# Electrotechnics Application Focused on RLC Circuits

## AEL-AI13-A

## INTRODUCTION

In the field of electricity, there are a lot of types of electric circuits and devices. The RLC circuit is a kind of circuit characterized by having resistors, inductances and capacitors. These kinds of circuits is very used in a wide varierty of applications, such as harmonics filters, radiofrequency recievers, etc. Another characteristic of these circuits is that they respond very different depending on the values of the each component, what it is very customizable by the user depending on what it wants to do.

The Electrotechnics Application focused on RLC Circuits, "AEL-AI13-A", is designed with the aim to understand the working and the purposes of RLC circuits. For that, this application have a set of resistors, inductances and capacitors with different values in order to implement some different kinds of circuits. In addition this application has a rectifier made with diodes to check how the circuit responds in face of different voltage waves or to construct harmonics filters with different frequency bands. Thus, the student can learn about RLC circuits and their wiring.

The AEL-AI13-A includes the following modules:

- N-ALI01. Industrial Main Power Supply.

- N-ALI10. Power Supply Module.

- N-CAR30. Inductances Module.

- N-CAR31. Capacitors Module.

- N-CAR32. Rectifier Diodes Module.

- N-CAR33. Resistive Components Module.

- N-MED65. Digital Multimeter.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-AI13-A/ICAI) to reinforce knowledge about this field.

This software is formed by:

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

- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-AI13-A can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following rack:

- N-RACK-A.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

The application includes the following modules:

- **N-ALI01. Industrial Main Power Supply.**

    Supply voltage: 400 VAC, 3PH+N+G.

    ON-OFF removable key.

    Output voltage connections:

    Three-Phase + Neutral: 400 VAC.

    Single-Phase: 230 VAC.

    Three-Phase supply hose with IP44 3PN+E 32A 400V connecting plug.

    Differential magnetothermal, 4 poles, 25 A, 300 mA AC 6 KA.

N-ALI01

- **N-ALI10. AC/DC Power Supply Module.**

    Supply voltage (Single-Phase): 230 VAC PH+N+G.

    Output voltage:

    15-0-15 VAC.

    24 VAC.

    24 VDC.

    0-24 VDC (adjustable).

N-ALI10

- **N-CAR30. Inductances module.**

    Nominal voltage: 24 V.

    Inductances:

    Two 1 mH inductances.

    One 2.2 mH inductance.

    Two 3.3 mH inductances.

    Two 10 mH inductances.

    Two 22 mH inductances.

    Ground terminal.

N-CAR30

- **N-CAR31. Capacitors module.**

    Nominal voltage: 24 V.

    Capacitors:

    One 47 nF non-polarised capacitor.

    One 68 nF non-polarised capacitor.

    Two 100 nF non-polarised capacitors.

    One 220 nF non-polarised capacitor.

    One 330 nF non-polarised capacitor.

    One 470 nF non-polarised capacitor.

    One 220 uF polarised capacitor.

    One 470 uF polarised capacitor.

    Ground terminal.

N-CAR31

• N-CAR32. **Rectifier diodes module.**

    Nominal voltage: 230V.

    Rectifiers: 6 x 40 A rectifier diodes.

    Ground terminal.

N-CAR32

• N-CAR33: **Resistive components module.**

    Nominal voltage: 24 V.

    Resistors:

        Three 47 k Ohm resistors.

        Three 51 k Ohm resistors.

        Two 82 k Ohm resistors.

        Two 100 k Ohm resistors.

        One 120 k Ohm resistors.

        Three 150 k Ohm resistors.

        One 10 k Ohm linear 5 W wound potentiometer.

        One 50 k Ohm linear potentiometer.

        One 10 k Ohm logarithmic potentiometer.

        One 50 k Ohm logarithmic potentiometer.

    Ground terminal.

N-CAR33

• N-MED65: **Digital Multimeter.**

    This module has a digital multimeter of about 3 ½ digits, with double-jack ending cables of about 4 mm to facilitate interconnections.

    With this digital multimeter we will be able to measure:

        Voltage.

        Current.

        Resistance.

        Capacitors capacity.

        Temperature.

N-MED65

• **All necessary cables to realize the practical exercises are included.**

**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.- Resistance measurement.

2.- Resistors in series association.

3.- Resistors in parallel association.

4.- Coils in series association.

5.- Coils in parallel association.

6.- Capacity measurement of a capacitor.

7.- Capacitors series association.

8.- Capacitors parallel association.

9.- Charge analysis of a capacitor.

10.- Discharge analysis of a capacitor.

11.- Calcule the time constant of a filter.

12.- Analysis of a RL circuit in series.

13.- Analysis of a RL circuit in parallel.

14.- Analysis of a RC circuit in series.

15.- Analysis of a RC circuit in parallel.

16.- Low-pass filter.

17.- High-pass filter.

18.- Star/delta transformation.

19.- Delta/star transformation.

## REQUIRED SERVICES

- Electrical supply: three-phase, 380V/50 Hz or 208V/60 Hz, 20 Kw.

## DIMENSIONS AND WEIGHTS

AEL-AI13-A:

-Dimensions: 640 x 320 x 920 mm approx.

(25.19 x 12.59 x 36.22 inches approx.)

-Weight: 45 Kg approx.

(99 pounds approx.)

## AEL-AI13-A/ICAI. Interactive Computer Aided Instruction Software System:
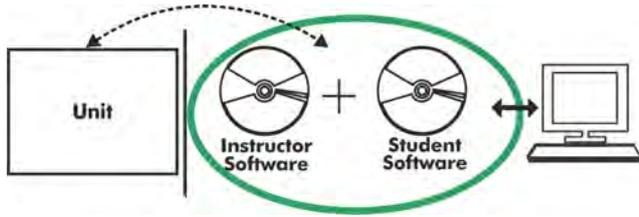


With no physical connection between unit and computer (PC), **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF)**. Both are interconnected so that the teacher knows at any 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.**
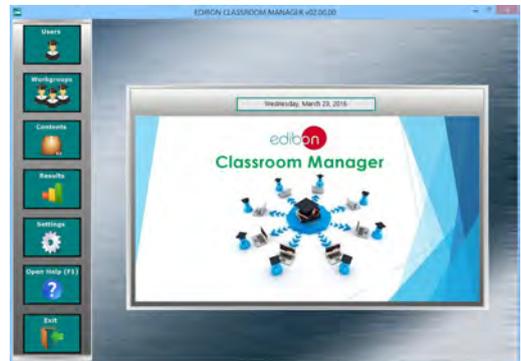


ECM-SOF. EDIBON Classroom Manager (Instructor Software)
Application Main Screen
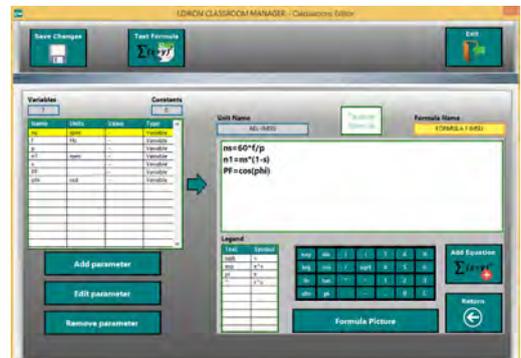


ECAL. EDIBON Calculations Program Package - Formula
Editor Screen
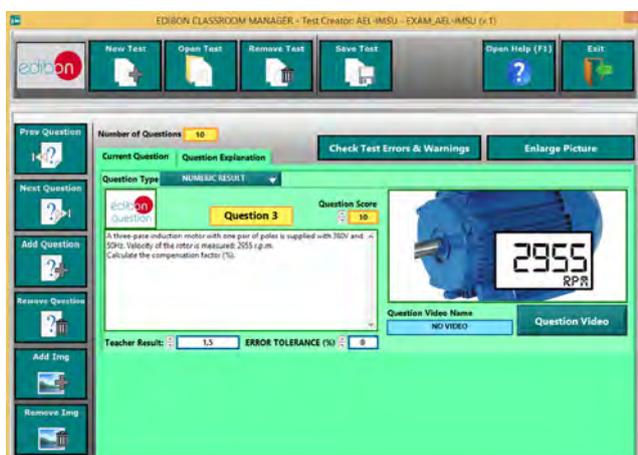


ETTE. EDIBON Training Test & Exam Program Package - Main Screen with
Numeric Result Question



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

## 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.



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



EPE. EDIBON Practical Exercise Program Package Main Screen

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

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



ERS. EDIBON Results & Statistics Program Package - Question Explanation
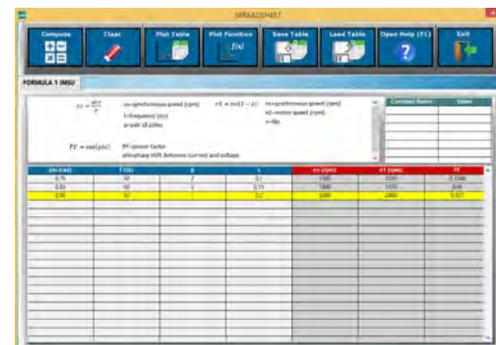


ECAL. EDIBON Calculations Program Package Main Screen

✱ Specifications subject to change without previous notice, due to the convenience of improvement of the product.

REPRESENTATIVE: