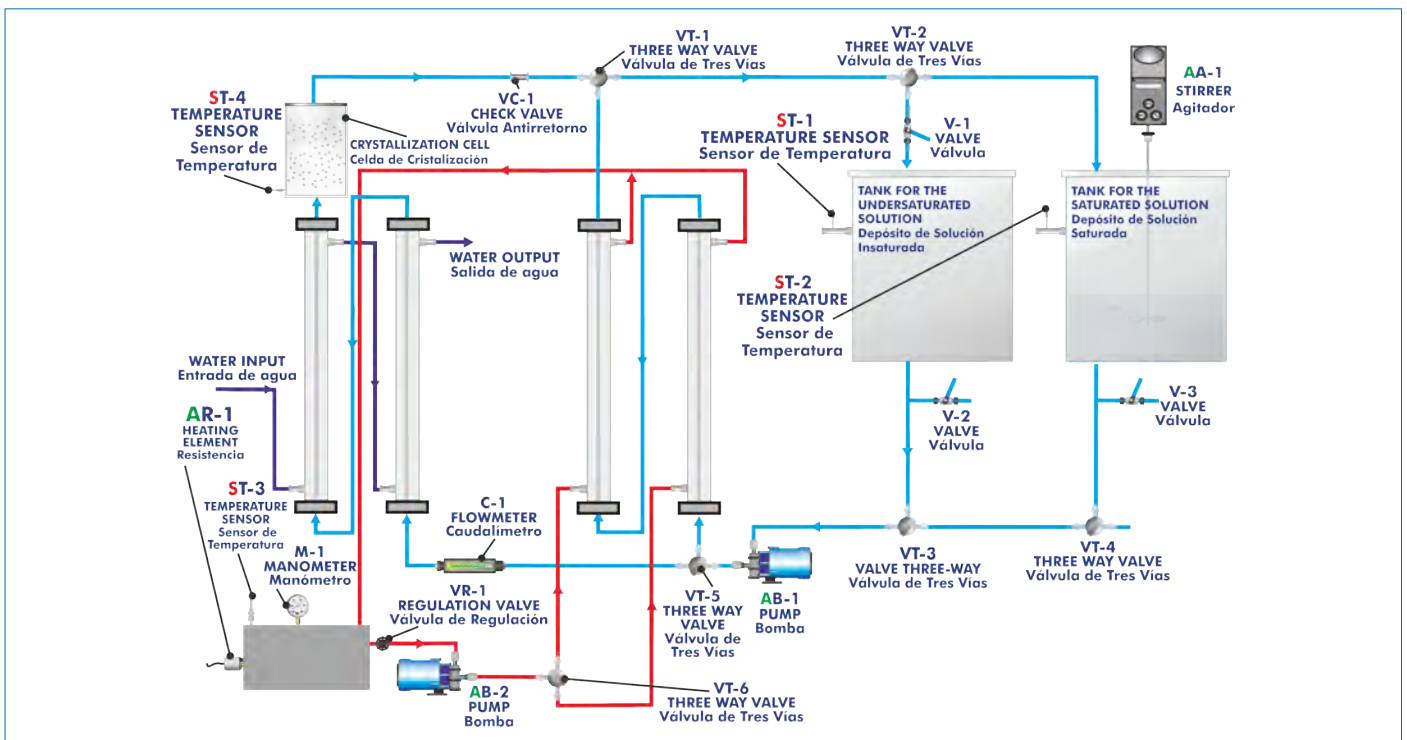




Electronic console

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

Crystallization is a method generally used to purify substances, so that the components of a solution can be separated. A solution must reach a supersaturated condition in order to crystallize its solute. To saturate a solution, a product (called solute) is dissolved in it to such a degree that the solution is unable to dissolve more solute.

There are several methods used to obtain a supersaturated solution:

- By evaporation.
- By cooling.
- By adding aggregates.

The Advanced Crystallization Unit, "QUCB/A", designed by EDIBON, is a cooling crystallization unit. One of the main advantages of the cooling method is its low energy costs of production.

GENERAL DESCRIPTION

The Advanced Crystallization Unit, "QUCB/A", designed by EDIBON, is a crystallization unit based on the cooling method that allows for observing and studying the mass transfer industrial operation in which a solid is formed from a homogeneous phase (dissolved solute). It is suitable for crystallization tests of those components whose solubility changes with temperature.

The process is divided into two stages, the first one consists on saturating the solution of the compound to be purified and the second one consists on cooling the solution to obtain crystals.

The process takes place in two circuits with two tanks. One circuit has the saturated solution and its tank includes a temperature sensor and a stirrer. The other circuit has the undersaturated solution and its tank includes a temperature sensor.

When the solution is undersaturated, a pump impels it to a heat exchanger (formed by two concentric tubes heat exchangers) to increase its temperature and, thus, to saturate the solution and prevent an early crystallization. The solution flows through the central tube, while water heated in a tank by a heating element and impelled by a pump flows through the jacket. The temperature of this heating water can be controlled.

When the solution is saturated, it is transferred to the stirred tank, where the same pump impels it to a crystallization cell through a bypass circuit.

The solution enters the crystallization cell crossing a heat exchanger (formed by two concentric tubes heat exchangers) to cool the solution and make it become a supersaturated solution. To supply the exchanger's cooling water, the user can choose either a tap or our recommended element: Refrigeration Water Recirculation Unit "TERA".

The crystallization cell consists of a tube with porous filters at the inlet and outlet. The cell can be opened to introduce seed crystals.

The flow conditions cause a fluidized bed in the cell that may be studied.

The cell is transparent so the crystallization phenomenon can be observed. The growth rate of the crystals can be determined by weighing the crystals before and after the test and measuring the time.

SPECIFICATIONS

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

The unit includes wheels to facilitate its mobility.

The main elements are transparent to observe the process.

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

Tank for the saturated solution with a capacity of 25 l. It includes:

"J" type temperature sensor.

Variable speed stirrer.

Tank for the undersaturated solution with a capacity of 25 l. It includes:

"J" type temperature sensor.

Heating circuit:

Tank with a capacity of 35 l. It includes:

Heating element with thermostat, power: 2 kW.

"J" type temperature sensor.

Level switch.

Pump to impel hot water:

Maximum flow rate: 8 l/min.

Maximum head: 10 m.

Two concentric tubes heat exchangers to heat the solution to be saturated.

Pump to impel the saturated solution:

Maximum flow rate: 20 l/min.

Maximum head: 40 m.

Two concentric tubes heat exchangers to cool the saturated solution.

Removable crystallization cell made of PMMA:

Approximate diameter: 40 mm.

Approximate height: 80 mm.

Flowmeter, range: 0 - 15 l/min.

Flow regulation by valves.

Electronic console:

Metallic box.

Temperature sensors connectors.

Digital display for the temperature sensors.

Selector for the temperature sensors.

Heating element controller.

Stirrer switch.

Pumps switches.

On/Off switches.

Cables and Accessories, for normal operation.

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

EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Understanding the principles of the cooling crystallization of solutions.
- 2.- Study of the crystallization of solutions in a fluidized bed.
- 3.- Study of the crystals size distribution.
- 4.- Study of the factors that influence the crystals' growth:
 - Cooling temperature.
 - Stirring level.
 - Saturation time.
 - Oversaturation.

REQUIRED SERVICES

- Power supply: single-phase, 220 V/50 Hz or 110 V/60 Hz.
- Cold water supply and drain, maximum: 15°C and minimum: 2.5 bar, or the recommended element: Refrigeration Water Recirculation Unit "TERA".

REQUIRED CONSUMABLES (Not included)

- Potassium sulfate, K_2SO_4 .

DIMENSIONS AND WEIGHTS

QUCB/A:

Unit:

- Dimensions: 1900 x 750 x 1800 mm approx.
(74.80 x 29.52 x 70.86 inches approx.).
- Weight: 200 Kg approx.
(441 pounds approx.).

Electronic console:

- Dimensions: 490 x 330 x 310 mm approx.
(19.29 x 12.99 x 12.20 inches approx.).
- Weight: 12 Kg approx.
(26.4 pounds approx.).

RECOMMENDED ELEMENTS (Not included)

- TERA. Refrigeration Water Recirculation Unit.
- Laboratory oven to dry the crystals samples.
- Precision scales.
- Screening machine.

AVAILABLE VERSIONS

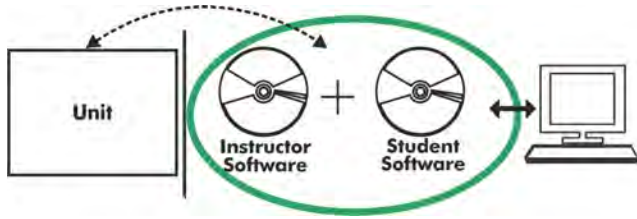
Offered in this catalog:

- QUCB/A. Advanced Crystallization Unit.

Offered in other catalogs:

- QUCC/A. Computer Controlled Advanced Crystallization Unit.
- QUCC. Computer Controlled Crystallization Unit.
- QUCB. Crystallization Unit.

QUCB/A/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.

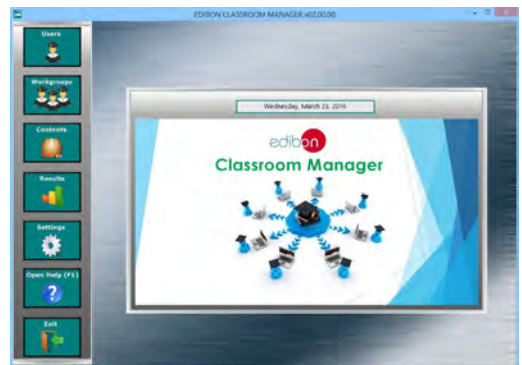
Instructor Software

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

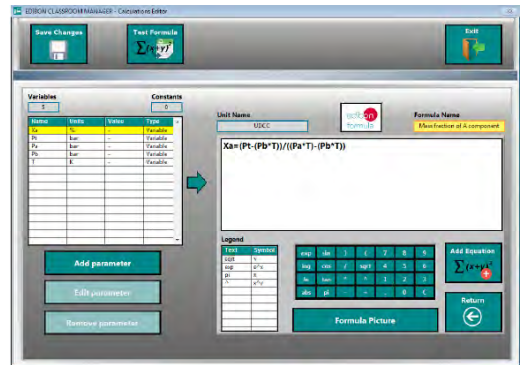
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

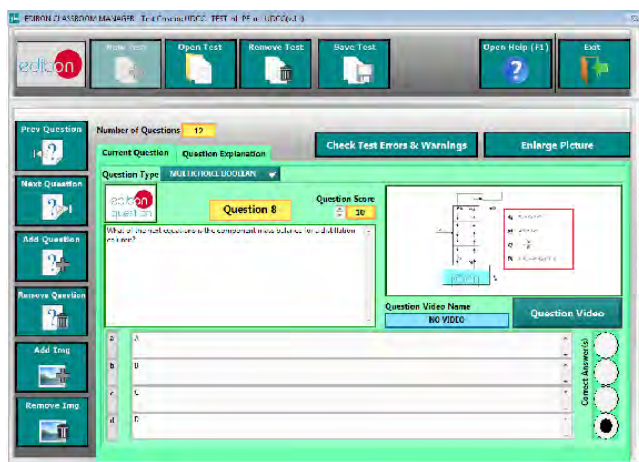
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



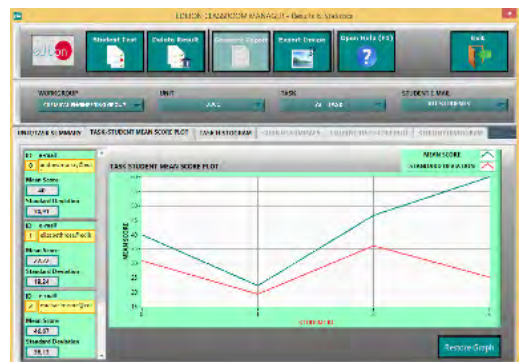
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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:

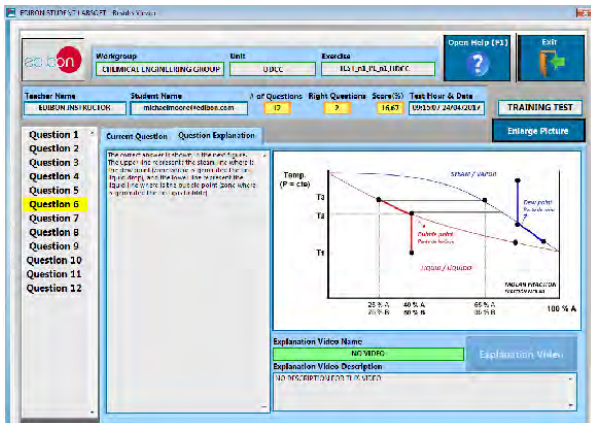
www.edibon.com/en/files/expansion/ICAI/catalog



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

Storage Volume	P1 (bar)	P2 (bar)	T1 (°C)	T2 (°C)
10	10	10	10	10
20	20	20	20	20
30	30	30	30	30
40	40	40	40	40
50	50	50	50	50
60	60	60	60	60
70	70	70	70	70
80	80	80	80	80
90	90	90	90	90
100	100	100	100	100

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 Web: www.edibon.com

Edition: ED01/18
Date: July/2018

REPRESENTATIVE:

