

# Flow, Level, Pressure and Temperature Regulation Unit for Process Control

**FLPTU/COM** and **FLPTU/MOD**



The image above shows modular version of the unit, FLPTU/MOD.

Key features:

- **The FLPTU unit is available in modular version, FLPTU/MOD, and compact unit 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.**

[www.edibon.com](http://www.edibon.com)  
 ↳ 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 behaviour and configuration of the devices involved and the design of the control strategies that regulate them.

## GENERAL DESCRIPTION

The "FLPTU", designed by EDIBON, allows the student to configure a flow, level, pressure and temperature control system, apart from studying the fundamentals of the control engineering on which they are based.

The "FLPTU" unit consists 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 supply tank to an upper tank equipped with a pneumatic controlling valve that it is used as actuator of the flow, pressure, level and temperature control loops.

In the hot water circuit, a circulation pump makes water flow through a heating device and the heat exchanger. The heating device 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.

The "FLPTU" unit includes different types of sensors to close the control loops; the unit includes flow meter sensor, ultrasonic level sensor, differential pressure sensor, pressure sensor and temperature sensor in order to perform the four types of control loops with different actuators and sensors to give the students a complete understanding of process control theory.

The "FLPTU" unit allows to use the industrial controller, included in the supply of the unit to perform the level, pressure, temperature and flow control loop. The PID parameters of the industrial controller can be modified through the front panel of the device. During the practical exercises the student will understand the procedure to perform all the stages of a PID control loop, measure of 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" also allows to perform the control of the level, temperature, pressure and flow with the optional EDIBON PLC unit, not included in the "FLPTU" supply. There are available the PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

## SPECIFICATIONS

The elements included in the "FLPTU" unit are:

- **Water Supply Unit.**

Module designed to pump water to the other devices of the application.

The elements included in the module are:

Water pump, with 20 l/min of maximum flow.

Plastic tank, with 30 litres of capacity.

- **Hot Water Pumping Unit.**

Water pumping unit designed for temperature control applications.

The elements included in the module are:

Circulation pump:

Supply voltage: 230 VAC single-phase.

Nominal power: 103 W.

Rated flow: 10 to 63.2 l/min.

Max operating pressure: 10 bar.

Safety relief valve:

Pressure setting: 3 bar.

Discharge line.

Additional manual opening system

Pressure gauge:

Pressure range: 0 to 4 bar.

Automatic air vent valve.

- **Pneumatic Control Valve.**

Normally closed valve.

Linear plug.

IPC Converter 4 - 20 mA to 0 - 15 psi.

Control signals: 3 to 15 psi.

Actuator: diaphragm type.

Pressurized air inlet required: 2.5 bar.

Two pressure gauge.

Manual Ball valve.

Air Filter and Pressure Regulator with Pressure Gauge:

Air pressure inlet admitted range: 0 to 10 bar.

Output pressure 2.5 bar.

Drain capacity 12 cm<sup>3</sup>.

Filtration: 5μ.

- **Heat Exchanger unit.**

Heat exchanger.

Type: plate heat exchanger.

Manual Ball valve.

Temperature sensor "J Type" thermocouple:

Transducer type: Thermocouple Type J.

Temperature range: -100 to 900 °C.

Accuracy: ± 1 °C.

• **2 kW Heating Element.**

Heating resistance:

Supply voltage: single-phase 220 VAC.

Max power: 2 kW.

Safety temperature switch.

Safety temperature sensor:

Transducer type: Thermocouple Type J.

Temperature range: -100 to 900 °C.

Accuracy:  $\pm 1$  °C.

Safety low level switch.

Control module box.

2 kW power control driver.

Based on Solid State Relay (SSR).

24 VDC Digital input.

Safety temperature controller:

On/Off control.

Set temperature: 65 °C.

Safety stop input for low level switch.

• **Paddle Wheel Flow Meter Sensor.**

Maximum flow rate: 20 l/min approx.

Pulsed output.

• **Differential Pressure Sensor.**

Smart differential pressure transmitter.

Output signal: 4 to 20 mA with HART protocol.

• **Mechatronic Piston Flow Meter Sensor.**

Supply voltage: 24 VDC.

Flow rate range: 0.5...25 l/min.

Two digital outputs NO or NC.

Red or green backlight depend of the flow rate measured.

Four digits LED display.

• **Ultrasonic Sensor.**

Supply voltage: 24 VDC.

Water height range: 60 to 800mm

Output current: 4 to 20 mA.

• **Pressure Sensor.**

Supply voltage: 24 VDC.

Pressure range: 0 to 1 bar.

Output current: 4 to 20 mA.

- **Pressurized Transparent Tank.**

Pressurized transparent tank with graduated scale for level and pressure applications.

The elements included are:

Pressurized tank:

Max pressure: 4 bar.

Height: 750 mm.

Diameter: 140 mm.

Volume: 11.5 l.

Height with millimeter scale: 550 mm.

Polycarbonate protective cover.

Safety relief valve:

Discharge line.

Manual Ball valves.

- **Power Supply Module for Control Circuits.**

Supply voltage (Single-phase): 230 VAC, L+N+G.

Emergency stop pushbutton.

ON-OFF removable key.

- **Industrial Controller.**

Display: Full-color LCD 5.5 cm (2.2 in) with built-in backlight.

Control parameters:

Control type:

On/Off control.

P, PI, PID control.

Control output:

Analog output.

Time proportioning.

On / Off.

Motorized valve with feedback.

Motorized valve without feedback.

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

Autotune function:

On-demand calculation of control settings.

Set points:

Configurable through the front panel.

Up to two local set points, all selectable via digital inputs or front panel.

Eight blocks math functions.

Eight blocks of logic functions.

Eight blocks process alarms.

Analog input with 125 ms of sample rate.

Analog output.

Relay up to 5 A at 240 V.

## Specifications

- **Panel Meter Module.**

Two analog panel meter:

Device size: 92 x 92 mm.

Input signal range: 4 - 20 mA.

Two digital panel meter

Four digit LED display.

Input signal range: 4 - 20 mA.

- **Four-channel Signal Paperless Recorder.**

Full-color LCD display.

4 Universal Analog inputs 4 - 20mA.

This application needs compressed air. The following accessory is recommended: (It is not included in the supply)

- **SU-P. Pneumatic Supply Unit.**

Module to supply compressed air to the rest of devices of the application.

The elements included in the "SU-P" module are:

Air compressor of 8 bar approx.

50 l/min of air flow.

**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

<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&amp;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.- Reading and calibration of the pressure sensor signal with the PLC.</p> <p>25.- Reading and calibration of the flow sensor signal with the PLC.</p> <p>26.- Reading and calibration of the ultrasonic sensor signal with the PLC.</p> <p>27.- Reading and calibration of the differential pressure transmitter sensor signal with the PLC.</p> <p>28.- Manual control of the pneumatic control valve with the PLC.</p> <p>29.- Pressure control loop with PLC.</p> <p>30.- Flow control loop with PLC.</p> <p>31.- Level control loop with an ultrasonic sensor and PLC.</p> <p>32.- Level control loop with a differential pressure transmitter and PLC.</p> <p>- Several other exercises can be done with the PLC alone and designed by the user.</p>
--	---

### REQUIRED SERVICES

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

### DIMENSIONS AND WEIGHTS

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

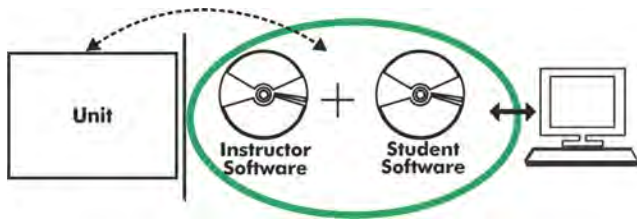
### REQUIRED ELEMENTS (Not included)

<ul style="list-style-type: none"> <li>- SU-P. Pneumatic supply unit.</li> </ul>
--

### ADDITIONAL RECOMMENDED ELEMENTS (Not included)

<ul style="list-style-type: none"> <li>- AE-PLC-PAN-UB. PANASONIC PLC Base Unit. + PAN-PLC-K2. Distributed analog inputs and outputs kit for PANASONIC PLC. + PAN-PLC-K4. Large HMI kit for PANASONIC PLC.</li> <li>- AE-PLC-SIE-UB. SIEMENS PLC Base Unit. + SIE-PLC-K2. Distributed analog inputs and outputs kit for SIEMENS PLC. + SIE-PLC-K4. Large HMI kit for SIEMENS PLC.</li> <li>- AE-PLC-AB-UB. ALLEN BRADLEY PLC Base Unit. + AB-PLC-K2. Distributed analog inputs and outputs kit for ALLEN BRADLEY PLC. + AB-PLC-K4. Large HMI kit for ALLEN BRADLEY PLC.</li> <li>- AE-PLC-OMR-UB. OMRON PLC Base Unit. + OMR-PLC-K2. Distributed analog inputs and outputs kit for OMRON PLC. + OMR-PLC-K4. Large HMI kit for OMRON PLC.</li> <li>- AE-PLC-MIT-UB. MITSUBISHI PLC Base Unit. + MIT-PLC-K2. Distributed analog inputs and outputs kit for MITSUBISHI PLC. + MIT-PLC-K4. Large HMI kit for MITSUBISHI PLC.</li> </ul>
---

**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.

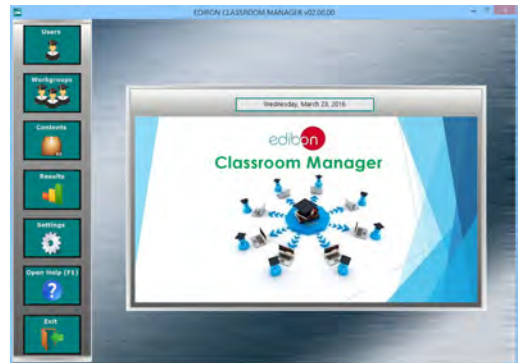
**Instructor Software**

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

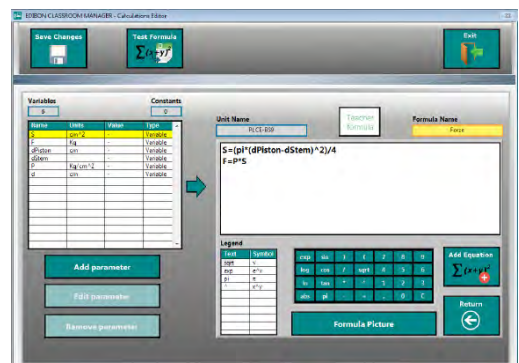
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

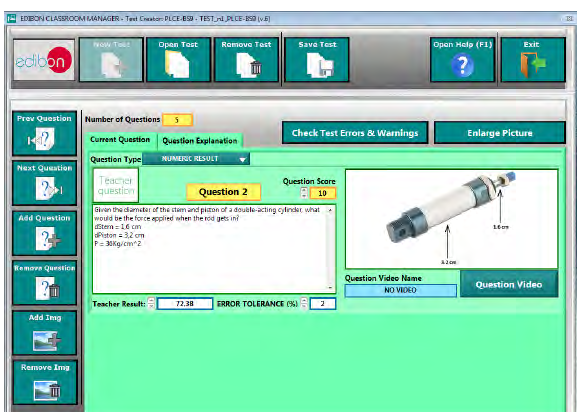
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



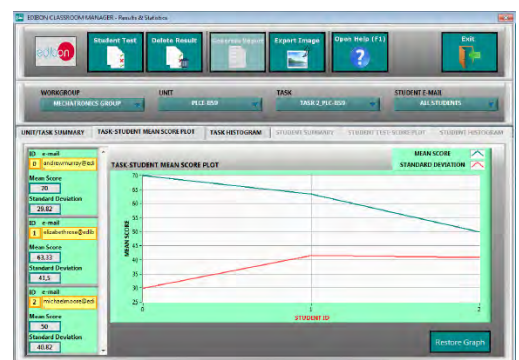
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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



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:

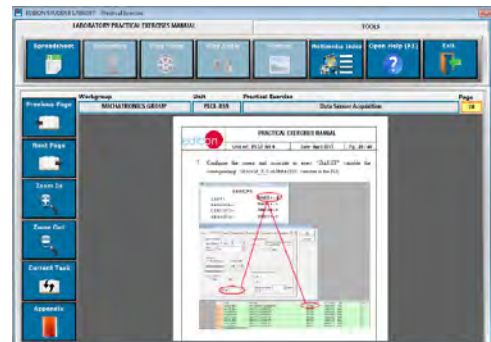
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge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

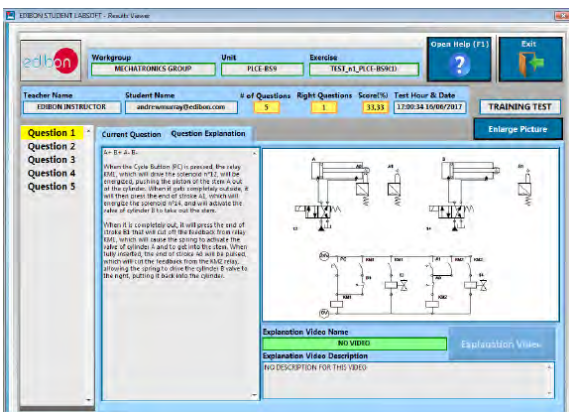
[www.edibon.com/en/files/expansion/ICAI/catalog](http://www.edibon.com/en/files/expansion/ICAI/catalog)



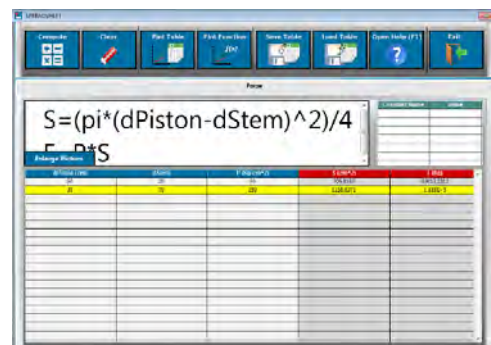
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



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.



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](mailto:edibon@edibon.com) Web: [www.edibon.com](http://www.edibon.com)

Edition: ED01/20  
Date: March/2020

REPRESENTATIVE:

