



The image above shows compact version: FLPTU/COM unit.

Key features:

- **There are available a modular version, FLPTU/MOD, and a compact version, FLPTU/COM.**
- **Four different control loops can be performed with the unit: Flow, Level, Pressure and Temperature control loop.**
- **Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensor before taking measurements.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Suitable for applied research, real industrial simulation, training courses, etc.**
- **Totally safe, using three safety systems (mechanical, electrical and electronic).**
- **Designed and manufactured under several quality standards.**
- **Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc., apart from supervising the knowledge and progress achieved by the user.**

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 ↳ PRODUCTS
 ↳ 10.-PROCESS CONTROL

For more information about Key Features, click here



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

Today, control systems play an essential role in most industrial processes due to the significant improvements they can provide in terms of production quality, efficiency, costs and performance.

The Flow, Level, Pressure and Temperature Regulation Unit for Process Control, "FLPTU", have been designed by EDIBON to study the fundamentals of process control systems, the behavior and configuration of the devices involved and the design of the control strategies that regulate them.

"FLPTU" is available in two versions: the modular version, "FLPTU/MOD", and the compact version, "FLPTU/COM". Both "FLPTU" versions contains the same components and allows to perform the same practical exercises, but the "FLPTU/MOD" version is divided in small structures or modules that perform simple tasks inside the unit, and the "FLPTU/COM" version contains all the components together.

GENERAL DESCRIPTION

The Flow, Level, Pressure and Temperature Regulation for Process Control, "FLPTU", designed by EDIBON, allows the student to configure a flow, level, pressure and temperature control systems, apart from studying the fundamentals of the control engineering on which they are based.

The "FLPTU/MOD" and "FLPTU/COM" units consist of a hot water circuit, a cold water circuit and a heat exchanger that transfer the heat between both circuits.

In the cold water circuit the three phase pump impels the water from the reservoir tank to an upper tank through a pneumatic control valve. These two components are used as actuators of the flow, pressure, level and temperature control loops.

In the hot water circuit, a circulation pump makes water flow through a heating element and the heat exchanger. The heating element can be used as an actuator for the temperature control loop. In addition, the temperature of this circuit can also be regulated by controlling the flow that circulates through the cold water.

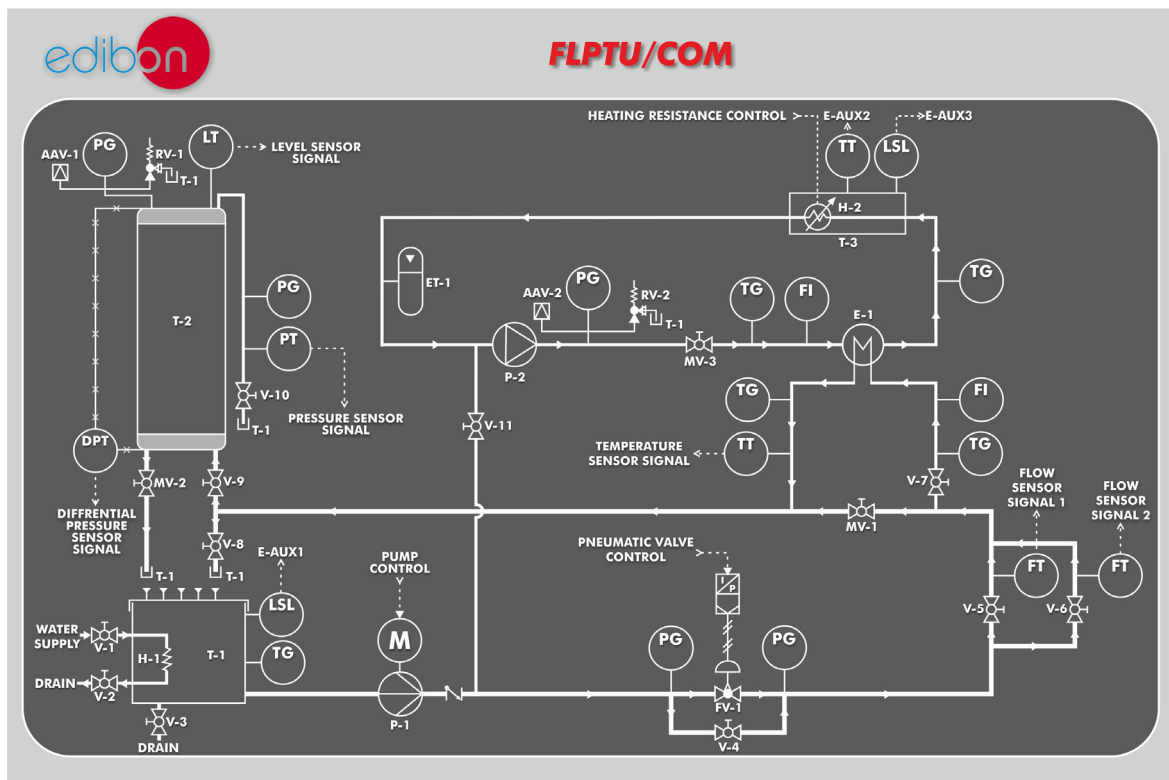


FLPTU/COM detail

The "FLPTU/MOD" and "FLPTU/COM" units include six different types of sensors, three actuators and an industrial controller to perform up to twelve different control loops of level, pressure, temperature and flow. Throughout the practical exercises the student will understand the procedure to perform all the stages of a PID control loop, take the physical measurement with a sensor, signal conditioning, program the controller device, configure the set point value and adjust the PID parameters to perform an appropriate control of the process.

The "FLPTU/MOD" and "FLPTU/COM" units also allow to perform the control of the level, temperature, pressure and flow with the EDIBON additional recommended elements (range of PLC units), not included in the "FLPTU/MOD" or "FLPTU/COM" supply. There are available the PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

FLPTU P&ID DIAGRAM



SPECIFICATIONS

“FLPTU” is available in two versions: the “FLPTU/MOD” and “FLPTU/COM”, both of them contains the same components and allows to perform the same practical exercises but the “FLPTU/MOD” version is divided in small structures or modules depending on its function inside the unit, and the “FLPTU/COM” version contains all the components together.

The elements included in the “FLPTU” are:

- **Water supply unit.**

Plastic tank:

Capacity: 140 l (37 gal).

Safety low level switch:

Normally open switch.

Cooling circuit.

Temperature gauge:

Measuring range: 0 – 60 °C (32 – 140 °F).

Resolution: 1 °C (2 °F).

Drain valve.

Centrifugal pump:

Supply voltage: 230 VAC three-phase.

Nominal power: 375 W.

Rated flow: 0 – 30 l/min (7.92 gpm).

Max operating pressure: 2 bar (29 psi).

Check valve.

- **N-FI/0.6kW. 0.6kW Variable-Frequency Driver Module.**

Supply voltage: 230 VAC single-phase.

Variable-frequency drive:

Output voltage: 230 VAC three-phase.

Max power: 600 W.

Input control signal: 4 – 20 mA.

Safety stop input for low level switch.

Local/remote control selector.

Start/Stop selector.

- **Hot water pumping unit.**

Circulation pump:

Supply voltage: 230 VAC single-phase.

Nominal power: 103 W.

Operating temperature range: 2 – 110 °C (35.6 – 230 °F).

Safety relief valve:

Pressure setting: 3 bar (43.5 psi).

Discharge line.

Additional manual opening system.

Safety pressure gauge:

Pressure range: 0 – 6 bar (0 – 87 psi).

Resolution: 0.2 bar (2.9 psi).

Automatic air vent valve.

Expansion tank:

Capacity: 5 l (1.32 gal).

Temperature: 10 – 100 °C (50 – 212 °F).

Max. operating pressure: 5 bar (72.52 psi).

Ball valve with scale:

Metering ball valve.

Scale from 90° (closed) to 0° (open).

• **Pneumatic control valve.**

Pneumatic control valve:

Normally closed valve.

Linear plug.

Current to pressure converter: 4 – 20 mA I/P converter.

Control signals: 0.207 – 1.034 bar (3 – 15 psi).

Pressurized air inlet required: at least 2.5 bar (36.26 psi).

Operating temperature range: -20 – +70 °C (-4 – 158 °F).

Max operating pressure: 2.5 bar (35 psi).

Actuator: diaphragm type.

DN 15.

Flow rate:

Kv: 2.9 (referenced to m³/h and bar units).

Cv: 3.4 (referenced to USGPM and psi units).

Air filter and pressure regulator with pressure gauge:

Air pressure inlet admitted range: 0 – 12 bar (0 – 174.05 psi).

Output pressure: 2.5 bar (35 psi).

Drain capacity: 12 cm³ (0.91 in³).

Filtration: 5µm (0.197 mil).

Two pressure gauge:

Pressure range: 0 – 35 psi (0 – 2.5 bar).

Resolution: 2 psi (0.125 bar).

Bypass ball valve.

• **Heat exchanger unit.**

Heat exchanger:

Two circuits.

Type: plate heat exchanger.

Ball valve.

Ball valve with scale:

Metering ball valve.

Scale from 90° (closed) to 0° (open).

Two analog flow meters:

Flow range: 2 – 10 l/min (0.528 – 5.283 gpm).

Resolution: 0.25 l/min (0.066 gpm)

Four temperature gauges:

Temperature range: 0 – 60 °C (32 – 140 °F).

Resolution: 1 °C (2 °F).

• **Temperature transmitter.**

Supply voltage: 24 VDC.

Transducer type: Pt-1000.

Temperature range: -30 – 150 °C (-22 – 302 °F).

Accuracy: ± 0.2 %.

• **2 kW heating element.**

Heating element:

Supply voltage: 230 VAC single-phase.

Max power: 2 kW.

Safety temperature switch.

Safety temperature transmitter:

Transducer type: thermocouple "J" type.

Temperature range: -100 – 900 °C (-148 – 1652 °F).

Accuracy: ± 1 °C.

Safety low level switch:

Normally open switch.

- **N-H-2K. 2 kW Heating Module.**

Supply voltage: 230 VAC single-phase.

2 kW power control driver:

Based on Solid State Relay (SSR).

4 – 20 mA electric control signal.

Linear response of the delivered power.

Safety temperature controller:

On/Off control.

Set temperature: 65 °C (149 °F).

Safety stop input for low level switch.

- **Paddlewheel flow transmitter.**

Supply voltage: 24 VDC.

Flow range: 2 – 20 l/min (0.528 – 5.283 gpm).

Output signal range: 15 – 180 Hz.

- **N-SEN52. Paddlewheel Flow Sensor with Current and Frequency Output Module.**

Electronic conditioning of the frequency variable signal from the paddlewheel sensor to 4 – 20 mA signal.

- **Ultrasonic level transmitter.**

Supply voltage: 24 VDC.

Level range in the unit: 0 – 550 mm (0 – 21.653 in).

Output signal range: 4 – 20 mA

Operating temperature range: -20 – +70 °C (-4 – 158 °F).

Repeatability: 1%.

Resolution: 2 mm (0.0787 in).

Level range outside in the unit: 60 – 800 mm (2.362 – 31.496 in)

Response time: 0 – 500 ms.

- **Pressure transmitter.**

Supply voltage: 24 VDC.

Pressure range: 0 – 1 bar (0 – 14.5 psi).

Max pressure supported: 3 bar (43.511 psi).

Output signal range: 4 – 20 mA.

Operating temperature range: -25 – +85 °C.

Accuracy: ± 0.5 % FSO BFSL.

Response time: 10 ms.

- **Pressurized transparent tank.**

Pressurized tank:

Max pressure: 4 bar (58.015 psi).

Height: 750 mm (29.52 in).

Diameter: 140 mm (5.51 in).

Volume: 11.5 l (3.08 gal).

Height with millimeter scale: 550 mm (21.65 in).

Safety relief valve:

Pressure setting: 2 bar (29 psi).

Discharge line.

Three ball valves.

Ball valve with scale:

Metering ball valve.

Scale from 90° (closed) to 0° (open).

Safety pressure gauge:

Pressure range: 0 – 6 bar (87.022 psi).

Resolution: ± 0.2 bar (2.9 psi).

Pressure gauge:

Pressure range: 0 – 2.5 bar (0 – 35 psi).

Resolution: 0.125 bar (± 2 psi).

• **N-AL120. Power Supply Module for Control Circuits Module.**

Supply voltage: 230 VAC single-phase.

Differential magneto-thermal circuit breaker.

Emergency stop pushbutton.

ON-OFF removable key.

Two power strips to power supply the other modules of the unit.

• **N-IC-SL. Single Loop Industrial Controller Module.**

Supply voltage: 230 VAC single-phase.

Display: Full-color 5.5 cm (2.2 in), ¼ VGA TFT, 1/8 DIN LCD with built-in backlight.

Control parameters:

Control type:

On/Off control.

P, PI, PID control.

Control output:

Analog output.

Time proportioning.

On / Off.

Split output with combinations of relay, digital output and current outputs.

Autotune function:

On-demand calculation of control settings.

Set points:

Local:

Configurable via front panel.

Math functions:

Number: 8 blocks.

Operators:

+, -, x, /.

Average, maximum, minimum.

High / low / median select.

Square root.

Multiplexer.

Logic functions:

Number: 8.

Element per equation: up to 15.

Operators: OR, AND, NOR, NAND, NOT, EXOR.

Specifications

Process alarms:

Number: 8 blocks.

Types: high / low process and high / low latch.

Acknowledgement: via front panel keys or digital signals.

Source: Fully configurable (for example, PV, analog input, math block inbuilt, OP control loop deviation).

Hysteresis: Level and time.

Alarm enable: enable / disable of individual alarms via a digital signal.

Analog inputs:

Number: 2.

Sample rate: 125 ms.

Type: 0 – 50 mA.

Analog outputs:

Number: 1.

Configurable as analog or digital pulse.

Current output range as analog output: 0 – 20 mA.

Relays output:

Number: 1.

NO and NC relay.

Contact ratings: 5A, 240 V.

• **N-TERM. 8 and 5 Pin Connector Terminal block Module.**

Six 8-pin connector terminal block.

Two 5-pin connector terminal block.

• **N-MED87. Analogs and Digitals Indicators of 4-20mA Current Signals Module.**

Two analog indicators:

Device size: 92 x 92 mm (3.62 x 3.62 in).

Input signal range: 4 – 20 mA.

Two digital indicators of 4 – 20 mA current signal.

Four digit LCD display.

Input signal range: 4 – 20 mA.

• **N-SR-3. Four-channel Signal Recorder Module.**

Supply voltage: 230 VAC single-phase.

Communication:

USB.

Ethernet.

Display: Full-color LCD 9 cm (3.5 in) with built-in backlight.

Analog inputs:

Number: 4.

Sample rate: 125 ms.

Type: 4 – 20 mA.

Relays output:

Number: 2.

NO relays.

Contact ratings: 2A, 230 V.

Digital Output:

Number: 1

Output: voltage levels 0 and 24 VDC.

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.

Specifications

Required elements (only one) (Not included):

- SU-P. Large Pneumatic Supply Unit.
- or
- SAC. Silent Air Compressor Unit.

Additional recommended elements (Not included):

- N-DPT-HART. Differential Pressure Transmitter with HART Communication Module.
 - Smart differential pressure transmitter.
 - Supply voltage: 24 VDC.
 - Differential pressure range: 1.5 mbar – 75 mbar used to measure from 0 to 550 mm of water column in the unit (0.015 – 1.0877 psi used to measure from 0 to 21.653 in the unit).
 - Output signal range: 4 – 20 mA with HART protocol communication.
 - Accuracy: ± 0.075 % of span.

- AE-PLC-PAN-UB. PANASONIC PLC Base Unit.
- PAN-PLC-K2. PANASONIC PLC Kit 2.
- PAN-PLC-K4. PANASONIC PLC Kit 4.

- AE-PLC-SIE-UB. SIEMENS PLC Base Unit.
- SIE-PLC-K2. SIEMENS PLC Kit 2.
- SIE-PLC-K4. SIEMENS PLC Kit 4.

- AE-PLC-AB-UB. ALLEN BRADLEY PLC Base Unit.
- AB-PLC-K2. ALLEN BRADLEY PLC Kit 2.
- AB-PLC-K4. ALLEN BRADLEY PLC Kit 4.

- AE-PLC-OMR-UB. OMRON PLC Base Unit.
- OMR-PLC-K2. OMRON PLC Kit 2.
- OMR-PLC-K4. OMRON PLC Kit 4.

- AE-PLC-MIT-UB. MITSUBISHI PLC Base Unit.
- MIT-PLC-K2. MITSUBISHI PLC Kit 2.
- MIT-PLC-K4. MITSUBISHI PLC Kit 4.

To work with one option of PLC manufacturer, it has to be included in the order the three elements that appear together in the list above: Base Unit, Kit 2 and Kit 4.

EXERCISES AND PRACTICAL POSSIBILITIES

<p>1.- Familiarization with the main components of a control system: sensor, actuator and controller.</p> <p>2.- Preparation of the piping and instrumentation diagram (P&ID) of flow, level, pressure and temperature control system.</p> <p>3.- Effect of the parameters of a PID controller.</p> <p>Flow control loop:</p> <p>4.- Flow control open loop (manual).</p> <p>5.- Flow control loop (on/off).</p> <p>6.- Flow control loop (Proportional + Integral + Derivative).</p> <p>7.- PID tuning of a flow control system.</p> <p>8.- Effect of disturbances in a flow control system with PID controller.</p> <p>Level control loop:</p> <p>9.- Level control open loop (manual).</p> <p>10.- Level control loop (on/off).</p> <p>11.- Level control loop (Proportional + Integral + Derivative).</p> <p>12.- PID tuning of a level control system.</p> <p>13.- Effect of disturbances in a level control system with PID controller.</p> <p>Pressure control loop:</p> <p>14.- Pressure control open loop (manual).</p> <p>15.- Pressure control loop (on/off).</p> <p>16.- Pressure control loop (Proportional + Integral + Derivative).</p> <p>17.- PID tuning of a pressure control system.</p> <p>18.- Effect of disturbances in a pressure control system with PID controller.</p> <p>Temperature control loop:</p> <p>19.- Temperature control open loop (manual).</p> <p>20.- Temperature control loop (on/off).</p>	<p>21.- Temperature control loop (Proportional + Integral + Derivative).</p> <p>22.- PID tuning of a temperature control system.</p> <p>23.- Effect of disturbances in a temperature control system with PID controller.</p> <p>- AE-PLC-PAN (also available with others PLC manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.):</p> <p>The practices available with the unit are:</p> <p>24.- Preparation of the piping and instrumentation diagram (P&ID) of flow, level, pressure and temperature control system.</p> <p>25.- Reading and calibration of the mechatronic flow transmitter signal with the PLC.</p> <p>26.- Reading and calibration of the ultrasonic level transmitter signal with the PLC.</p> <p>27.- Reading and calibration of the differential pressure transmitter with the PLC (with the optional unit N-DPT-HART).</p> <p>28.- Reading and calibration of the pressure transmitter signal with the PLC.</p> <p>29.- Reading and calibration of the temperature transmitter signal with the PLC.</p> <p>30.- Flow control loop with PLC.</p> <p>31.- Level control loop with the ultrasonic transmitter and PLC.</p> <p>32.- Level control loop with the differential pressure transmitter and PLC (with the optional unit N-DPT-HART).</p> <p>33.- Pressure control loop with PLC.</p> <p>- Several other exercises can be done with the PLC alone and designed by the user.</p>
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REQUIRED SERVICES

<ul style="list-style-type: none"> - Electrical supply: three-phase, 380 VAC- 400 VAC/50 Hz o 190 VAC-240/60 Hz, 3 kW. - Compressed air with a 50 l/min of air flow and 8 bar of pressure. - Water supply and drain.

DIMENSIONS AND WEIGHTS

<p>FLPTU/MOD and FLPTU/COM:</p> <ul style="list-style-type: none"> - Dimensions: 1200 x 700 x 400 mm approx. (47.24 x 27.55 x 15.74 inches approx.) - Weight: 110 Kg approx. (242 pounds approx.)

REQUIRED ELEMENTS (Not included)

<p>Required (only one):</p> <ul style="list-style-type: none"> - SU-P. Large Pneumatic Supply Unit. <li style="text-align: center;">or - SAC. Silent Air Compressor Unit.
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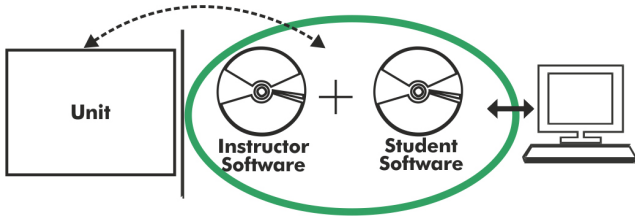
ADDITIONAL RECOMMENDED ELEMENTS (Not included)

<ul style="list-style-type: none"> - N-DPT-HART. Differential Pressure Transmitter with HART Communication Module. - AE-PLC-PAN-UB. PANASONIC PLC Base Unit + PAN-PLC-K2. PANASONIC PLC Kit 2 + PAN-PLC-K4. PANASONIC PLC Kit 4. - AE-PLC-SIE-UB. SIEMENS PLC Base Unit + SIE-PLC-K2. SIEMENS PLC Kit 2 + SIE-PLC-K4. SIEMENS PLC Kit 4. - AE-PLC-AB-UB. ALLEN BRADLEY PLC Base Unit + AB-PLC-K2. ALLEN BRADLEY PLC Kit 2 + AB-PLC-K4. ALLEN BRADLEY PLC Kit 4. - AE-PLC-OMR-UB. OMRON PLC Base Unit + OMR-PLC-K2. OMRON PLC Kit 2 + OMR-PLC-K4. OMRON PLC Kit 4. - AE-PLC-MIT-UB. MITSUBISHI PLC Base Unit + MIT-PLC-K2. MITSUBISHI PLC Kit 2 + MIT-PLC-K4. MITSUBISHI PLC Kit 4.
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SIMILAR UNITS AVAILABLE

<p><u>Offered in this catalog:</u></p> <ul style="list-style-type: none"> - FLPTU/COM. Flow, Level, Pressure and Temperature Regulation Unit for Process Control (Compact). - FLPTU/MOD. Flow, Level, Pressure and Temperature Regulation Unit for Process Control (Modular). <p><u>Offered in other catalog:</u></p> <ul style="list-style-type: none"> - APC-FLPTIC. Temperature, Pressure, Level and Flow Regulation Application with Industrial Controller.
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FLPTU/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.

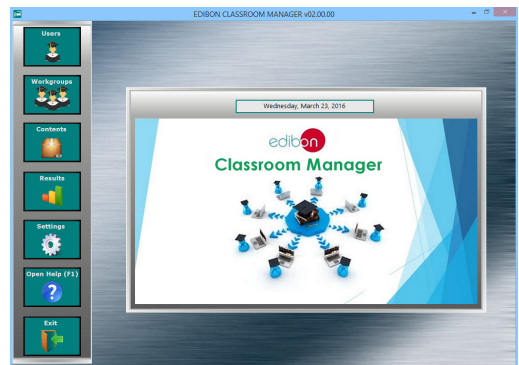
Instructor Software

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

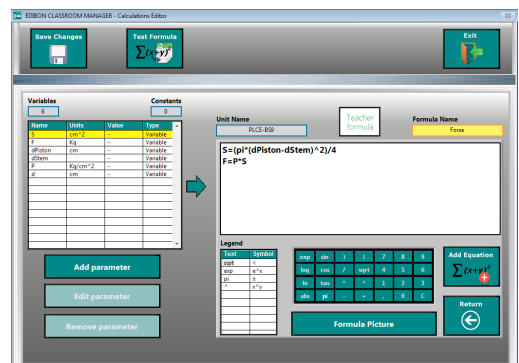
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

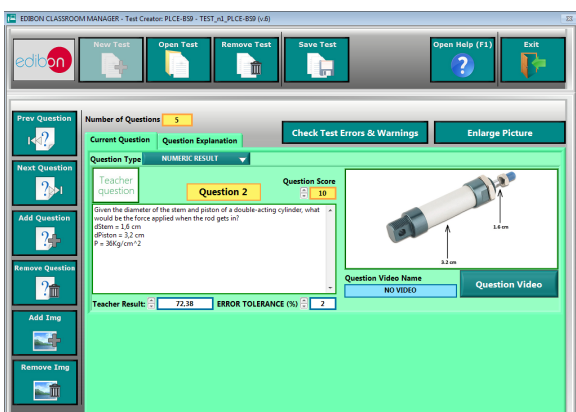
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



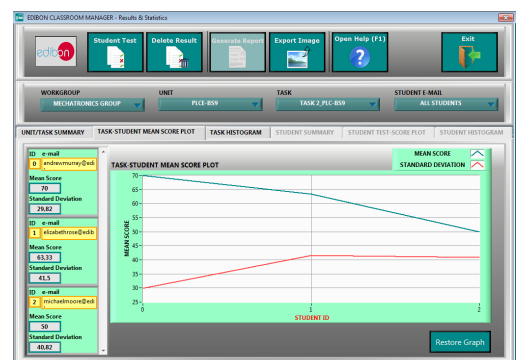
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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:

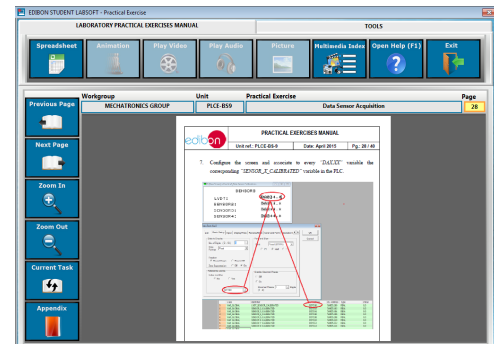
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge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

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

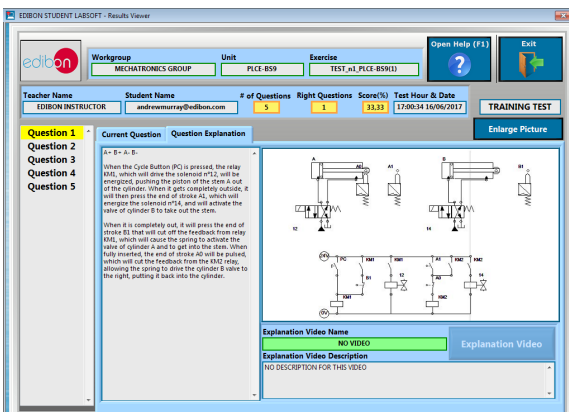
<https://www.edibon.com/en/interactive-computer-aided-instruction-software>



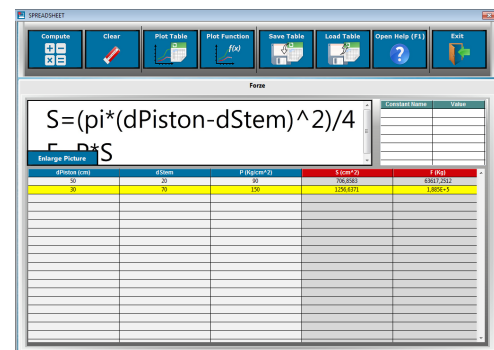
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



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.



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REPRESENTATIVE:

