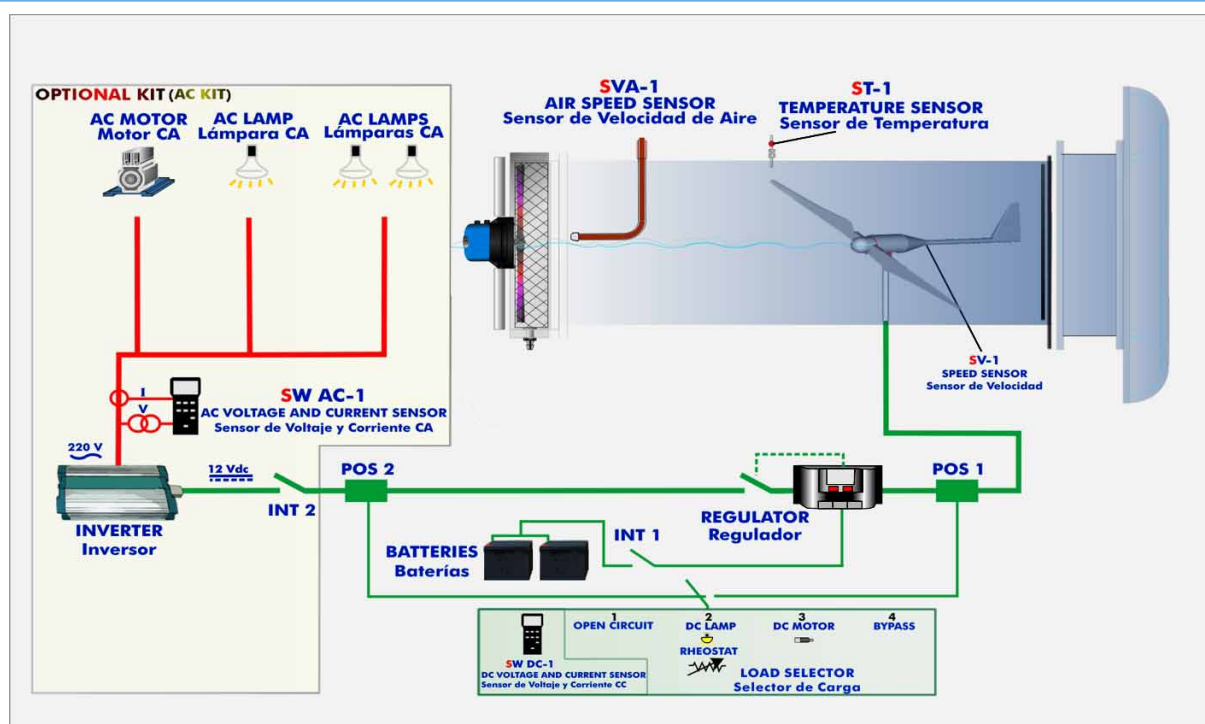
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Products
Products range
Units
5.-Energy



Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



ISO 9000: Quality Management
(for Design, Manufacturing,
Commercialization and After-sales service)



European Union Certificate
(total safety)



Certificates ISO 14000 and
ECO-Management and Audit Scheme
(environmental management)



Worlddidac Quality Charter
Certificate
(Worlddidac Member)

DESCRIPTION

"EEE" is a laboratory-scale unit designed to study the eolic energy and the influence of some factors on this generation.

Basically it is formed by:

- Tunnel.
- Aerogenerator (with angle-adjustable and with removable and angle-adjustable blades).
- Axial fan.
- Load and Battery Charger Regulator.
- Auxiliary battery charger.
- Battery.
- DC Loads Module.
- Sensors (temperature, speed).
- Ammeter/Voltmeter.
- Electronic console.

An axial flux fan introduces air in the tunnel. An air speed sensor measures air speed.

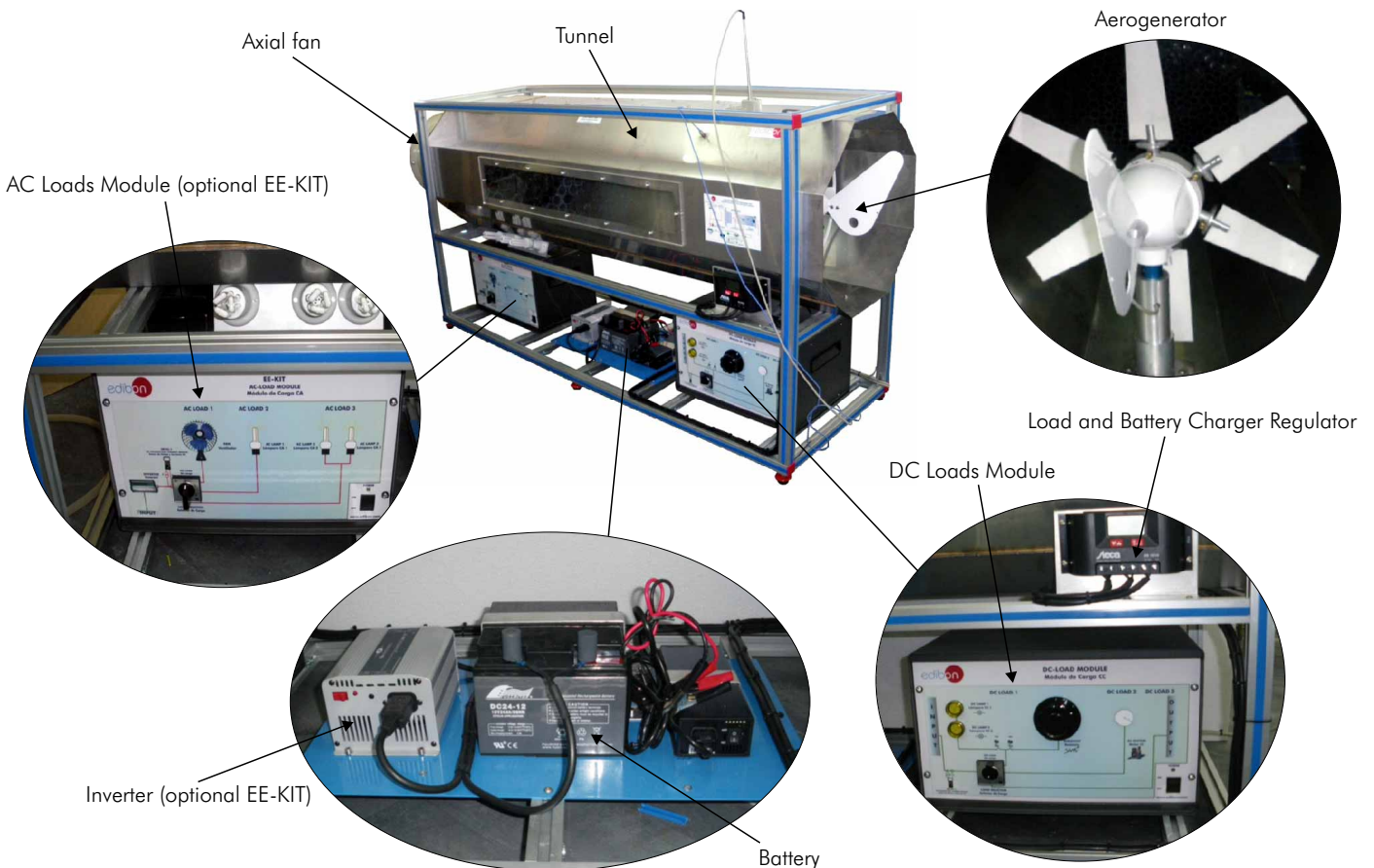
It is possible to know the value of voltage and current given by aerogenerator, measured before and after the regulator.

We can know, by means of a sensor, the rotational speed of the aerogenerator (r.p.m.).

There is one temperature sensor before the rotor, in order to know the temperature for density calculation.

Optional (NOT included in the standard supply):

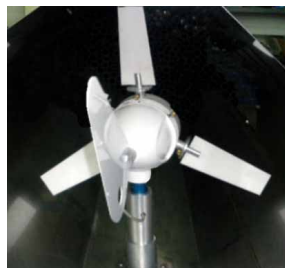
- EE-KIT. Kit of Conversion and Consumption Simulation (AC):
 - Single-phase inverter.
 - AC Loads Module:
 - Lamps of 220V-240V, 50-60Hz, 15W; Fan of 230V; and 4 Positions Selector.
 - AC voltage, current and power sensors.
- EE-KIT2. Grid Connection Inverter Kit:
 - Grid Connection Inverter.
 - Energy Generation Simulator.



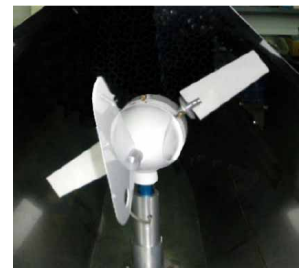
Aerogenerator configurations



Aerogenerator with 6 blades



Aerogenerator with 3 blades



Aerogenerator with 2 blades

Anodized aluminium structure and panels in painted steel.

Main metallic elements in stainless steel.

Diagram in the front panel with similar distribution to the elements in the real unit.

Stainless steel tunnel of 2000 x 550 x 550 mm. approx., which includes two transparent windows of 1100 x 200 mm. approx.

Aerogenerator of 6 blades:

Angle-adjustable aerogenerator: to modify the angle of incidence and simulate different weather conditions.

Angle-adjustable blades: this unit allows to change the angle of every single blade, as each one embeds its own calibrated protractor. The blades can be adjusted full 360° range.

Removable blades: it's possible to set 6, 3 or 2 blades, depending on the experiment.

Power: 60 W.

Aerogenerator diameter: 510mm.

Starting air speed: 2.0 m/s.

Max. power 60W (25.7 m/s.).

Axial fan with speed variation for the wind simulation:

2800 r.p.m.

Power: 0.37 kW.

Flow : 5700 m³/h.

Load and Battery Charger Regulator:

Load regulation.

PWM 30Hz regulation.

Staggered charge.

Quick charge.

Floating charge.

Under-voltage disconnection and warning messages.

Reconnection.

Over-voltage disconnection.

High temperature protection.

Batteries high voltage protection.

Load and module over-current protection.

Inverse current flow protection.

Auxiliary battery charger for battery of 12Vdc.

Battery:

Battery of deep cycle charge. Plates with active materials of high density. 24 Amp/hour. 12 Vdc.

DC Loads Module:

Metallic box.

Diagram in the front panel.

DC lamps of 12Vdc.

DC motor of 24-36Vdc.

Rheostat of 300W.

4 Positions Selector.

Temperature sensor ("J" type).

Air speed sensor.

Speed sensor (aerogenerator).

Voltmeter.

Ammeter.

Electronic console:

Metallic box.

Connector for the temperature sensor.

Digital display for the temperature sensor.

Connector for the speed sensor.

Digital display for the speed sensor.

Voltmeter display.

Ammeter display.

Fan speed regulator.

Cables and Accessories, for normal operation.

Manuals:

This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

Optional (NOT included in the standard supply) :

-EE-KIT. Kit of Conversion and Consumption Simulation (AC).

-EE-KIT2. Grid Connection Inverter Kit.

See section "Optional" in page 4.

EE-KIT. Kit of Conversion and Consumption Simulation (AC):

• Single-phase inverter:

- Single-phase.
- 25 kHz switch mode technology.
- Start-up power of 200%.
- Short-circuits protection.
- High temperature protection.
- Overcharge protection.
- Operation state LED indicator.
- Rear connection/disconnection switch.

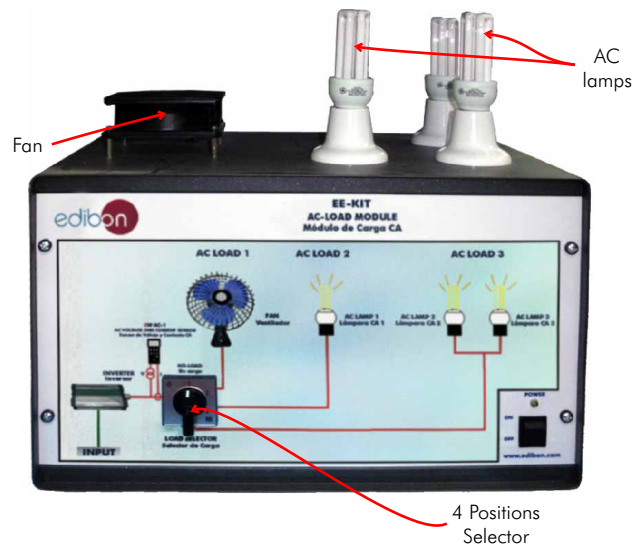
Inverter



• AC Loads Module:

- Metallic box.
- Diagram in the front panel.
- Fan of 230V.
- Lamps of 220V - 240V, 50-60 Hz., 15W.
- Independent connection for every load with the help of the 4 Positions Selector:
 - With the load selector in position 1, the inverter operates without load.
 - With the load selector in position 2, the fan motor is connected.
 - With the load selector in position 3, one AC lamp is connected.
 - With the load selector in position 4, two AC lamps are connected in parallel.

AC Loads Module



• AC voltage, current and power sensors.

EE-KIT2. Grid Connection Inverter Kit:

Inverter used for the conversion and injection to the grid of the power generated by a simulated source of renewable energy. The simulated source is a simulator used to obtain a variable power to be injected to the grid.

The operation mode is displayed by means of a LED indicator at the front side of the housing.

It is equipped with extensive safety measures to ensure that it switches off immediately as soon as the AC plug is removed from the wall socket or the public grid fails in operation.

The inverter can be connected to a PC through RS232 communication to display some parameters such as voltage and current inputs, mains voltage and frequency, maximum AC power, Kwh, etc.

• Grid Connection Inverter:

Input (DC):

- Nominal power @ 25°C: 200 W.
- Maximum power @ 25°C: 250 W.
- PV power: 160-300 Wp.
- MPP voltage: 40-75V DC.
- Maximum voltage: 155V DC.
- Nom. rated current: 4A.

Output (AC):

- Voltage: 85% ~ 110% Un (195-253 V).
- Nominal power: 140 W.
- Maximum power/fuse: 2.25 A / 3.15 A.
- Frequency: 49.5 ~ 50.5 Hz.

• Energy Generation Simulator.



EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

- 1.- Study of the aerogenerator operation in function of the wind speed variation.
- 2.- Generator angle of incidence variation.
- 3.- Operation differences using the three available blades configurations (aerogenerator with 6, 3 or 2 blades).
- 4.- Operation differences depending on the angle of the blades.
- 5.- Load variation influence on the aerogenerator.
- 6.- Study of the voltage, power and current.
- 7.- Study of V, I, W in function of different loads.
- 8.- Efficiency experimental determination (depending on: number of blades, angle of the blades, generator's angle; among others).
- 9.- Wind energy measurement.
- 10.- Familiarization with the regulator parameters.
- 11.- Study of the power generated by the aerogenerator depending on the wind speed.
- 12.- Study of the power generated by the aerogenerator depending on the air incident angle.
- 13.- Connection of loads to direct voltage.

Practices to be done with the OPTIONAL KIT "EE-KIT":

- 14.- Connection of loads to alternating voltage of 220V.

Practices to be done with the OPTIONAL KIT "EE-KIT2":

- 15.- Study of the grid utility inverter.

REQUIRED SERVICES

- Electrical supply: single phase, 220V/50Hz or 110/60Hz., 5 kVA.

DIMENSIONS & WEIGHTS

EEE:

Unit: -Dimensions: 2300 x 630 x 1080 mm. approx.

-Weight: 120 Kg. approx.

Electronic Console: -Dimensions: 490 x 330 x 310 mm. approx.

-Weight: 15 Kg. approx.

OPTIONAL

- EE-KIT. Kit of Conversion and Consumption Simulation (AC):

Single-phase inverter.

AC Loads Module:

Lamps of 220V-240V, 50-60Hz, 15W; Fan of 230V; and 4 Positions Selector.

AC voltage, current and power sensors.

- EE-KIT2. Grid Connection Inverter Kit:

Grid Connection Inverter.

Energy Generation Simulator.

AVAILABLE VERSIONS

Offered in this catalogue:

-EEE. Wind Energy Unit.

Offered in other catalogues:

-EEEC. Computer Controlled Wind Energy Unit.

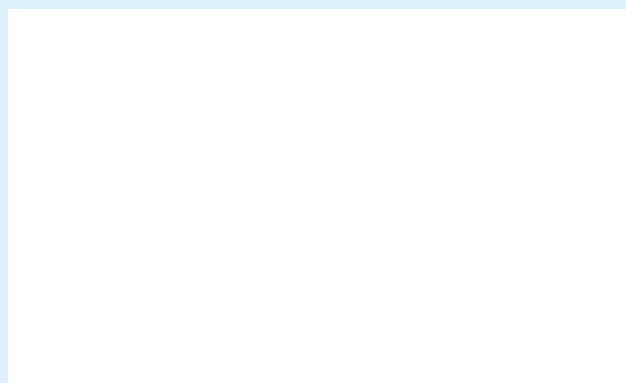
-MINI-EEEC. Computer Controlled Wind Energy Basic Unit.

-MINI-EEE. Wind Energy Basic Unit.

*Specifications subject to change without previous notice, due to the convenience of improvements of the product.



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