edibon

Engineering and Technical Teaching Equipment

Wiring Installation Training, Power Generation Hybrid Systems

WIT-PGH

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PRODUCTS
40.- ELECTRICITY

INTRODUCTION

Renewable energies are clean sources of energy (they do not produce greenhouse gases), inexhaustible and increasingly competitive (their costs are being reduced). Hybrid systems arise from the association of renewable energies with conventional generation and storage systems. Due to current and actual importance of these energy generation systems, it is needed to train future professionals in this field.

ISO 9001: Quality Management (for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate (total safety)

Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)

"Worlddidac Quality Charter" and Platinum Member of Worlddidac

GENERAL DESCRIPTION

The Wiring Installation Training, Power Generation Hybrid Systems application, "WIT-PGH", has been designed by Edibon for training at a practical and professional level in the field of installation, wiring and commissioning of hybrid renewable energies systems.

This application will provide future professionals with the knowledge and skills essential to the assembly, installation, wiring and commissioning of wind and solar installations based on commercial and residential applications. This application includes and recommends different kits to provide experience in the installation of numerous isolated hybrid systems that can be implemented with photovoltaic solar energy, wind energy and energy coming from an electric generating set.

In order to acquire complete knowledge, the application includes a specific manual which explains at a theoretical and practical level, the aspects related to the installation, wiring and commissioning procedures of these installations.

The WIT-PGH application includes the following elements:

- FP-STR. Assembly Frame with Safe Electrical Power Supply.
- FP-KIT-2. DC Motor Controller Installation Kit.
- FP-KIT-4. Wiring Installation Kit.
- FP-KIT-10. Tubes and Fittings for Channeling Wiring Kit.
- FP-KIT-16. Photovoltaic Generation Kit.
- FP-KIT-19. Lighting Consumption Kit.
- FP-KIT-22. Hybrid Installation Kit.
- FP-KIT-23. Wind Turbine Installation for Hybrid Systems Kit.
- FP-KIT-52. Meters, Switches and Distribution Bus Bar Installation Kit.

Required elements:

- CHER. Tool Box.

Recommended elements:

- MED65. Digital Multimeter.
- FP-KIT-5. Measuring Kit.
- FP-GENS. Genset.

SPECIFICATIONS

The WIT-PGH application includes the following elements:

- FP-STR. **Assembly Frame with Safe Electrical Power Supply.**
  - Aluminum structure:
    - Three aluminum struts.
    - Easy assembly of components via hammer head screws.
    - Possibility of simultaneous work of several students.
    - Four swiveling casters to facilitate the movement.
    - Dimensions:
      - Structure height: 1800 mm.
      - Useful working height: 1000 mm.
      - Width: 1500 mm.
  - Three-Phase connection plug.
  - Safe electric box:
    - Differential magnetothermal, 4 poles, 25A, 300mA AC 6KA.
    - Emergency stop mushroom (230/400V AC).
    - 5-wire hose for connection to frame.
    - Signal lamp of voltage presence.

- FP-KIT-2. **DC Motor Controller Installation Kit.**
  - DC Motor Controller:
    - Supply voltage: 230 VAC (PH+N+G).
    - Three ON-OFF switches:
      - ON-OFF power switch.
      - Star-Stop control activation switch.
      - Internal tachodynamo feedback switch.
    - Two potentiometers:
      - Speed control.
      - Torque control.
    - Terminals:
      - Rotor terminals.
      - Excitation terminals.
      - Tachodynamo terminals.
    - Three driver status leds: (red, yellow and green).
    - Variable output voltage: 0-300V CC.
  - A control cabinet with door:
    - Dimensions:
      - Height: 500 mm.
      - Width: 400 mm.
      - Depth: 200 mm.
  - Cut rail, 2 m.
  - Grey cable duct for wiring, 2 m.
  - 200 W, DC Motor with Wound Rotor.

- FP-KIT-4. **Wiring Installation Kit.**
  - 100 meters of grey wire of 1.5 mm^2.
  - 100 meters of brown wire of 1.5 mm^2.
  - 100 meters of black wire of 1.5 mm^2.
  - 100 meters of green/yellow wire of de 1.5 mm^2.
  - 25 meters of screened wire.

- FP-KIT-10. **Tubes and Fittings for Channeling Wiring Kit.**
  - PVC electrical conduit for wiring installation, 20 m.
  - 7 electrical boxes.
  - Cable guide.
  - 20 cable clamps 20 mm.

- FP-KIT-16. **Photovoltaic Generation Kit.**
  - Two lamps panel to simulate solar radiation:
    - Power: 2 x 250 W.
    - Switch ON/OFF.
    - Intensity Regulator.
    - Aluminum frame.
  - 96 W Photovoltaic Panel:
    - Maximum Power: 96 W.
    - Voltage at maximum power: 17.8 V.

- FP-KIT-19. **Lighting Consumption Kit.**
  - Four sockets.
  - Two 12V DC lamps.
  - Two 230V AC (PH+N) halogen bulb.
  - Four switches.

- FP-KIT-22. **Hybrid Installation Kit.**
  - DC Analog ammmeter from 0-10 A.
  - Current cutoff switch.
  - Sine-Wave inverter:
    - Nominal power: 1000 VA.
    - Input voltage: 12V DC.
    - Output voltage: 230V AC.
  - Battery charger.
  - Gel Battery:
    - Battery voltage: 12V DC.
    - Battery capacity: 90 Ah.

- FP-KIT-23. **Wind Turbine Installation for Hybrid Systems Kit.**
  - DC analog Ammeter from 0-10 A.
  - Dump Load implemented in the controller.
  - Switch to stop generator spinning.
  - Permanent Magnet Wind Turbine:
    - Power output: 200 W.
    - Nominal wind speed: 11,5 m/s.
  - Charge regulator:
    - Output voltage: 12V DC.

- FP-KIT-52. **Meters, Switches and Distribution Bus Bar Installation Kit.**
  - Distribution electric box.
  - Differential thermal switch, two poles.
  - 2 x energy power meters.
  - Distribution busbar:
    - It consists of two rails:
      - One for the connection of positive poles.
      - One for the connection of negative poles.

Specifications

Required elements:

- CHER. **Tool Box.**
  - Crimper.
  - Tin.
  - Meter.
  - Insulation tape.
  - Heat shrink.
  - Voltage tester screwdriver.
  - Cross-head screwdriver and flat-head screwdriver.
  - Allen keys.
  - Soldering iron.
  - Rubber hammer.
  - Wire terminals and Connection terminals.
  - Flanges.
  - Wire cutter.
  - Screw Clamp Terminals.
  - Wire stripper.

Recommended elements:

- MED65. **Digital Multimeter.**
  - This module has a digital multimeter of about 3 ½ digits, with double-jack ending cables of about 4 mm to facilitate interconnections.
  - With this digital multimeter we will be able to measure:
    - Voltage.
    - Current.
    - Resistance.
    - Capacitors capacity.
    - Temperature.

- FP-KIT-5. **Measuring Kit.**
  - Clamp Meter:
    - Clamp for alternating/direct current measurements contactless.
    - The clamp can measure:
      - Current.
      - Voltage.
      - Resistance.
  - A voltage and continuity tester:
    - Voltage range: 12-690V AC.
    - Phases rotating detection in three-phase systems.
    - Polarity tester.

- FP-GENS. **Genset.**
  - Single-phase.
  - Nominal voltage: 230V AC.
  - Maximum power: 1000 W.
  - Frequency: 50 Hz.
  - Approximate autonomy: 6 h.

- **All necessary cables to realize the practical exercises are included.**

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.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Wiring of the needed protections for the island operation of solar and wind systems.
2.- Wiring of the photovoltaic panel to the solar load regulator.
3.- Wiring of the solar load regulator to the busbar.
4.- Wiring of the busbar to the battery.
5.- Wiring of the battery to the inverter.
6.- Simulation of different solar radiations.
7.- Start-up of the photovoltaic generation system.
8.- Voltage and current measurement at the outlet of the PV panel and at the battery.
9.- Wiring of the wind turbine to the wind load controller.
10.- Wiring of the wind load regulator to the busbar.
11.- Simulation of different wind conditions.
12.- Start-up of the wind generation system.
13.- Voltage and current measurement at the outlet of the wind turbine and at the battery.
14.- Start –up of the hybrid generation system.
15.- Wiring of the backup generator to the current inverter.
16.- Start-up of the backup generation system
17.- Wiring of light loads.
- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

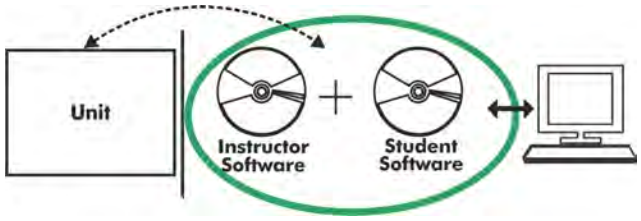
- Electrical supply: three-phase, 380V/50 Hz or 208V/60 Hz, 3 kW.

DIMENSIONS AND WEIGHTS

WIT-PGH:

- Dimensions: 1500 x 400 x 1800 mm approx.
  (59.05 x 15.74 x 70.86 inches approx.)
- Weight: 80 Kg approx.
  (176 pounds approx.)

WIT-PGH/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF).** Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

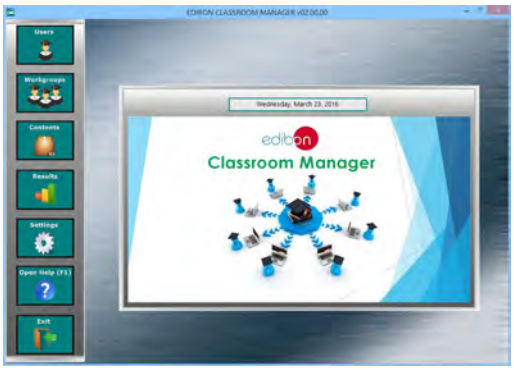
Instructor Software

- ECM-SOF. **EDIBON Classroom Manager (Instructor Software).**

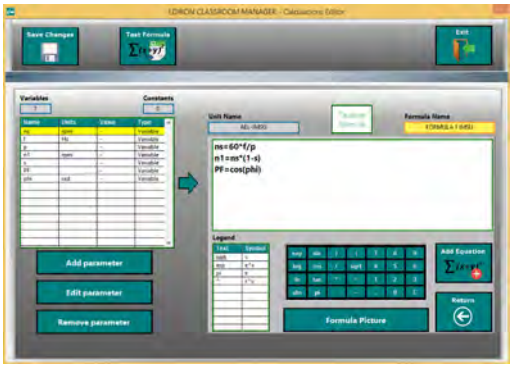
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

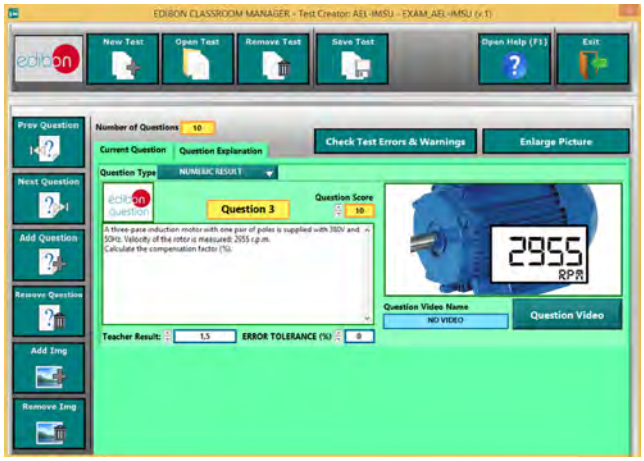
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation System Solver Engine.**
- **Updatable Contents.**
- **Report generation, User Progression Monitoring and Statistics.**



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

Optional

Student Software

- ESL-SOF. **EDIBON Student Labsoft** (**Student Software**).

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

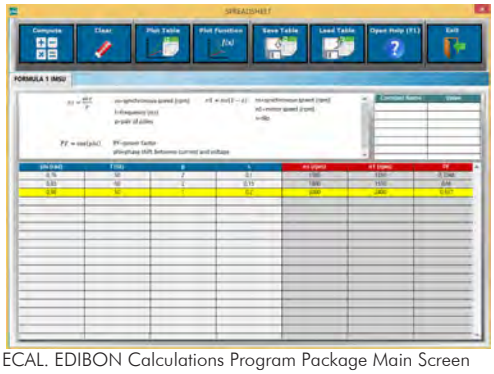
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge and progression.**
- **Test self-correction.**
- **Calculations computing and plotting.**
- **Equation System Solver Engine.**
- **User Monitoring Learning & Printable Reports.**
- **Multimedia-Supported auxiliary resources.**

ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen

EPE. EDIBON Practical Exercise Program Package Main Screen

For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/files/expansion/ICAI/catalog

ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

✱ Specifications subject to change without previous notice, due to the convenience of improvement of the product.

edibon INTERNATIONAL

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REPRESENTATIVE: