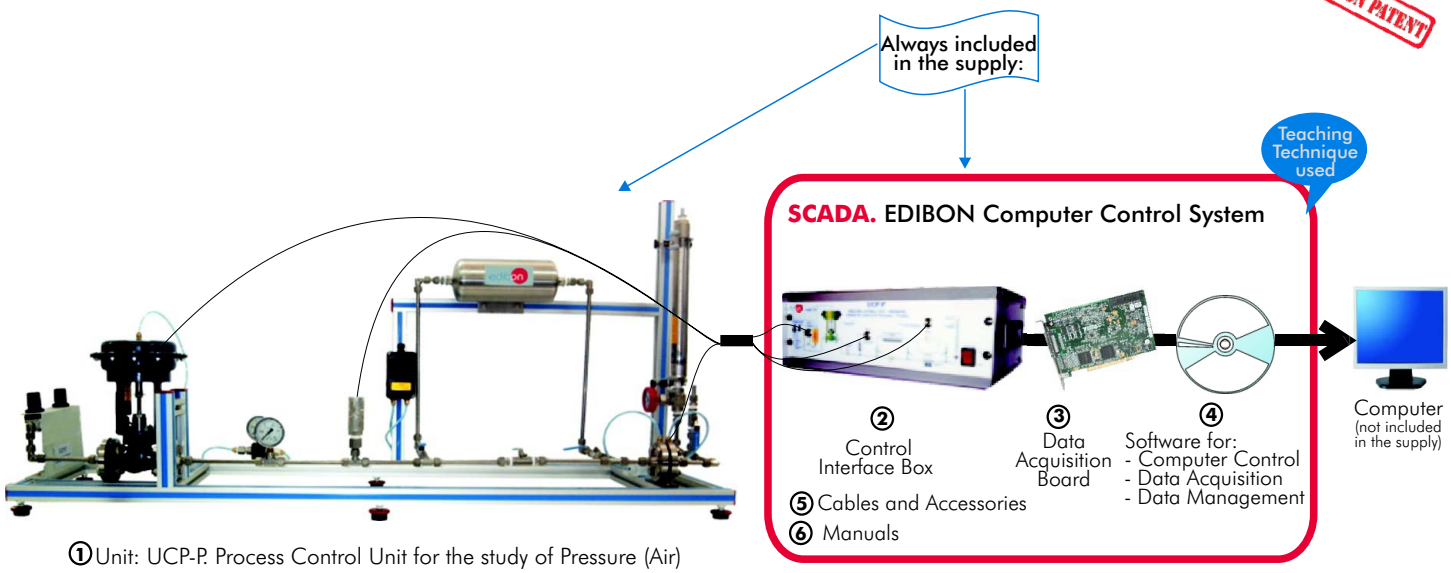
Computer Controlled **Process Control Unit for the Study of Pressure (Air)**

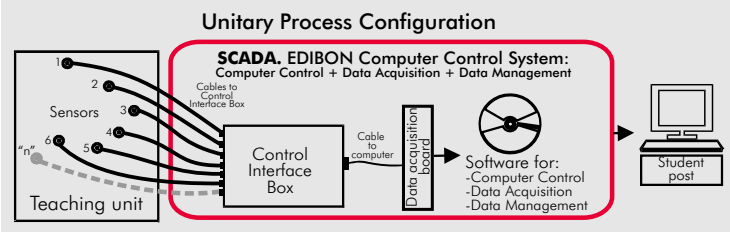
UCP-P

Technical Teaching Equipment

EDIBON PATENT



①Unit: UCP-P. Process Control Unit for the study of Pressure (Air)

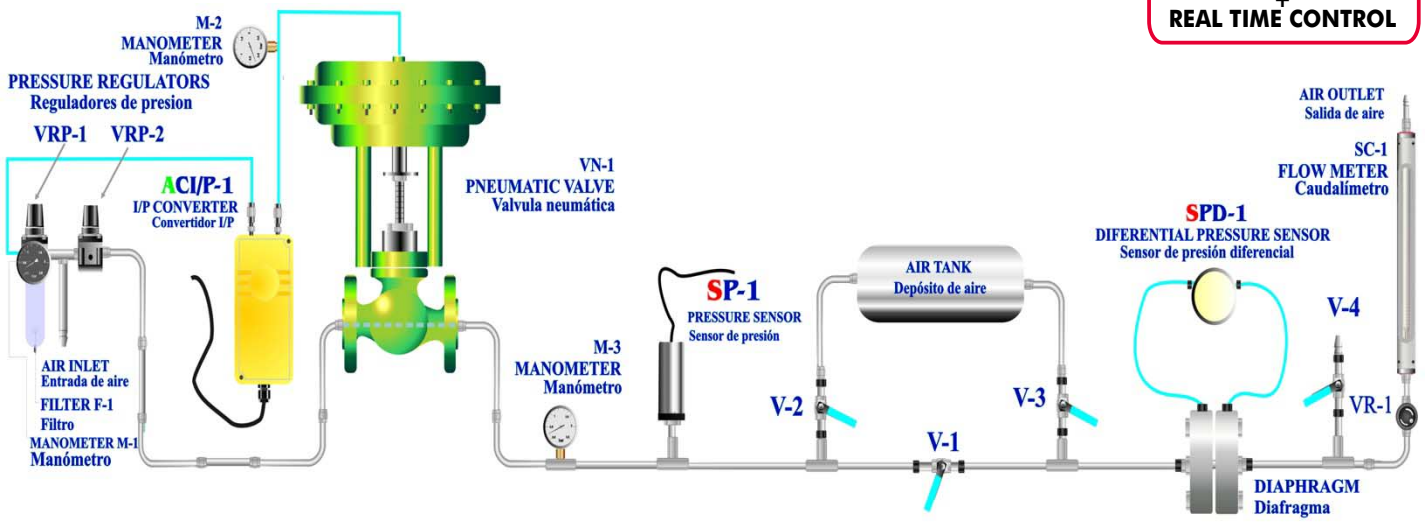


www.edibon.com
Products
Products range
Units
10.-Process Control

PROCESS DIAGRAM AND ELEMENTS ALLOCATION

1 actuators and 2 sensors controlled from any computer, and working simultaneously

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL



ISO:9001-2000 Certificate of Approval. Reg. No. E204034

European Union Certificate

Certificates ISO 14001: 2004 and ECO-Management and Audit Scheme (environmental management)

Worlddidac Quality Charter Certificate
Worlddidac Member

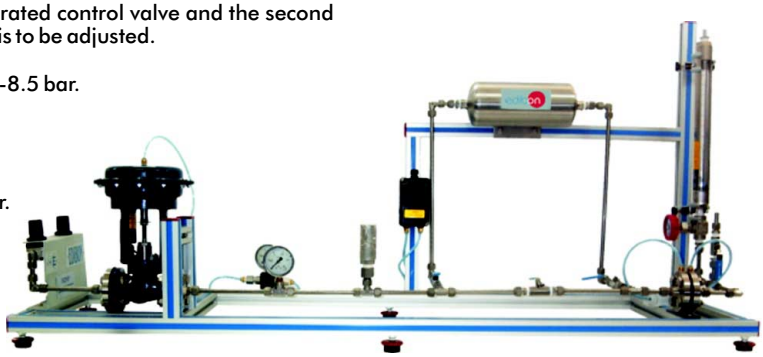
DESCRIPTION

This unit basically consist of the following elements:
Pneumatic circuit consisting of a tank, valves, pressure sensors, pressure regulators and pressure manometers.
For the pressure and flow control, a pneumatically operated control valve, an I/P converter and an absolute pressure sensor and a differential pressure sensor are used.
This Computer Controlled Unit is supplied with the EDIBON Computer Control System (SCADA), including: Control Interface Box + Data Acquisition Board + Computer Control and Data Acquisition Software, for controlling the process and the parameters involved.

SPECIFICATIONS

Items supplied as standard

① UCP-P. Unit:
Bench-top unit.
Anodized aluminium structure.
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution that the elements in the real unit.
2 Pressure regulators, one for controlling the pneumatically operated control valve and the second for suppling the necessary flow and/or pressure to the circuit that is to be adjusted.
Pressure regulators range:
Input of control air through the filter and the regulator "1": 0.5-8.5 bar.
Input of process air through regulator "2": 0.5-8.5 bar.
I/P Converter, range: 4-20 mA; 0.2-1 bar.
On/off valves.
Inlet/outlet valves.
Pneumatically operated control valve, range: CV=0.25; 0.2-1 bar.
Storage (air) tank, capacity: 2 l.
Absolute pressure sensor, range: 0-2 bar.
Differential pressure sensor, range: 0-0.066 bar.
Diaphragm.
Flow meter, range: 0.8-9.5 m^3/h.
1 pressure manometer, range 0-4 bar.
2 pressure manometers, range (each one): 0-2.5 bar.


UCP-P. Unit

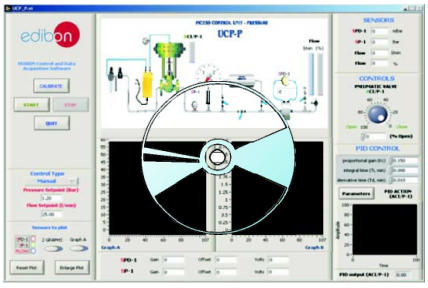
② UCP-P/CIB. Control Interface Box :
Control interface box with process diagram in the front panel and with the same distribution that the different elements located in the unit, for an easy understanding by the student.
All sensors, with their respective signals, are properly manipulated for -10V. to +10V. computer output.
Sensors connectors in the interface have different pines numbers (from 2 to 16), to avoid connection errors.
Single cable between the control interface box and computer.
The unit control elements are permanently computer controlled, without necessity of changes or connections during the whole process test procedure. **Simultaneously visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process.**
Real time curves representation about system responses. Storage of all the process data and results in a file. Graphic representation, in real time, of all the process/system responses.
All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process. All the actuators and sensors values and their responses are placed in only one computer screen. **Shield and filtered signals to avoid external interferences.**
Real time PID control with flexibility of modifications from the computer keyboard of the PID parameters, at any moment during the process. Real time PID and on/off control for pumps, compressors, resistances, control valves, etc. **Real time PID control for parameters involved in the process simultaneously. Open control** allowing modifications, at any time and in a real time , of parameters involved in the process simultaneously.
Proportional control, integral control and derivative control, based on the real PID mathematical formula, by changing the values, at any time, of the three control constants (proportional, integral and derivative constants). Possibility of automatization of the actuators involved in the process.
Three safety levels, one mechanical in the unit, other electronic in control interface and the third one in the control software.


UCP-P/CIB

③ DAB. Data Acquisition Board:
PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.
Analog input:
Number of **channels= 16** single-ended or 8 differential. **Resolution=16 bits**, 1 in 65536.
Sampling rate up to: 250 KS/s (Kilo samples per second).
Input range (V)=±10V. Data transfers=DMA, interrupts, programmed I/0. Number of DMA channels=6.
Analog output:
Number of **channels=2**. **Resolution=16 bits**, 1 in 65536. Maximum output rate up to: 833 KS/s.
Output range(V)=±10V. Data transfers=DMA, interrupts, programmed I/0.
Digital Input/Output: Channels=24 inputs/outputs. D0 or DI Sample Clock frequency: 0 to 1 MHz.
Timing: **Counter/timers=2**. Resolution: Counter/timers: 32 bits.


DAB

④ UCP-P/CCSOF. Computer Control+Data Acquisition+Data Management 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.
Analog and digital PID control. Menu for PID and set point selection required in the whole work range.
Management, processing, comparison and storage of data. Sampling velocity up to 250,000 data per second guaranteed. Student calibration system for all sensors involved in the process.
It allows the registration of the alarms state and the graphic representation in real time.
Comparative analysis of the obtained data, after to the process and modification of the conditions during the process.
Open software, allowing to the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access at different work levels.
This unit allows that the 30 students of the classroom can visualize simultaneously all results and manipulation of the unit, during the process, by using a projector.


UCP-P/CCSOF

⑤ Cables and Accessories, for normal operation.
⑥ Manuals: This unit is **supplied with 8 manuals:** Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

✱References 1 to 6: UCP-P + UCP-P/CIB + DAB + UCP-P/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.

Continue...

Complementary items to the standard supply

PLC. Industrial Control using PLC (7 and 8):

⑦ PLC-PI. PLC Module:

Circuit diagram in the front panel.

Front panel:

Digital inputs(X) and Digital outputs (Y) block:

16 Digital inputs, activated by switches and 16 LEDs for confirmation (red).

14 Digital outputs (through SCSI connector) with 14 LEDs for message (green).

Analog inputs block:

16 Analog inputs (-10V. to + 10V.)(through SCSI connector).

Analog outputs block:

4 Analog outputs (-10V. to + 10V.)(through SCSI connector).

Touch screen:

High visibility and multiple functions.
Display of a highly visible status.
Recipe function.
Bar graph function.
Flow display function.
Alarm list.
Multi language function.
True type fonts.

Back panel:

Power supply connector.
Fuse 2A.
RS-232 connector to PC.

Inside:

Power supply outputs: 24 Vdc, 12 Vdc, -12 Vdc, 12 Vdc variable.

Panasonic PLC:

High-speed scan of 0.32 μsec. for a basic instruction.
Program capacity of 32 Ksteps, with a sufficient comment area.
Free input AC voltage(100 to 240 V AC).
DC input:16 (24 V DC).
Relay output: 14 (250 V A AC/2 A).
High-speed counter.
Multi-point PID control.
Digital inputs/outputs and analog inputs/outputs Panasonic modules.

Communication RS232 wire, to computer (PC).

PLC-PI

⑧ UCP-P/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

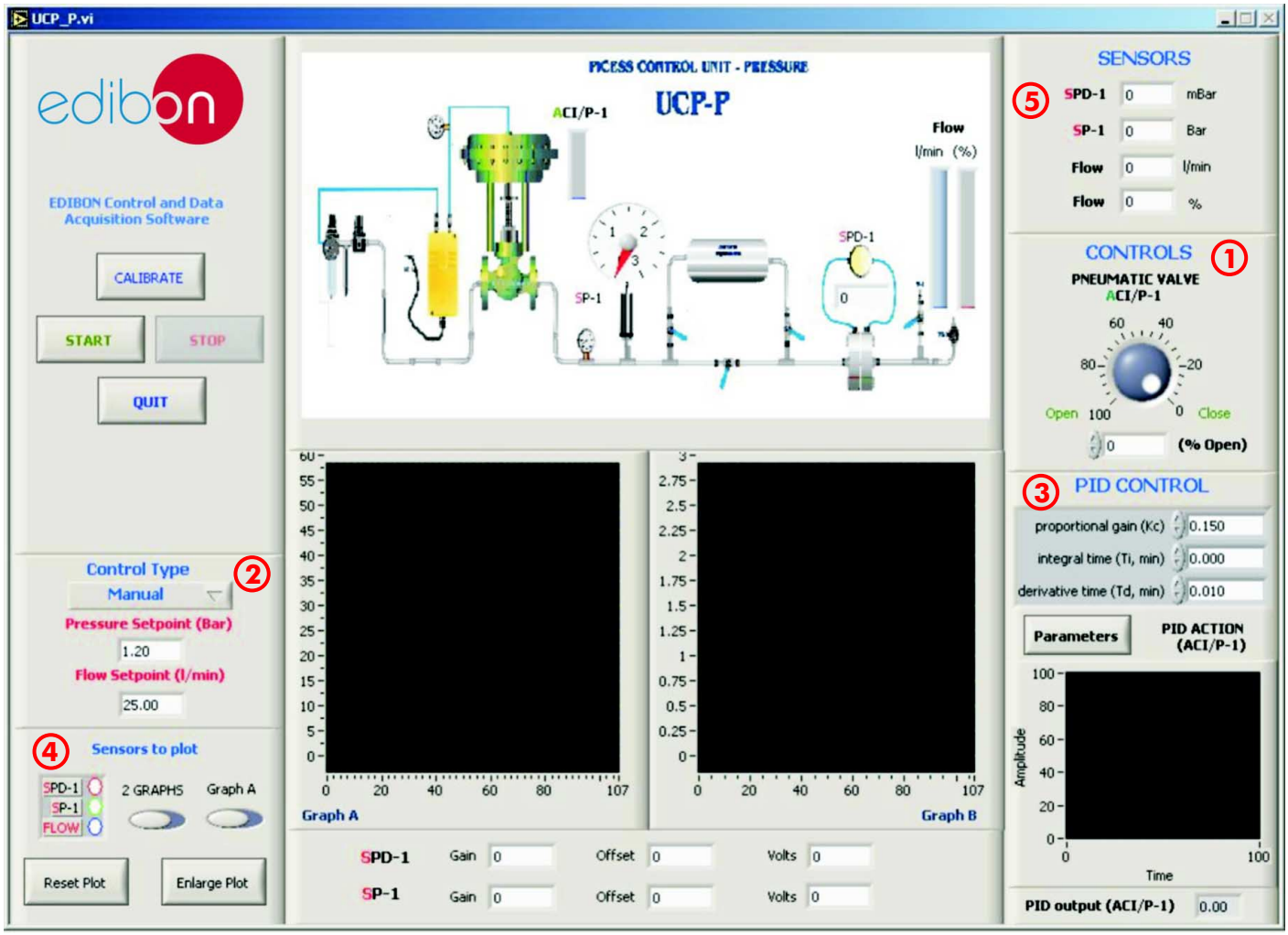
Items available on request

⑨ UCP-P/CAL. Computer Aided Learning Software (Results Calculation and Analysis).

⑩ UCP-P/FSS. Faults Simulation System.

Software Main Screens

Main screen



①Control of the pneumatic valve.

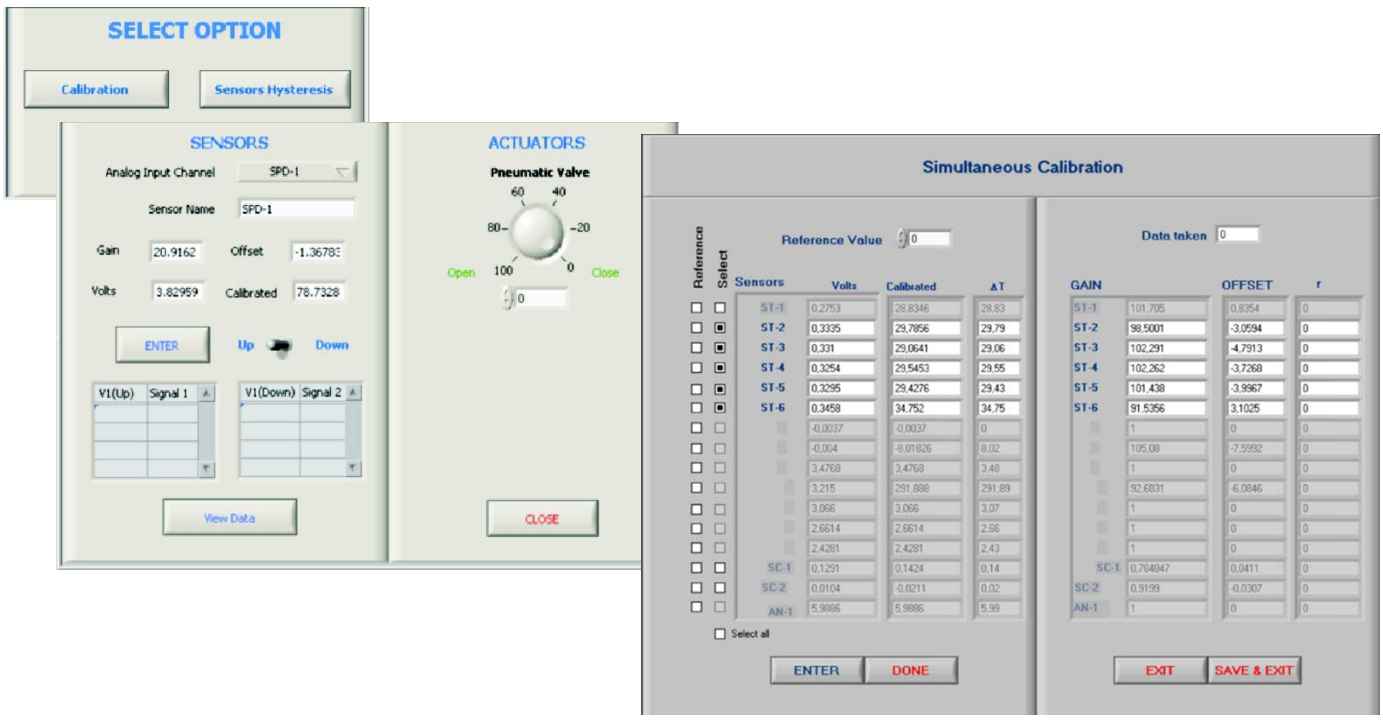
②Manual controller and Pressure and Air Flow PID Control.

③PID parameters.

④ Select plot channels.

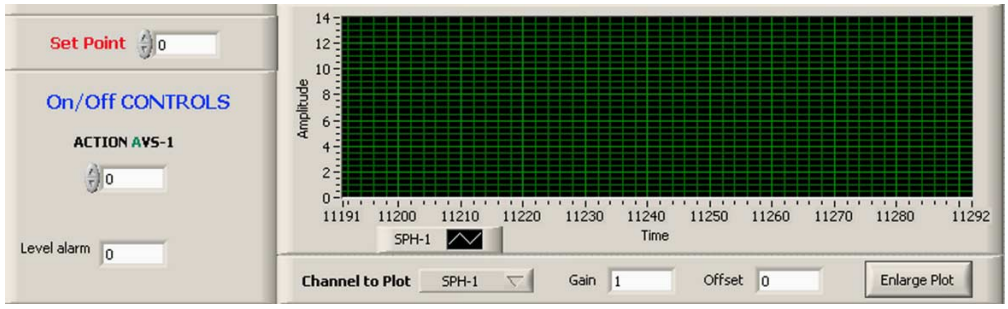
⑤ Air Flow Display and Pressure Display.
(Sensors: SPD= Differential Pressure sensor. SP= Pressure sensor.).

Examples of Sensors Calibration screens

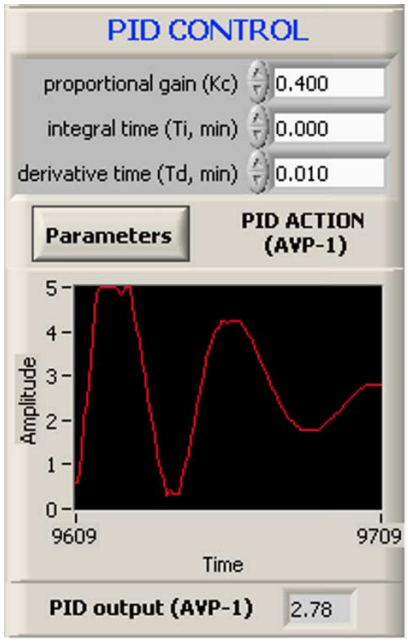


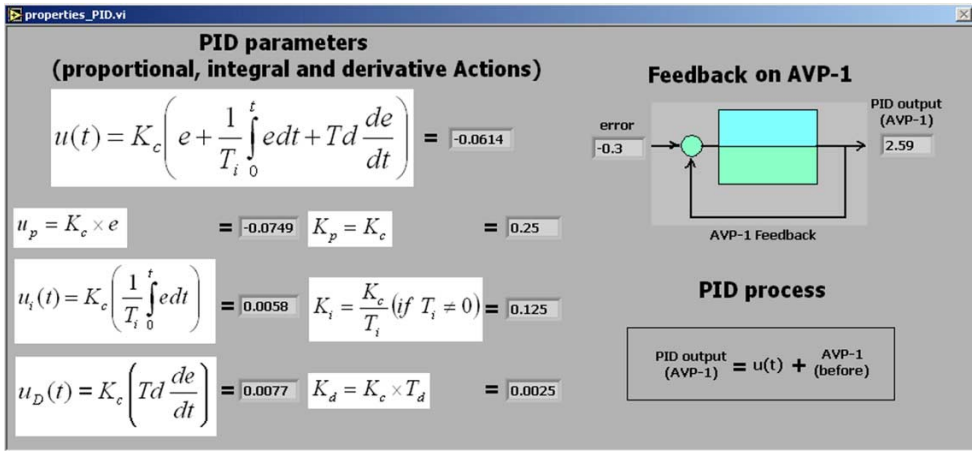
Continue...

Examples of On /Off Controls screens



Examples of PID Control screens





EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Calculating the fluid flow in function of different pressure sensor.

2.- Calibration processes.

3.- Pressure sensor calibration. Study of the hysteresis curve.

4.- I/P converter calibration.

5.- Identification of the pneumatic valve type.

6.- Determination of the influence of the flow rate of the conduction.

7.- Pressure control in conduction using a PID controller.

8.- Proportional control (P) characteristics.

9.- Characteristics of a proportional and integral control (P+I).

10.-Characteristics of a proportional and derivative control (P+D).

11.-Optimization of the variables of a PID controller.

12.-Optimization of the variables of the PID controller, flow control.

13.-Flow rate control in conduction with a PID controller.

Practices to be done by PLC Module (PLC-PI)+PLC Control Software:

14.-Control of the UCP-P unit process through the control interface box without the computer.

15.-Visualization of all the sensors values used in the UCP-P unit process.

16.-Calibration of all sensors included in the UCP-P unit process.

17.-Hand on of all the actuators involved in the UCP-P unit process.

18.-Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).

19.-Simulation of outside actions, in the cases do not exist hardware elements. (Example: test of complementary tanks, complementary industrial environment to the process to be studied, etc).

20.-PLC hardware general use and manipulation.

21.-PLC process application for UCP-P unit.

22.-PLC structure.

23.-PLC inputs and outputs configuration.

24.-PLC configuration possibilities.

25.-PLC program languages.

26.-PLC different programming standard languages (literal structured, graphic, etc.).

27.-New configuration and development of new process.

28.-Hand on an established process.

29.-To visualize and see the results and to make comparisons with the UCP-P unit process.

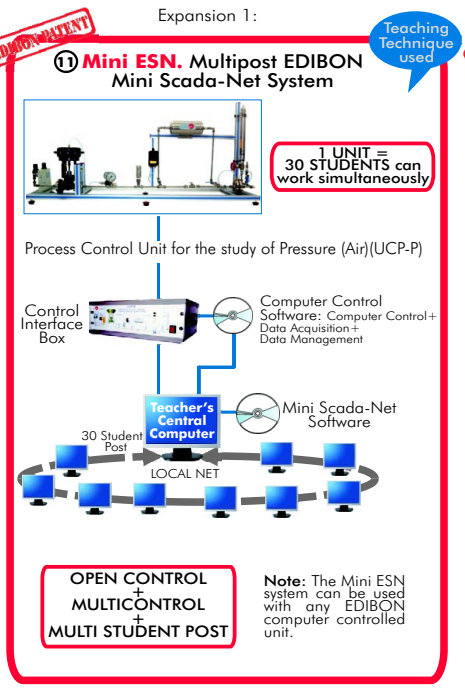
30.-Possibility of creating new process in relation with the UCP-P unit.

31.-PLC Programming Exercises.

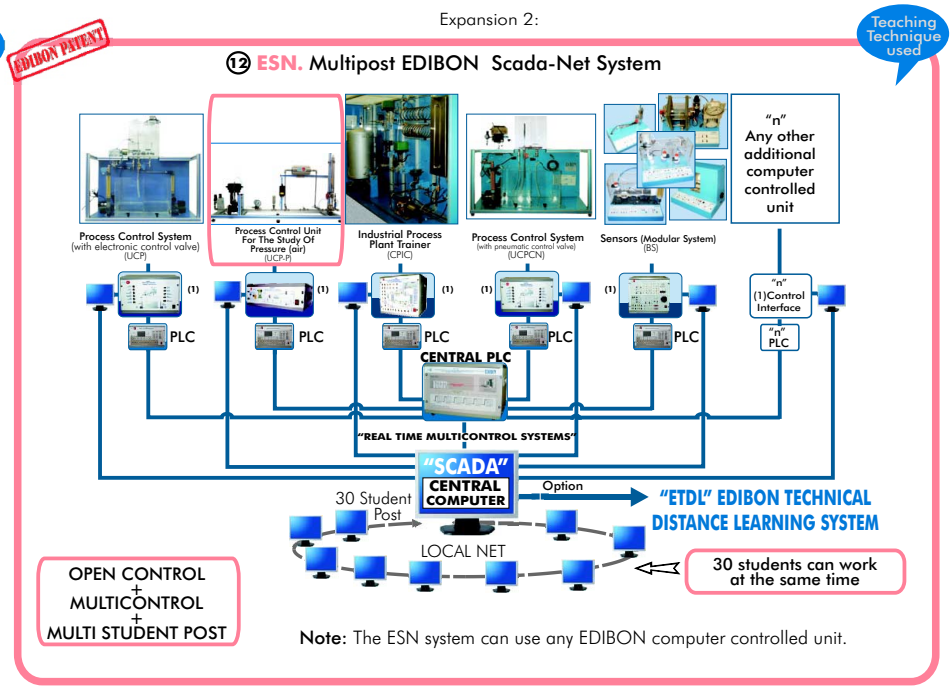
32.-Own PLC applications in accordance with teacher and student requirements.

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS

Expansion 1:



Expansion 2:



ORDER INFORMATION

Items supplied as standard

Minimum configuration for normal operation includes:

① **Unit: UCP-P. Process Control Unit for the study of Pressure (Air).**
② **UCP-P/CIB.Control Interface Box.**
③ **DAB.Data Acquisition Board.**
④ **UCP-P/CCSOF. Computer Control + Data Acquisition + Data Management Software.**
⑤ **Cables and Accessories**, for normal operation.
⑥ **Manuals.**

*** IMPORTANT: Under UCP-P we always supply all the elements for immediate running as 1, 2, 3, 4, 5 and 6.**

Complementary items to the standard supply

PLC. Industrial Control using PLC (7 and 8):

⑦ PCL-PI.PLC Module.
⑧ UCP-P/PLC-SOF. PLC Control Software.
⑨ UCP-P/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request).
⑩ UCP-P/FSS. Faults Simulation System. (Available on request).

Expansions

⑪ Mini ESN. Multipost EDIBON Mini Scada-Net System.
⑫ ESN. Multipost EDIBON Scada-Net System.

REQUIRED SERVICES

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

-Air supply, pressure: 8 bar (max.), flow up to 180 l/min. approx.

-Computer (PC).

DIMENSIONS & WEIGHTS

UCP-P Unit:	-Dimensions: 1000 x 500 x 600 mm. approx.
	-Weight: 20 Kg. approx.
Control Interface Box:	-Dimensions: 490 x 330 x 175 mm. approx.
	-Weight: 5 Kg. approx.
PLC Module (PLC-PI):	-Dimensions: 490 x 330 x 310 mm. approx.
	-Weight: 30 Kg. approx.

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

edibon INTERNATIONAL

C/ Del Agua, 14. Polígono San José de Valderas. 28918 LEGANES. (Madrid). SPAIN.
Phone: 34-91-6199363 FAX: 34-91-6198647
E-mail: edibon@edibon.com WEB site: www.edibon.com

Issue: ED01/09
Date: March/2009

REPRESENTATIVE: