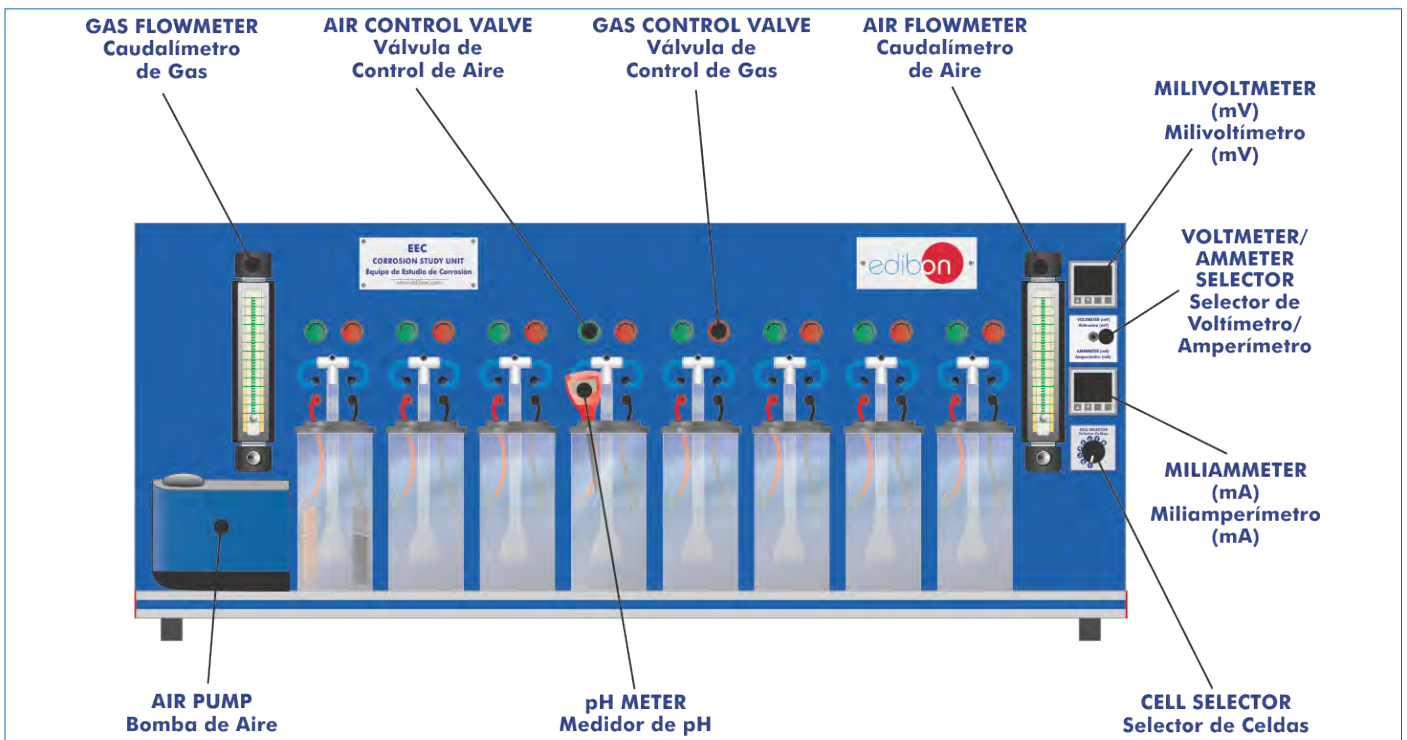




PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



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

Corrosion is defined as the deterioration of essential properties of a material due to reactions with its environment. From a chemical point of view the corrosion means the oxidation of the atoms of a material, that is to say, the loss of electrons.

This phenomenon is caused by exposure of materials to the environment, where there is sufficient moisture and oxygen needed to begin this process of deterioration of equipment. However, this process will be accelerated if there is exposure to other corrosive substances such as acids or some salts such as sodium chloride.

When a structure loses its mechanical properties due to a corrosion process, this begins to weaken in the affected areas and its moving parts or those of greater use will wear. Depending on the process, the structure can deform and even break.

The repair of these structures requires large investments of time, manpower and money.

GENERAL DESCRIPTION

The Corrosion Study Unit, "EEC", allows the corrosion simultaneous study up to eight corrosion cells. This unit allows to study several conditions that influence in the corrosion processes.

Each sample for the test is put in such away that unwanted secondary effects are eliminated.

The cells included a cover to adapt two test sheets, a reference electrode and a gas diffuser tube.

A salt bridge is included for the study and production of electrochemical cells.

It is possible connect the different samples to a power supply to study the principle of sacrificial anodes.

The ambient air is introduced into the electrolyte solution with an air pump. An air flowmeter is situated at the pump outlet to measure the air flow. There are several air control valves to adjust the air flow rate for each corrosion cell. It is also possible to feed other gases into the electrolyte solution using a gas flowmeter and several gas control valves.

The service panel includes a miliammeter and a milivoltmeter to measure the intensity and the voltage between the electrodes, a voltmeter/ammeter selector, a cell selector and several connecting terminals in the test sheets.

The unit includes a pH-meter to study and compare the influence of the electrolyte solution on the corrosion processes.

The corrosion rate of a certain sample can be measured qualitatively by "visual observation", or quantitatively though "immersion test by initial and final weighing".

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.

Eight corrosion cells. Each one consists of:

- 600 ml glass vessel with a cover.

- Such cover has four orifices: two to put the test sheets, one for the reference electrode and another one for the gas diffuser tube.

Air circuit. It includes:

- Air pump to introduce ambient air into the electrolyte solution, flow rate: 400 l/h.

- Air flowmeter, range: 1 – 7.5 l/min.

- Eight air control valves to adjust the air flow rate, one for each corrosion cell.

Gas circuit. It includes:

- Gas inlet.

- Gas flowmeter, range: 1 – 7.5 l/min.

- Eight air control valves to adjust the gas flow rate, one for each corrosion cell.

Power supply of direct current (DC) that allows applying a direct current 0 – 30 V and 0 – 3 A output, with an intensity and voltage indicator.

Ag/AgCl reference electrode.

Salt bridge.

pH-meter to study and compare the influence of the electrolyte solution on the corrosion processes.

Set of test sheets (electrodes):

- It consists of 40 x 20 mm sheets of variable thickness depending on the material.

- Materials: copper, aluminum, iron, zinc, graphite, stainless steel and brass.

The service panel includes:

- Miliammeter and a milivoltmeter to measure the intensity and the voltage in the electrodes.

- Voltmeter/ammeter selector.

- Cell selector.

- Connecting terminals for the test sheets.

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.- Galvanic potentials.
 - 2.- Study of galvanic couples.
 - 3.- Passivation of iron.
 - 4.- Influence of pH.
 - 5.- Aluminum anodizing process.
 - 6.- Cathodic protection.
 - 7.- Galvanic corrosion + oxidation.
 - 8.- Daniell cell construction to obtain standard potentials.
- Additional practical possibilities:
- 9.- Influence of the O_2 concentration in the corrosion.
 - 10.- Simultaneous study of corrosion in several cells.
 - 11.- Electrolytic corrosion.
 - 12.- Chemical inhibition.
 - 13.- Prevention of scaling.
 - 14.- Effect of internal stress.
 - 15.- Water treatment studies:
 - Calcium carbonate stabilization.
 - Oxidation of iron and manganese in ground waters.
 - Water softening by chemical precipitation.
 - Desinfection of waste water with chlorine solutions.

REQUIRED SERVICES

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

RECOMMENDED ELEMENTS (Not included)

- Electronic balance.
- Laboratory glassware: beakers, burette.
- Band paper.
- Cotton.

REQUIRED CONSUMABLES (Not included)

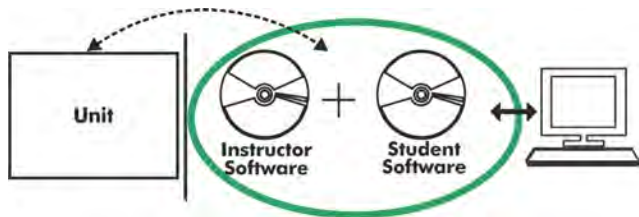
- Chemical reagents required for the dissolutions preparation: NaCl, HNO_3 , HCl, NaOH, diluted mercuric chloride, H_2SO_4 , alizarine watery solution, acetone or alcohol, NH_3 , $CuSO_4$, $Al_2(SO_4)_3$, $ZnSO_4$, $FeSO_4$, KCl.
- Water.
- Oxygen gas cylinder.

DIMENSIONS AND WEIGHTS

EEC:

- Dimensions: 1200 x 450 x 400 mm approx.
(47.24 x 17.71 x 15.74 inches approx.)
- Weight: 50 Kg approx.
(110 pounds approx.)

EEC/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.

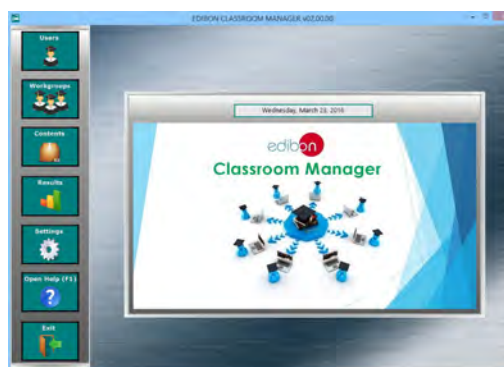
Instructor Software

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

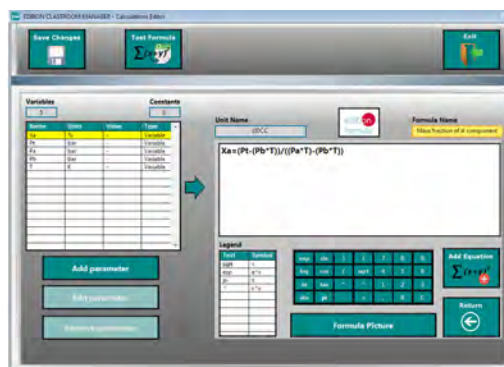
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

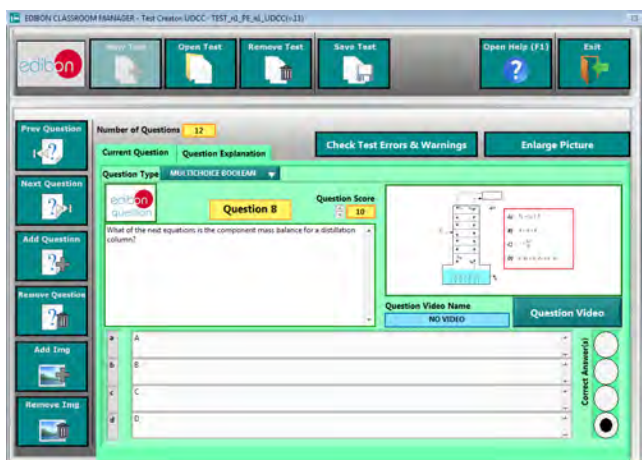
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



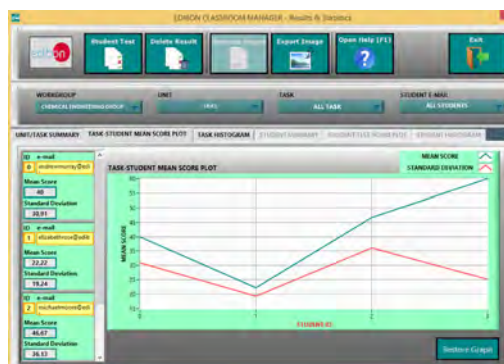
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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:

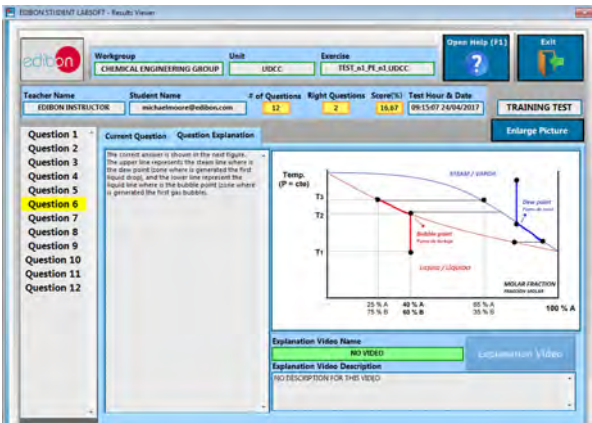
www.edibon.com/en/files/expansion/ICAI/catalog



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

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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REPRESENTATIVE:

