



## INTRODUCTION

Calorimetry is a fundamental test of great significance to anyone concerned with the production or utilization of solid or liquid fuels. One of the most important tests in the evaluation of materials which are burned, as fuels, is the determination of the heat of combustion, or calorific value.

These measurements can be made with Bomb Calorimeters.

Bomb Calorimeter, "TBCF", is a classic device used to determine the heating or calorific value of solid and liquid fuel samples at constant volume.

Basically, this device burns a fuel sample and transfers the heat into a known mass of water. From the weight of the fuel sample and temperature rise of the water, the calorific value can be calculated. The calorific value obtained in a bomb calorimeter test represents the gross heat of combustion per unit mass of fuel sample. This is the heat produced when the sample burns, plus the heat given up when the newly formed water vapor condenses and cools to the temperature of the bomb. Determining calorific values is profoundly important; fuels are one of the biggest commodities in the world, because of their calorific value.

The Bomb Calorimeter study is carried out to gain a better understanding of the working principles behind the bomb calorimeter and also to find out the gross calorific values of different types of liquid fuel.



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

Bomb Calorimeter, "TBCF", comprises the calorimeter, a calorimeter vessel, an outer double walled water jacket, control unit to switch on/off the stirrer and the ignition device, a Beckman type thermometer, a magnifying glass, and charging unit with pressure gauges to facilitate the charging of the calorimeter with oxygen.

The calorimeter vessel and outer jacket wall are manufactured in stainless steel.

The bomb calorimeter is a container made of stainless steel that can support high pressures. It is sealed by a screw top. The bomb is charged with gas (oxygen) through the filling valve. This bomb is introduced inside a calorimeter vessel made of stainless steel that is filled with water, and at the same time it is introduced inside a double walled water jacket.

The rod of the calorimeter supports a metallic crucible. The bomb calorimeter, which contains the fuel sample to be burned, is hermetic to the gas by closing the filling valve and its cover. Combustion is started through a thin wire that is red hot-heated up momentarily due to the passing of an electrical current that flows through an isolated terminal and the rod, which is electrically connected to the cover.

The water in the calorimeter vessel is agitated automatically with a stirrer driven by a small motor. The top of the double walled jacket is closed with a cover that has some orifices. A Beckman thermometer to measure the temperature of the calorimeter vessel passes through one of these orifices. Other orifices are used to fasten the jacket to the cover. Also, one of these holes is used to insert the wire that supplies the electric current to the rod.

The unit includes a control unit that switches on/off the stirrer and the ignition device through the heating up of the thin wire, a load unit with pressure gauges to make the filling with oxygen of the calorimeter easier and a magnifying glass to magnify the Beckman's thermometer reading accuracy.

## SPECIFICATIONS

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

Main metallic elements made of stainless steel.

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

Calorimeter for testing calorific value of fuels, including:

Calorimeter bomb in stainless steel. Working pressure: 30 atm.

Calorimeter vessel:

Made in stainless steel.

Maximum volume: 4 l.

Double walled outer jacket in stainless steel, with water inlet and outlet.

Electric stirrer with one rod and two blades (330 r.p.m.).

Control unit to switch on/off the stirrer and the ignition device.

Beckman thermometer, range: 6 °C.

Magnifying glass.

Charging unit with pressure gauges.

Nickel crucible.

Reel of Nickel-Chrome wire.

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.



TBCF detail

## EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Beckman thermometer adjustment.
- 2.- Obtaining the calorific value of fuel.
- 3.- Performing experiments to measure heats of combustion.
- 4.- Calculating the heats of combustion from experimental results.
- 5.- Calculating internal energies of combustion from bomb calorimeter experiments.
- 6.- Calculating enthalpies of combustion from bomb calorimeter experiments.

## REQUIRED SERVICES

- Electrical supply: single-phase, 220V/50 Hz or 110V/60 Hz.
- Water supply and drain.

## DIMENSIONS AND WEIGHTS

- TBCF:
- Dimensions: 600 x 400 x 1000 mm approx.  
(23.62 x 15.75 x 39.37 inches approx.)
  - Weight: 50 Kg approx.  
(110.23 pounds approx.)

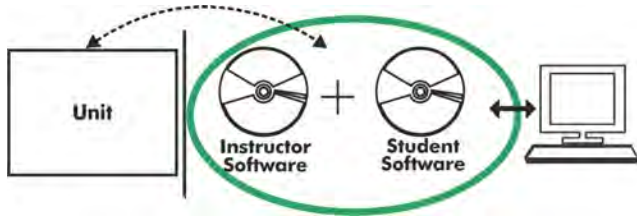
## RECOMMENDED ELEMENTS (Not included)

- TBCF-1. Briquetting press for use with solid fuels.
- TBCF-2. Replacement calorimeter for use as a spare.

## REQUIRED CONSUMABLES

- Oxygen cylinder.
- Several types of fuels.

**TBCF/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.

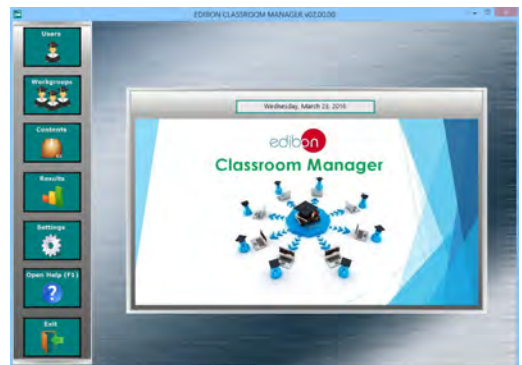
Instructor Software

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

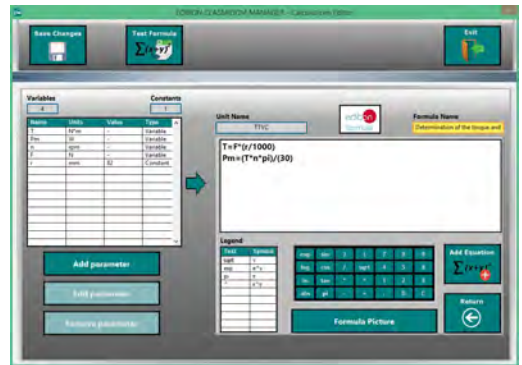
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

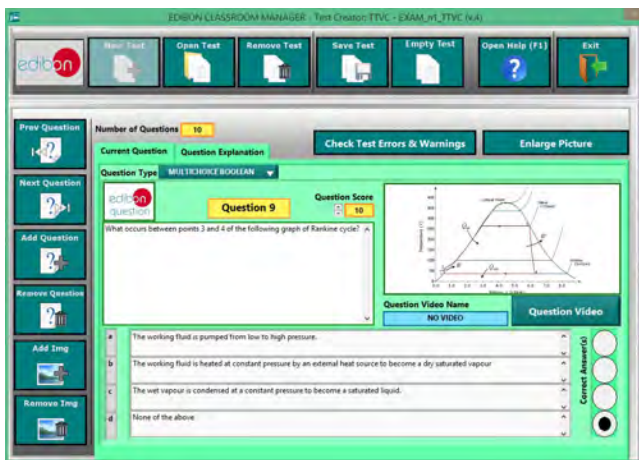
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- 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:

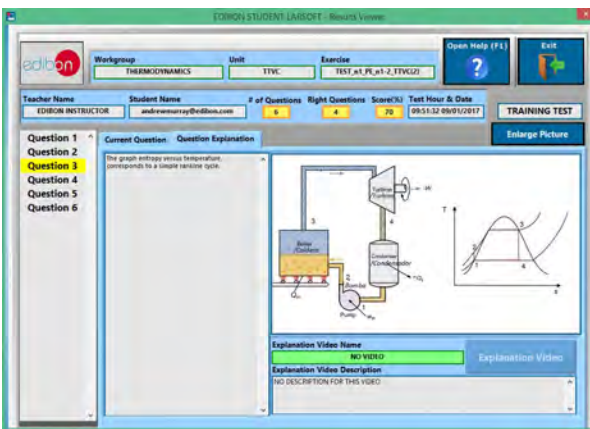
[www.edibon.com/en/files/expansion/ICAI/catalog](http://www.edibon.com/en/files/expansion/ICAI/catalog)



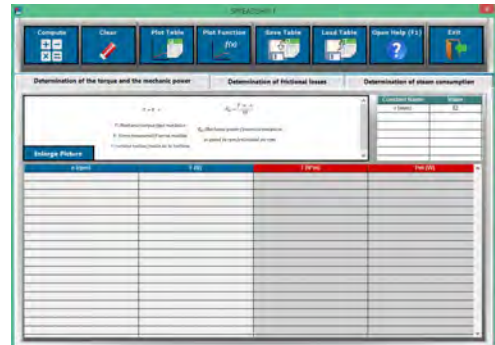
ESL-SOF. EDIBON Student LabSoft (Student Software)  
Application Main Screen



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.



C/ Julio Cervera, 10-12-14. Móstoles Tecnológico.  
28935 MÓSTOLES. (Madrid). ESPAÑA - SPAIN.  
Tel.: 34-91-6199363 Fax: 34-91-6198647

E-mail: [edibon@edibon.com](mailto:edibon@edibon.com) Web: [www.edibon.com](http://www.edibon.com)

Edition: ED01/18  
Date: May/2018

REPRESENTATIVE:

