Servosystems Basic Unit for DC Motors

SERIN/CCB

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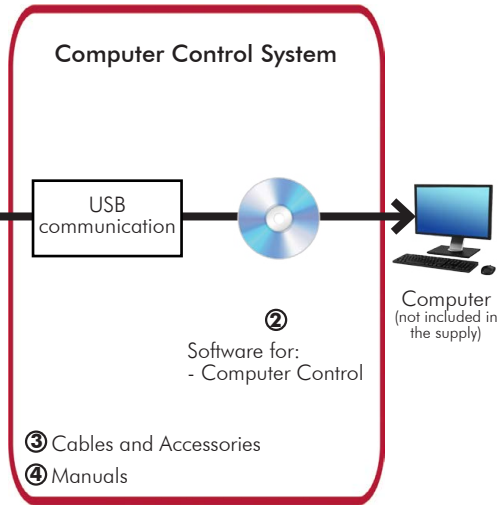
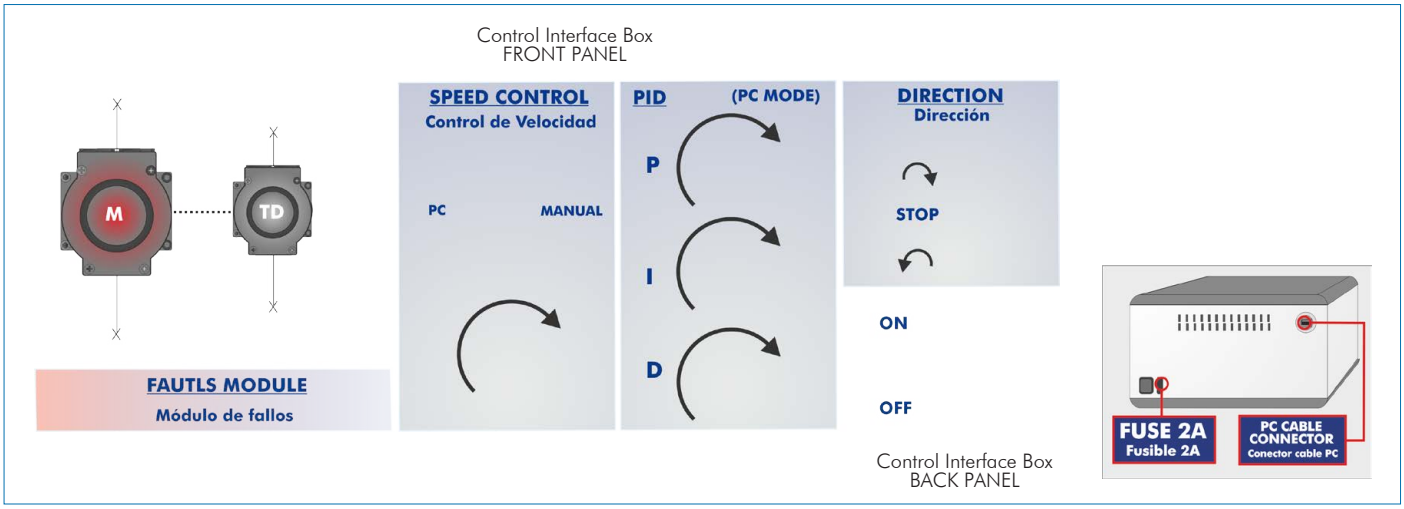
↳PRODUCTS
↳2.- ELECTRONICS

① Unit: Servosystems Basic Unit for DC Motors



* **Minimum supply always includes: 1 + 2 + 3 + 4** (Computer not included in the supply)

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



Certificate of Approval of the Quality Management System

European Union Certificate
(total safety)

UL and CSA Regulations
(All our products are manufactured according to current UL and CSA regulations)

Certificate of Approval of the Environmental Management System

Worlddidac Association Certificate of Membership

INTRODUCTION

The automatic control has played an important role in the engineering and science advance. Apart from its extreme importance in systems for space vehicles, missile guidance, robotics and similar, the automatic control has become an important and integral part of industrial and manufacture modern processes. For example, the automatic control is essential in numerical control of machine tools for the manufacture industry, for the design of autopilot systems in the aerospace industry, and for the design of cars and trucks in the automotive industry. It is also essential in industrial process operations.

Engineers and scientists must have a good knowledge of this field since advances in the theory and practice of the automatic control provide the means to obtain an optimum performance of dynamic systems, improve productivity and lighten the load of many repetitive and routine manual operations, among other activities.

GENERAL DESCRIPTION

The Servosystems Basic Unit for DC Motors, "SERIN/CCB", is an unit whose goal is studying low power servo systems. It is a low power DC motor speed control trainer that has a breakdown simulator.

This unit is a basic version of the Computer Controlled Advanced Industrial Servosystem Unit (for DC Motors), "SERIN/CC", being advisable for an introductory study of closed and open loop control systems.

It consists of an electromechanical unit with an DC motor and a tachometer, attached through an inertial wheel, mounted on a steel box that contains the power stage and the acquisition and control board, as well as the supervision and control software.

This set allows open and closed loop control, control and generation of command variable, ramp generator, proportional error amplifier and PID, current limiter, PWM modulator, turn inversion control, start and stop control, braking control, and breakdown simulator, that allows introducing a great number of dysfunctions so that students may diagnose nature and location of the fault, without risking the integrity of the unit.

Unit control may be done manually, on the unit itself, basically or in a more advance way through the control software SCADA. This control software can do two kinds of control: Open-loop and Closed-loop control.

The base unit has four different parts as seen on the front panel:

Connection zone for motor and tachogenerator.

Manual or Compute rised Speed control. There is a lever-like switch for selecting the kind of control.

PID zone. Here, the values of the PID constants can be manipulated (Proportional, Integral and Derivative). This functionality is only available for PC mode, the speed control lever has to point to PC.

Turning and stop control zone. Allows changing the turning sense and stopping the motor.

Simple integrated circuits to be able to analyse independently each functional stage.

Visible components with 2 mm connectors for voltage and current measurement.

Control through PWM pulses and power stage configured with MOSFET transistors.

① SERIN/CCB. Unit:

Base Unit:

Steel box.

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

Electromechanic unit.

Tachometric adaptor.

Generation and control of set point.

Ramp generator, as well as sinusoidal, triangular and square wave generator.

PWM modulator.

Open loop control.

Close loop control:

Proportional Control (P).

Integrative Proportional Control (PI).

Proportional derivative Control (PD).

Proportional Integrative derivative control (PID).

Current limiter.

Turn inversion control.

Stop/starting control.

Power stage and excitation of the power stage.

Brake control.

Fault simulator that allows the entries of a considerable amount of dysfunctions in order to the students diagnose its nature and find out the components that cause them. Without taking risks to provoke any damage in the unit.

Type of faults included in the unit:

Fault 1: The absolute value of the feedback signal from the tachogenerator is not calculated for its subtraction from the reference, thus, for one of the turning senses, the error is wrong.

Fault 2: The value of the Proportional constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 3: The value of the Integral constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 4: The value of the Derivative constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 5: The signal from the tachogenerator is modified, making the PID control to believe that the speed is ten times lower to the real one.

None of these faults are exclusive, being possible to combine them.

Direct current motor (DC) and tachometric generator.

Unit: SERIN/CCB

② SERIN/CCB/CCSOF. Computer Control Software:

Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process in screen. Compatible with the industry standards.

Registration and visualization of all process variables in an automatic and simultaneously way.

Flexible open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.

Management, processing, comparison and storage of data.

Comparative analysis of the obtained data, after to the process and modification of the conditions during the process.

SERIN/CCB/CCSOF

③ Cables and Accessories, for normal operation.

④ Manuals:

This unit is **supplied with the following manuals:** Required services, Assembly and Installation, Control software, Starting-up, Safety, Maintenance & Practices manuals.

∗References 1 to 4: SERIN/CCB + SERIN/CCB/CCSOF + Cables and Accessories + Manuals are included in the minimum supply for enabling a normal and full operation.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Open loop control response.

2.- Demonstration of a bracking ramp functioning.

3.- Functioning of a PWM modulator and the response of the system.

4.- Closed loop or feedback control through a Proportional control (P).

5.- Closed loop or feedback control through a Derivative control (D).

6.- Closed loop or feedback control through a Proportional-Integral controller (PI).

7.- Closed loop or feedback control through a Proportional-Derivative controller (PD).

8.- Achievement of an over damped system using a closed loop system.

9.- Achievement of a critically damped system using a closed loop PID.

10.- Instability, a characteristic of closed loop systems.

11.- Stabilisation of an unstable system.

12.- Faults simulation:

Type of faults including on the unit:

Fault 1: The absolute value of the feedback signal from the tachogenerator is not calculated for its subtraction from the reference, thus, for one of the turning senses, the error is wrong.

Fault 2: The value of the Proportional constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 3: The value of the Integral constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 4: The value of the Derivative constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 5: The signal from the tachogenerator is modified, making the PID control to believe that the speed is ten times lower to the real one.

None of these faults are exclusive, being possible to combine them.

- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

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

REQUIRED ELEMENTS (Not included)

- AEL-PC. Touch Screen and Computer.

or

- PC. PC to work with the unit.

DIMENSIONS AND WEIGHTS

SERIN/CCB:

- Dimensions: 400 x 330 x 310 mm approx.
  (15,74 x 12,99 x 12,20 inches approx.)
- Weights: 10 Kg approx.
  (22 pounds approx.)

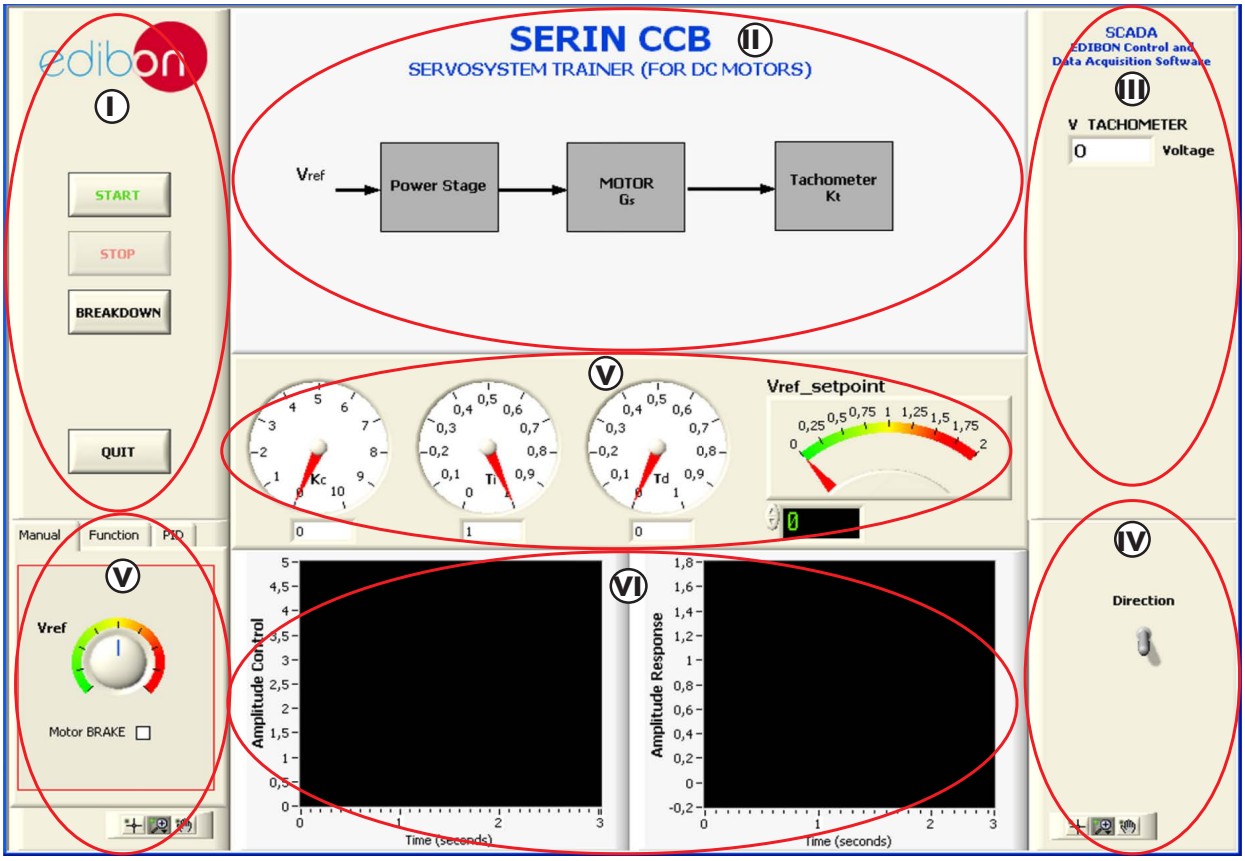
SIMILAR UNITS AVAILABLE

Offered in this catalog:

- SERIN/CCB. Servosystems Basic Unit for DC Motors.

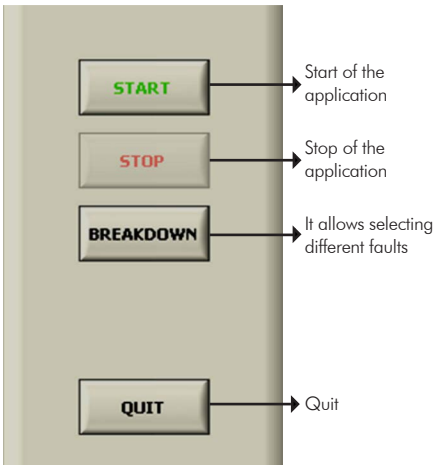
Offered in other catalog:

- AEL-SERIN/CA-1KW. 1 kW AC Industrial Servomotor Application.
- SERIN/CC. Computer Controlled Advanced Industrial Servosystem Unit (for DC Motors).
- SERIN/CA. Computer Controlled Advanced Industrial Servosystems Unit (for AC Motors).
- BMI-UB. Brushless Motor Base Unit.
- SMI-UB. Servomotor Base Unit.

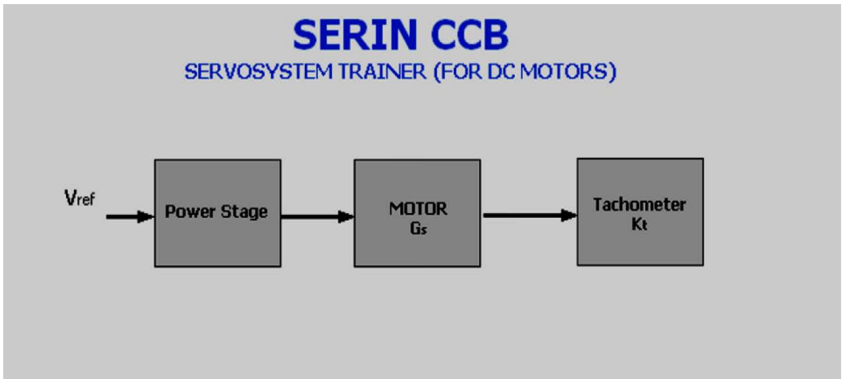


The application has several parts:

Ⓘ Actions:

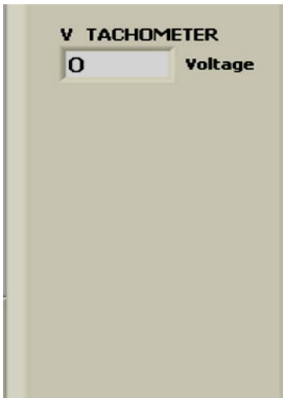


Ⓘ Unit Diagram:

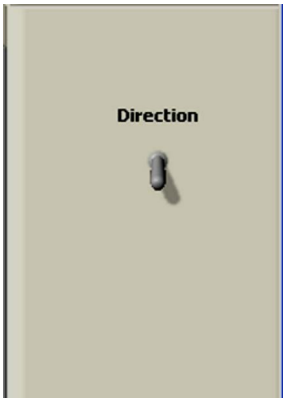


Note: The diagram changes according to the selected control (see part Ⓥ)

Ⓘ Speed sensor. Tachogenerator:

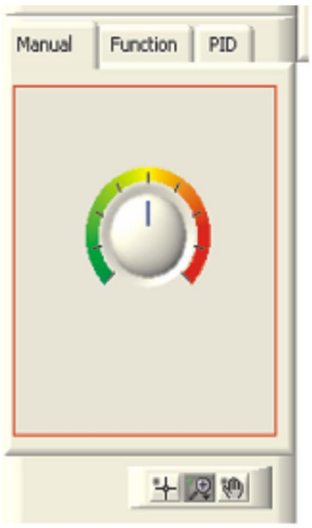


Ⓘ Change of turning direction of the motor:

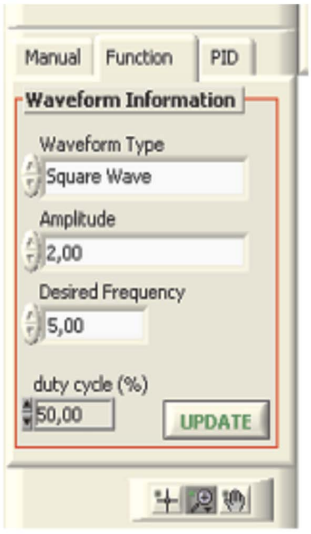


Ⓥ Controls:

Open Loop Controls:

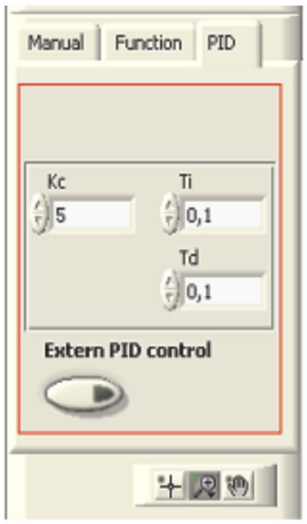


Manual Control from Software

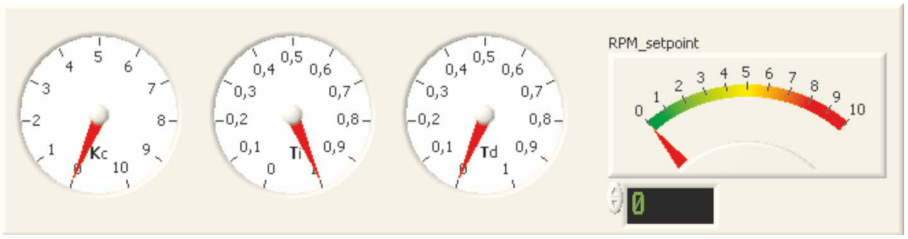


Functions Generator

Closed Loop Controls:

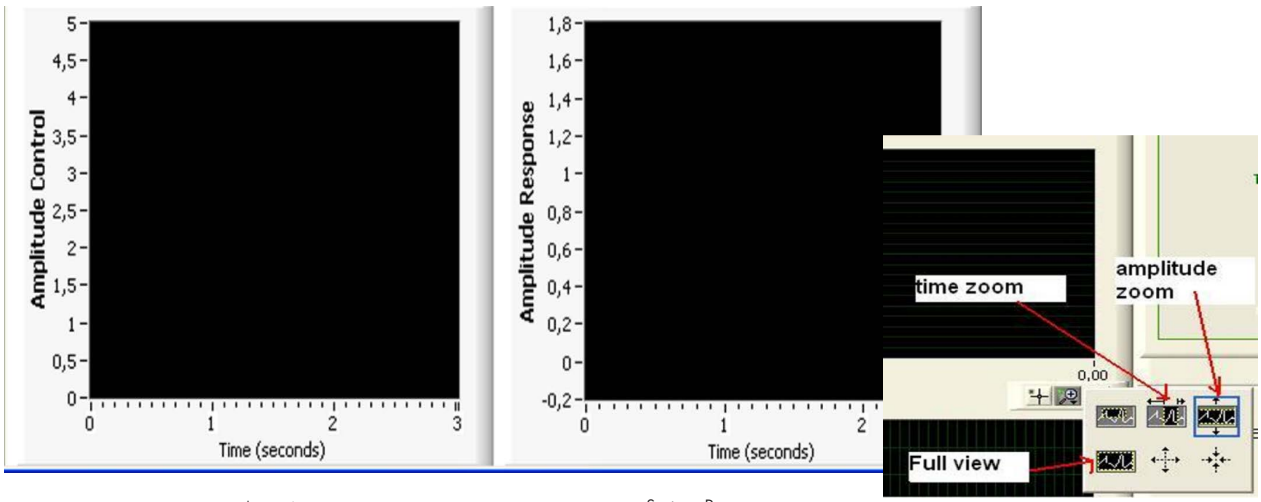


PID Control



Control Set Point

Ⓥ Gráficas:

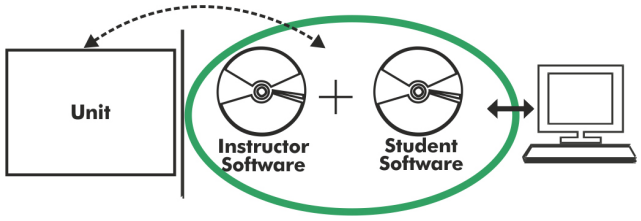


Actuation

System Response

Graph configuration tool

SERIN/CCB/ICAI. Interactive Computer Aided Instruction Software:



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.

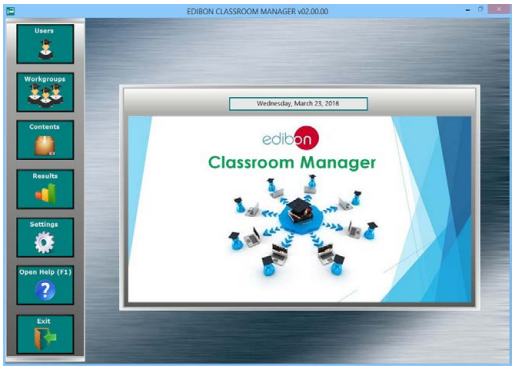
Instructor Software

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

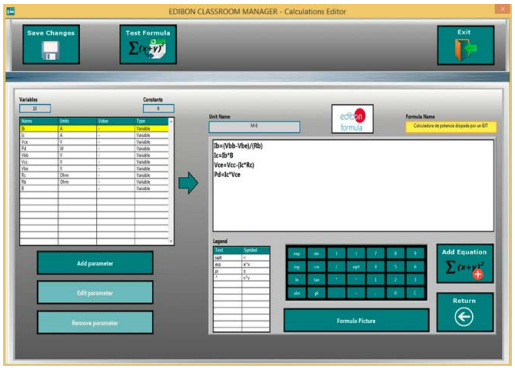
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

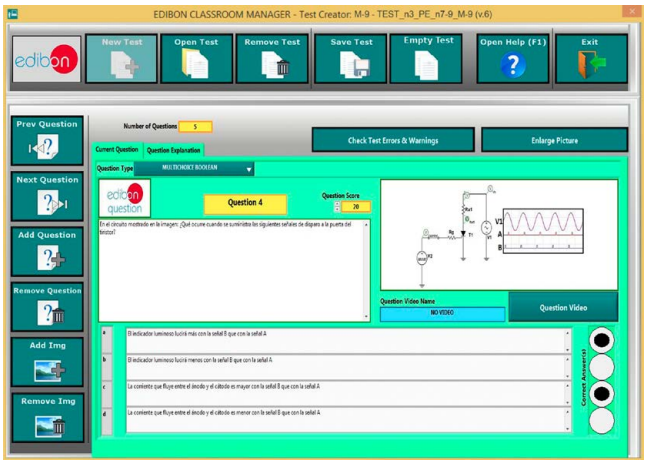
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation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



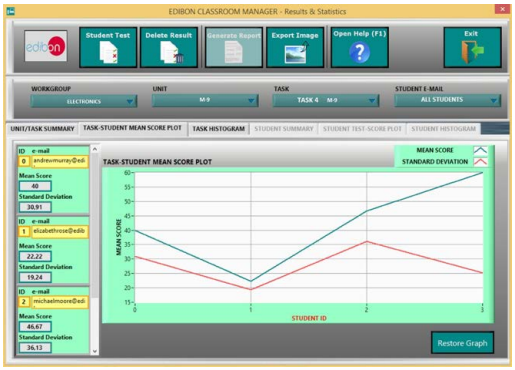
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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).

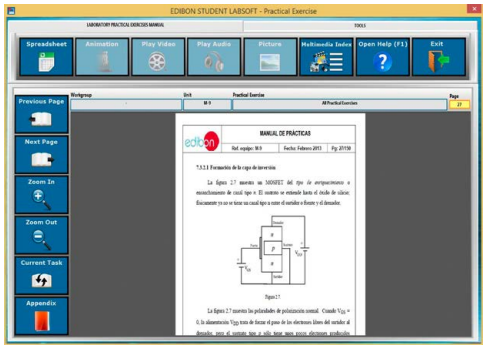
ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are 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:

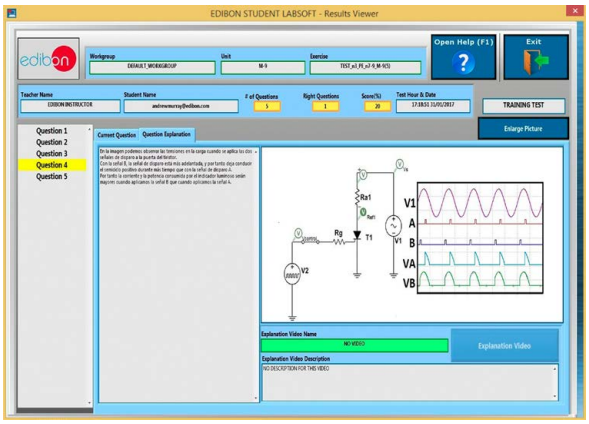
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge 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/interactive-computer-aided-instruction-software

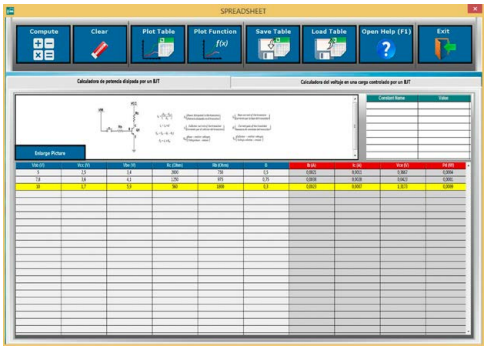
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



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. Móstoles Tecnológico.
28935 MÓSTOLES. (Madrid). ESPAÑA - SPAIN.
Tel.: 34-91-6199363 Fax: 34-91-6198647
E-mail: edibon@edibon.com Web: **www.edibon.com**

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REPRESENTATIVE: