edibon

Engineering and Technical
Teaching Equipment

Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION
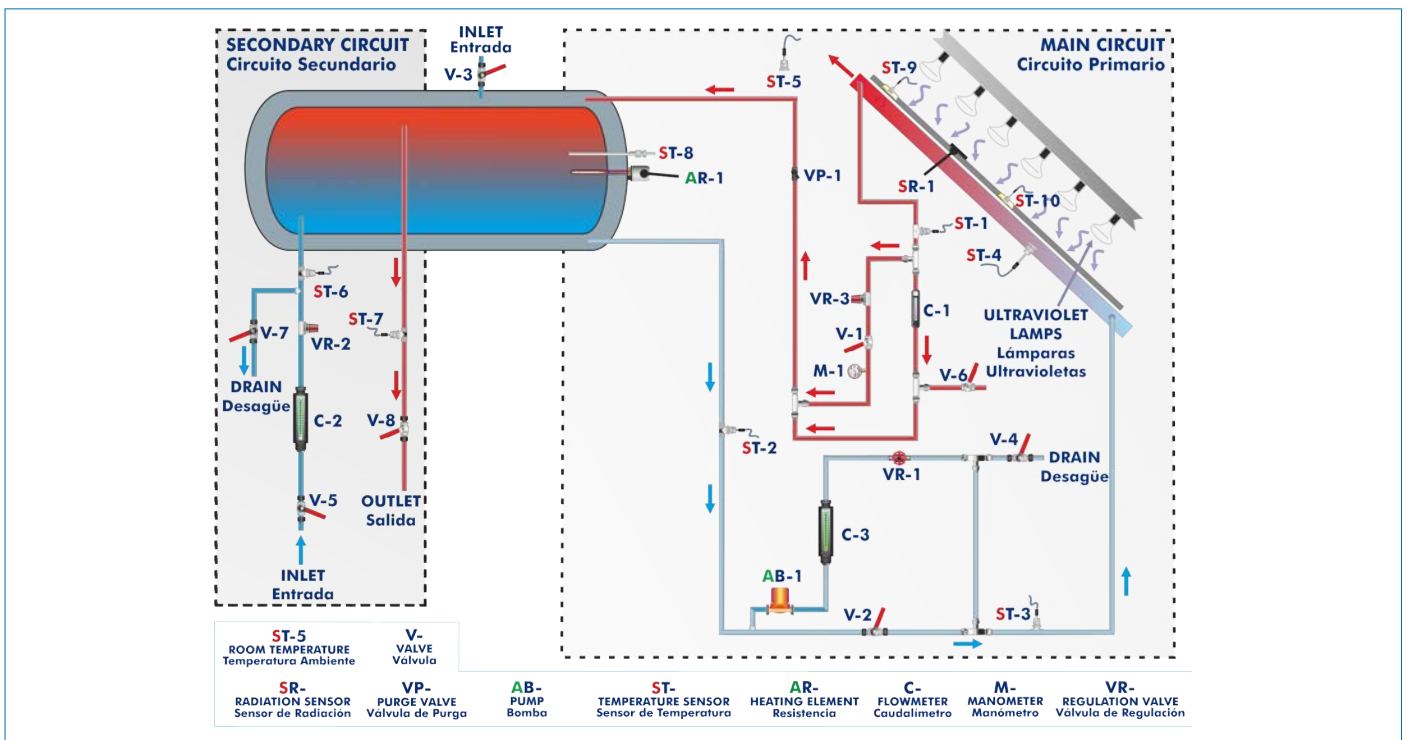
| SECONDARY CIRCUIT | | MAIN CIRCUIT | |
| Circuito Secundario | | Circuito Primario | |

| ST-5 ROOM TEMPERATURE Temperatura Ambiente | V- VALVE Válvula | | |
| SR- RADIATION SENSOR Sensor de Radiación | VP- PURGE VALVE Válvula de Purga | AB- PUMP Bomba | ST- TEMPERATURE SENSOR Sensor de Temperatura | AR- HEATING ELEMENT Resistencia | C- FLOWMETER Caudalímetro | M- MANOMETER Manómetro | VR- REGULATION VALVE Válvula de Regulación |

INTRODUCTION

The sun provides us a wide spectrum of solar energy. Except for the light that we see around us every day, all of the other types of solar energy are invisible. The other parts of the spectrum consist of cosmic rays, gamma rays, x-rays, infrared, heat and ultraviolet energy.

Thermal solar systems convert solar energy into usable thermal energy.

The Thermal Solar Energy Unit, "EEST", allows to demonstrate solar thermal heating of domestic water in an illustrative manner.

GENERAL DESCRIPTION

The Thermal Solar Energy Unit, "EEST", is a system that transforms solar energy into usable thermal energy. It uses the thermosiphon solar system to heat water or the traditional pumping system. In both cases, the absorbed thermal energy is given by the simulated solar radiation; in our case, it is done using a panel with powerful luminous sources.

The EEST unit mainly consists of the following elements:

- Thermal solar collector.
- Accumulator tank.
- Solar simulator.
- Pumping system.

The solar collector is mounted on an aluminum frame and the fluid (water) flows through cooper tubes. It has been developed in such a way that the geometrical shape of the surface allows the most efficient absorption.

The accumulator tank is protected with an anti-corrosive material. It has a heating element with a safety device to prevent over-temperatures.

Lamps of the solar simulator emit radiation similar to the sun radiation and allows a range of exercises to be carried out in the laboratory. The light is converted into heat in the solar collector and transferred to the heat transfer fluid. Three different configurations can be simulated with the solar simulator: all the lamps are turned on, half of the lamps are turned on in zig zag, or only one lamp is turned on.

Besides, the unit includes a pump to perform a forced convection of the heat transfer fluid through the accumulator tank.

The unit is fitted with sensors and meters to record the relevant parameters (temperature and flow) and are included safety valves for overpressure protection.

SPECIFICATIONS

Anodized aluminum frame and panels made of painted steel.

The unit includes wheels to facilitate its mobility.

Main metallic elements made of stainless steel.

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

Solar panel (thermal solar collector):

Copper pipes, wrapped with insulating material, to connect the panel and the accumulator tank.

Area of the panel: 1.92m² .

Material: tempered glass.

Accumulator tank:

Vacuum vitrified boiler, high efficiency heating circuit and anti-corrosion protections.

It has a supporting heating group with a heating element, power: 2400 W.

Contact thermostat to control the temperature.

Volume: 154 l.

Max. pressure: 8 bar.

Max. temperature: 110 °C.

Solar simulator:

Aluminum structure with adjustable height.

Sixteen solar spectrum lamps of 300 W. each one, distributed into independent circuits.

Electricity security group, made up by magnetothermics.

Three different configurations can be simulated with the solar simulator: all the lamps are turned on, half of the lamps are turned on in zig zag, or only one lamp is turned on.

Pumping system:

Pump, flow range: 0 – 2 l/min., max. pressure: 0.6 bar.

Three flowmeters:

One of 0.2 – 2 l/min in the primary circuit (forced circulation with pump).

One of 4 – 50 cc/min in the primary circuit (free circulation, without pump).

One of 1.5 – 10 l/min in the secondary circuit.

Ten temperature sensors, "J " type.

Manometer, range: 0-4 bar.

Two safety valves for over-pressure protection.

The unit includes two "Venetian" type blinds to reduce a direct visual contact with the lamps and to reduce the direct contact with the solar panel when the unit is working.

Electronic console:

Metallic box.

Connections for the temperature sensors.

Digital display for the temperature sensors.

Selector for the temperature sensors.

Pump switch.

Heating element switch.

Three switches for the different configurations of the solar simulator: one for all the lamps on, other for half of the lamps on and another for only one lamp on.

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.

EEST detail

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Study of the thermosiphon operation.

2.- Study of the luminosity profile of the lamps.

3.- Study of the efficiency of the solar panel.

4.- Study of the influence of the tilt angle of the lamps panel on the unit efficiency.

5.- Study of relation between the flow and the temperature.

6.- Study of energy balance of the solar collector.

7.- Study of energy balance of the accumulator tank.

8.- Determination of the experimental efficiency.

9.- Study of the influence of the angle of incidence on the temperature.

REQUIRED SERVICES

- Electrical supply: three-phase, 380 V/50 Hz or 220 V/60 Hz, minimum power 6000W.
- Water supply (2 bar) and drain.

DIMENSIONS AND WEIGHTS

EEST:

Unit:

-Dimensions: 2200 x 1200 x 2005 mm approx.

(86.61 x 47.24 x 78.94 inches approx.)

-Weight: 290 Kg approx.

(639.34 pounds approx.).

Electronic console:

-Dimensions: 490 x 330 x 310 mm approx.

(19.29 x 12.99 x 12.2 inches approx.)

-Weight: 10 Kg approx.

(22 pounds approx.).

AVAILABLE VERSIONS

Offered in this catalogue:

- EEST Thermal Solar Energy Unit.

Offered in other catalogues:

- EESTC Computer Controlled Thermal Solar Energy Unit.
- MINI-EEST Thermal Solar Energy Basic Unit.
- MINI-EESTC. Computer Controlled Thermal Solar Energy Basic Unit

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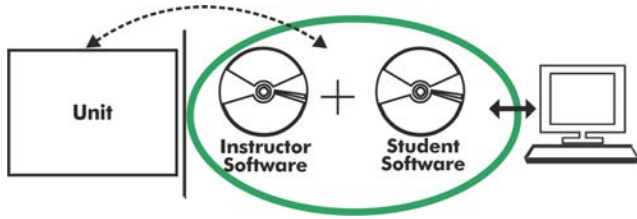
With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF).** Both are interconnected so that the teacher knows at any moment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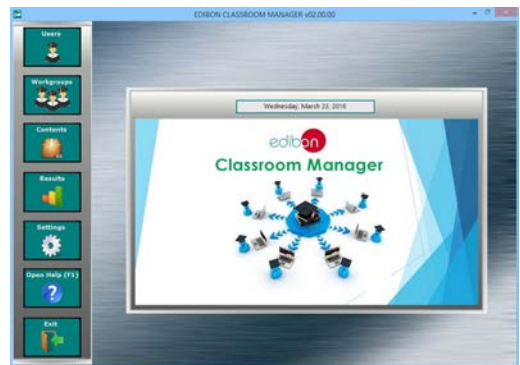
Instructor Software

### - 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
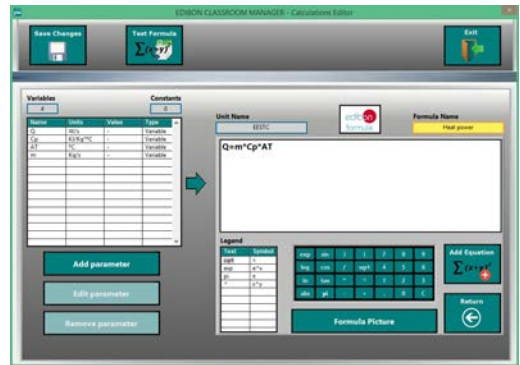
ECAL. EDIBON Calculations Program Package - Formula Editor Screen
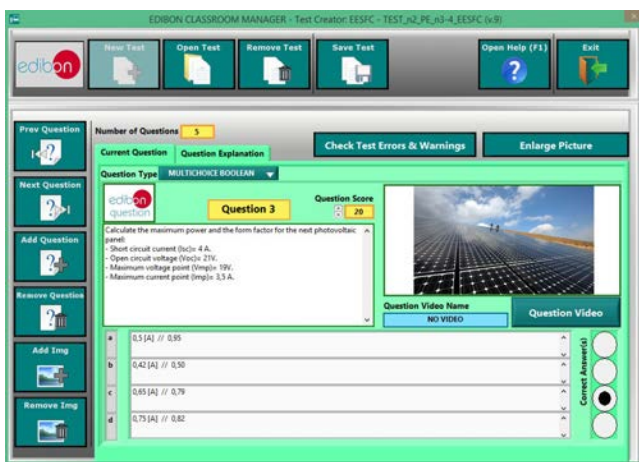
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

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

- 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.

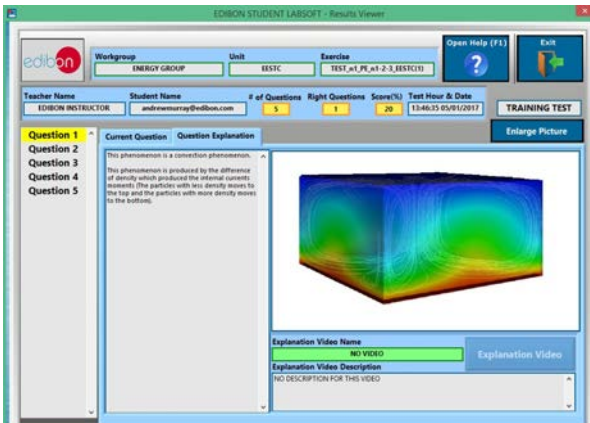For more information see ICAI catalogue. Click on the following link:

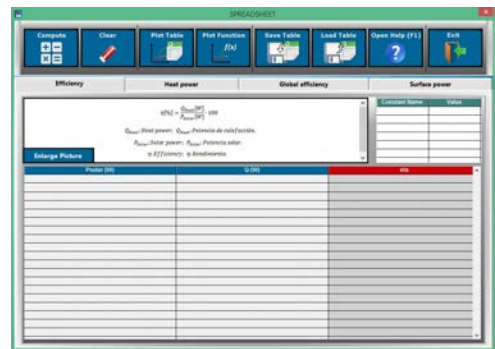www.edibon.com/en/files/expansion/ICAI/catalog

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

EPE. EDIBON Practical Exercise Program Package Main Screen

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.

INTERNATIONAL

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REPRESENTATIVE: