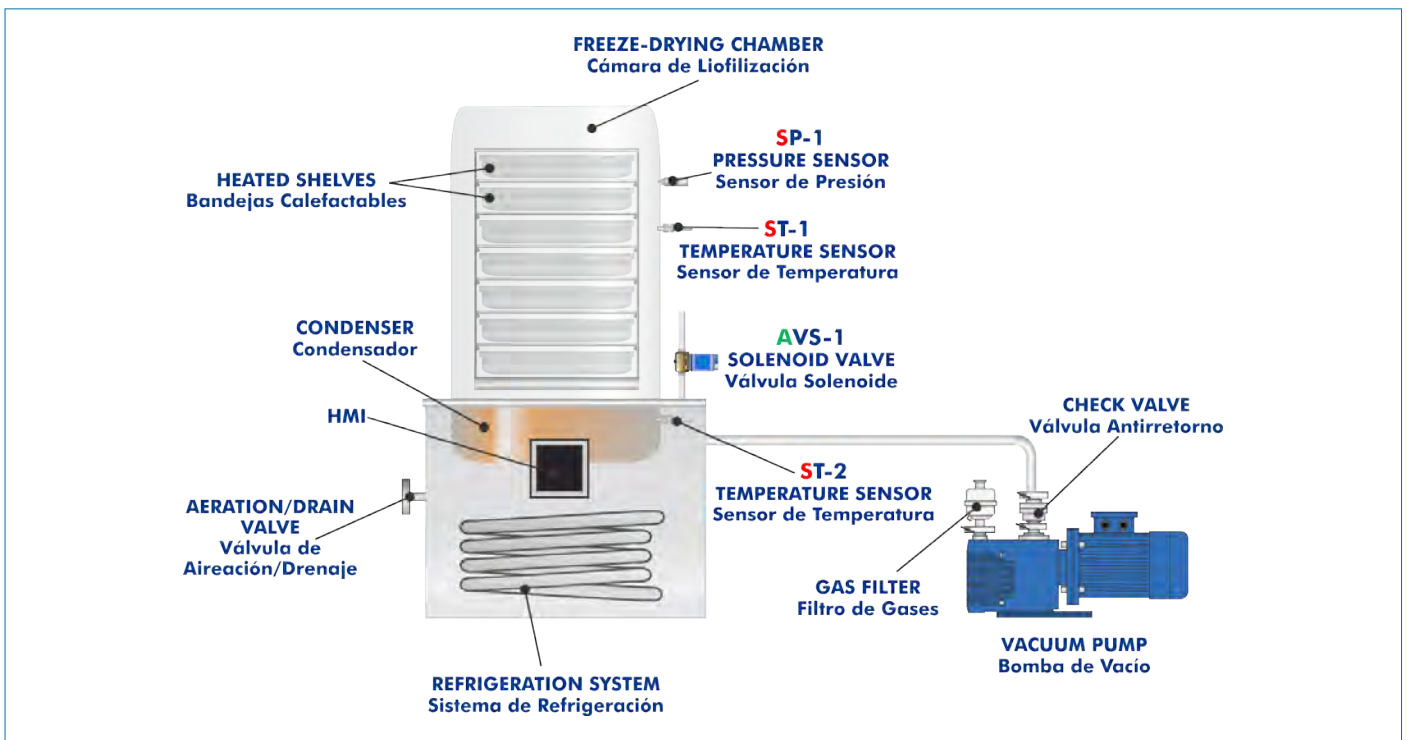




### PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



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

## INTRODUCTION

Freeze-drying is a dehydration process that is usually performed to increase the durability of a perishable product by affecting its original properties as little as possible or to reduce the weight of a product in order to facilitate its transport. It is mainly used in the food and pharmaceutical industry. The lyophilization is a technique with higher operating costs than other traditional drying techniques, therefore, it is used in products with a high added value since a higher quality final product is achieved.

The previous step to freeze-drying is a rapid freezing at very low temperatures. The faster the freezing, the better the characteristics of the final product. When the product is at such a low temperature, there is a drop in pressure to fairly high vacuum values. For this pressure value, the product does not pass through the liquid state to obtain a gas phase, but rather the direct sublimation of the humidity is produced. In this way, the product is dried preserving the molecular structure of the freeze-dried substance.

The Freeze Dryer, "BLIO", allows the study of the entire process of freeze drying in a compact unit.

## GENERAL DESCRIPTION

The Freeze-Dryer, "BLIO", is able to carry out the freeze-drying process for the drying of different products inside a transparent chamber that allows the control of the pressure, and on heatable trays that allow to control the temperature of the product.

Once the frozen sample has been introduced into the working chamber, EDIBON's freeze-drying equipment allows the pressure to be reduced in a controlled way thanks to the vacuum pump that is included with the equipment. In this way, it is possible to directly sublimate the humidity contained in the product introduced into the chamber. Furthermore, the tray supports incorporate electrical resistances that allow a progressive increase in temperature to guarantee optimum drying of the product.

The sublimated solvent passes to the condenser where it is retained in the form of ice due to the low temperatures and is evacuated as liquid water at the end of the process.

The freeze-drying equipment "BLIO" allows to control the operation conditions: pressure, product temperature and operation time.

The control, monitoring and recording of the process variables are carried out through an integrated PLC that incorporates a touch screen for data visualization. Thus it is possible to compare the freeze-drying process of different products and find out the influence of each of the operating parameters. Furthermore, if the optimal freeze-drying values of a product are known, it is possible to pre-program the equipment to carry out a fully automated operation.

## SPECIFICATIONS

Bench-top unit.

Transparent methacrylate working chamber for full visualization of the process:

Four heatable trays.

Total useful surface: 0.12 m<sup>2</sup>.

Diameter of the trays: 200 mm.

Maximum capacity of the condenser: 6 kg.

Condenser final temperature: - 55 °C.

Total electrical power: 1400 W.

Product temperature control.

Vacuum control:

Relief valve that allows to work in a manual or automatic way.

Control by PLC touch screen and USB output:

Digital display allowing continuous reading of freeze-drying parameters (temperature, pressure, time).

Possibility to program the process for a correct adjustment of the operation conditions.

Temperature sensors in the working chamber and the condenser.

Pressure sensor in the condenser.

Vacuum pump:

Nominal flow rate: 6 m<sup>3</sup>/h.

Non-return valve.

Gas discharge filter.

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.- Study of the freeze drying process.
- 2.- Study of the influence of the heating temperature in the freeze drying process.
- 3.- Study of the influence of the pressure in the freeze drying process.
- 4.- Evaluations of the freeze drying time necessary for each product.
- 5.- Study of the influence of the condenser temperature in the freeze drying process.
- 6.- Calculation of the amount of solvent removed from the solid.

### REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.

### DIMENSIONS AND WEIGHTS

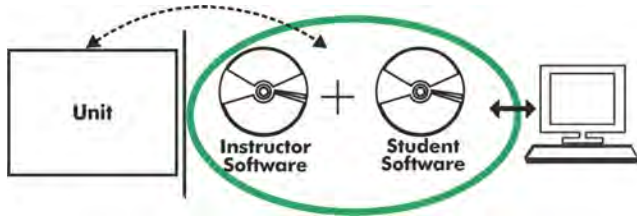
BLIO:

- Dimensions: 575 x 420 x 400 mm approx.  
(22.63 x 16.53 x 15.74 inches approx.).
- Weights: 65 Kg approx.  
(143 pounds approx.).

### REQUIRED CONSUMABLES (Not included)

- Products to lyophilize previously frozen.

**BLIO/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.

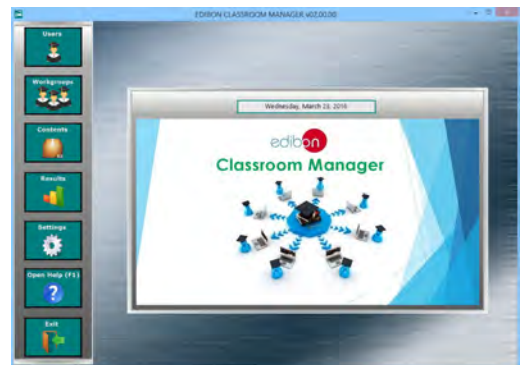
Instructor Software

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

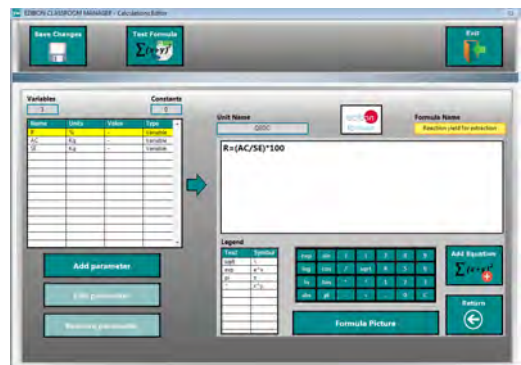
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

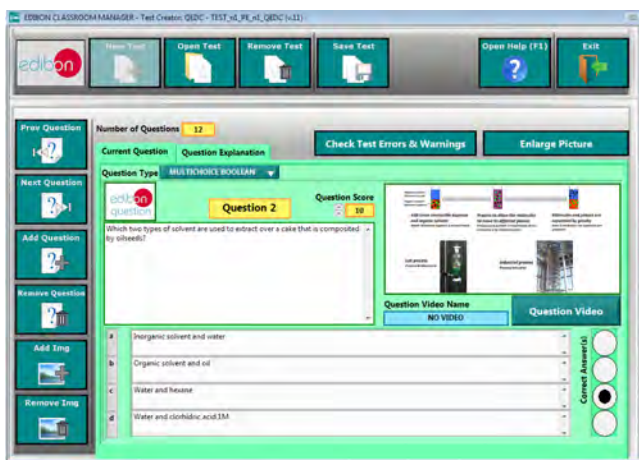
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



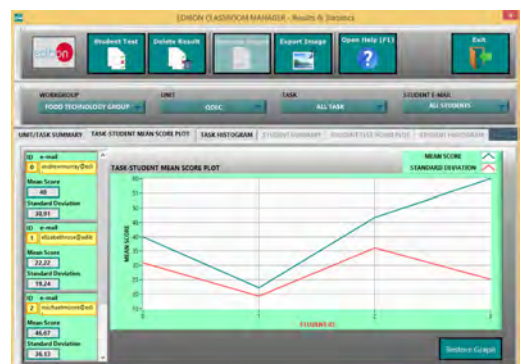
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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:

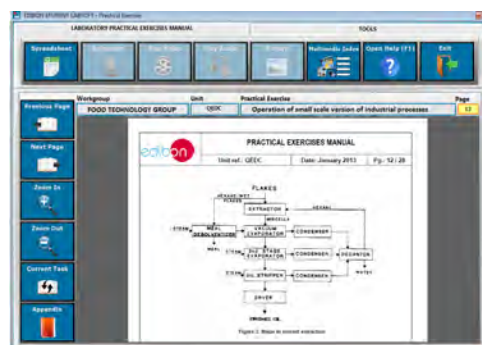
- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.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

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

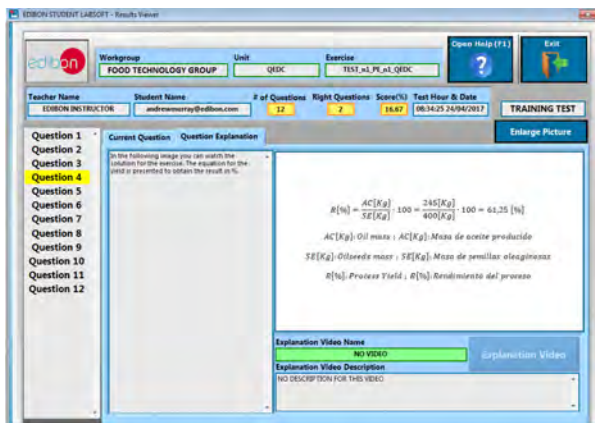
[www.edibon.com/en/files/expansion/ICAI/catalog](http://www.edibon.com/en/files/expansion/ICAI/catalog)



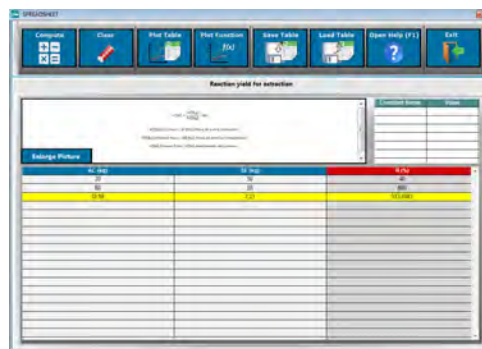
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



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.



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