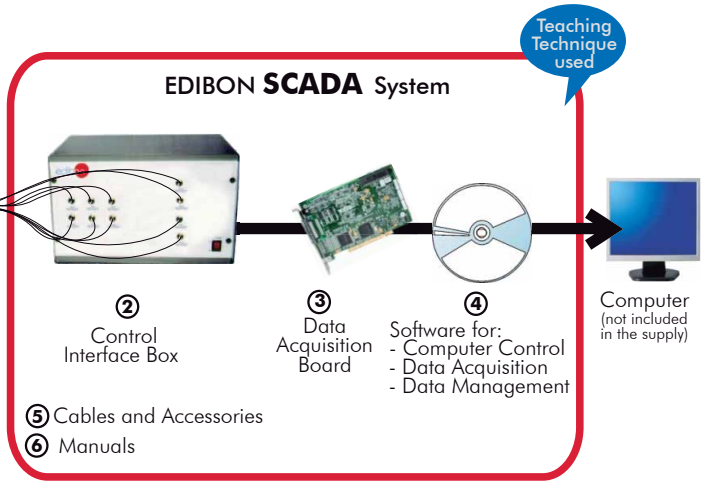
edibon
Technical Teaching Equipment

Computer Controlled **Aeration Unit,** with SCADA

PEAIC

① Unit: PEAIC. Aeration Unit

EDIBON PATENT



*Minimum supply always includes: 1 + 2 + 3 + 4 + 5 + 6
(Computer not included in the supply)

Key features:

- **Advanced Real-Time SCADA.**
- **Open Control + Multicontrol + Real-Time Control.**
- **Specialized EDIBON Control Software based on Labview.**
- **National Instruments Data Acquisition board (250 KS/s , kilo samples per second).**
- **Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Capable of doing applied research, real industrial simulation, training courses, etc.**
- **Remote operation and control by the user and remote control for EDIBON technical support, are always included.**
- **Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).**
- **Designed and manufactured under several quality standards.**
- **Optional CAL software helps the user perform calculations and comprehend the results.**
- **This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.**

OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL

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Products
Products range
Units
13.-Environment

For more information about Key Features, click here:

ISO 9000: Quality Management
(for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate
(total safety)

Certificates ISO 14000 and
ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter Certificate
(Worlddidac Member)

GENERAL DESCRIPTION

This unit permits the study of the oxygen transfer characteristics of diffused air systems, and to study the physical and chemical parameters which influence their oxygenation capacity. The "PEAIC" unit demonstrates the water aeration process which, mainly, eliminates smell and taste from water.

The main component of the unit is the central tank where the liquid subjected to study will be poured in, normally water. An air pump, located underneath the tank, is responsible of injecting air within the tank. The air-injection pipe goes through a device that measures and control the injected air, allowing control of the volume of air allowed to flow to the deposit. After the air flow controller, the air is taken through a flexible pipe to the upper inlet of the tank. There, three different air outlets might be connected, each one disperses air at the bottom of the tank in a different way.

On the other hand, there exists a stirrer shaft (with variable speed, computer controlled) in the middle of the unit/tank. The main part of the stirrer is a motor that makes it turn inside the tank.

There is a oxygen-sensor to measure the oxygen dissolved in the water and a temperature sensor.

With the unit it is supplied a Control Interface Box, a Data Acquisition Board and a Computer Control + Data Acquisition + Data Management Software to control all process and parameters.

SPECIFICATIONS

Items supplied as standard

① PEAIC. Unit:

Bench top unit.
Anodized aluminium structure and panels in painted steel.
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution to the elements in the real unit.
Open tank of 28 l. capacity.
Air injection pipe.
Air injection control.
Flow sensor.
Paddle stirrer with variable speed control.
Air pump.
Oxygen sensor and oxygen probe (300 mm. length).
Three diffusers: sparger tube, disk airstone and single airstone.
Temperature sensor.

PEAIC. Unit

② PEAIC/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 from -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.
Simultaneous 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 displayed on only one screen in the computer.
Shield and filtered signals to avoid external interferences.
Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Real time and on/off control for pumps, compressors, resistances, control valves, etc.
Real time control for parameters involved in the process simultaneously.
Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.
Three safety levels, one mechanical in the unit, other electronic in the control interface and the third one in the control software.

PEAIC/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:
Number of **channels=24 inputs/outputs**. D0 or DI Sample Clock frequency: 0 to 1 MHz.

DAB

④ PEAIC/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 simultaneous 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.**
Sampling velocity up to 250,000 data per second.
Calibration system for the 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 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 to different work levels.
This unit allows the 30 students of the classroom to visualize simultaneously all results and manipulation of the unit, during the process, by using a projector or an electronic whiteboard.

PEAIC/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: PEAIC + PEAIC/CIB + DAB + PEAIC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.

Continue...

Additional and optional 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.
USB 2.0 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.
Power supply input (100 to 240 V AC).
DC input: 16 (24 V DC).
Relay output: 14.
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 PEAIC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

Items available on request

⑨ PEAIC/CAL. Computer Aided Learning Software (Results Calculation and Analysis).

⑩ PEAIC/FSS. Faults Simulation System.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Aeration necessity determination.
2.- To measure the absorption coefficient K_s and the oxygenation capacity R.
3.- Influence of the injected oxygen volume.
4.- Study of the effect on K_s and R of:
- Water temperature.
- Degree of fluid mixing.
- Gas flow rate.
- Diffuser arrangement.
- Depth of water.
- Water composition.

5.- Influence of the stirrer turn speed.
6.- Aeration with air injection and agitation.
7.- Influence of the temperature in the process.
8.- Influence of liquid level in the tank.
9.- Effects of oxygen transfer under non-steady state conditions.

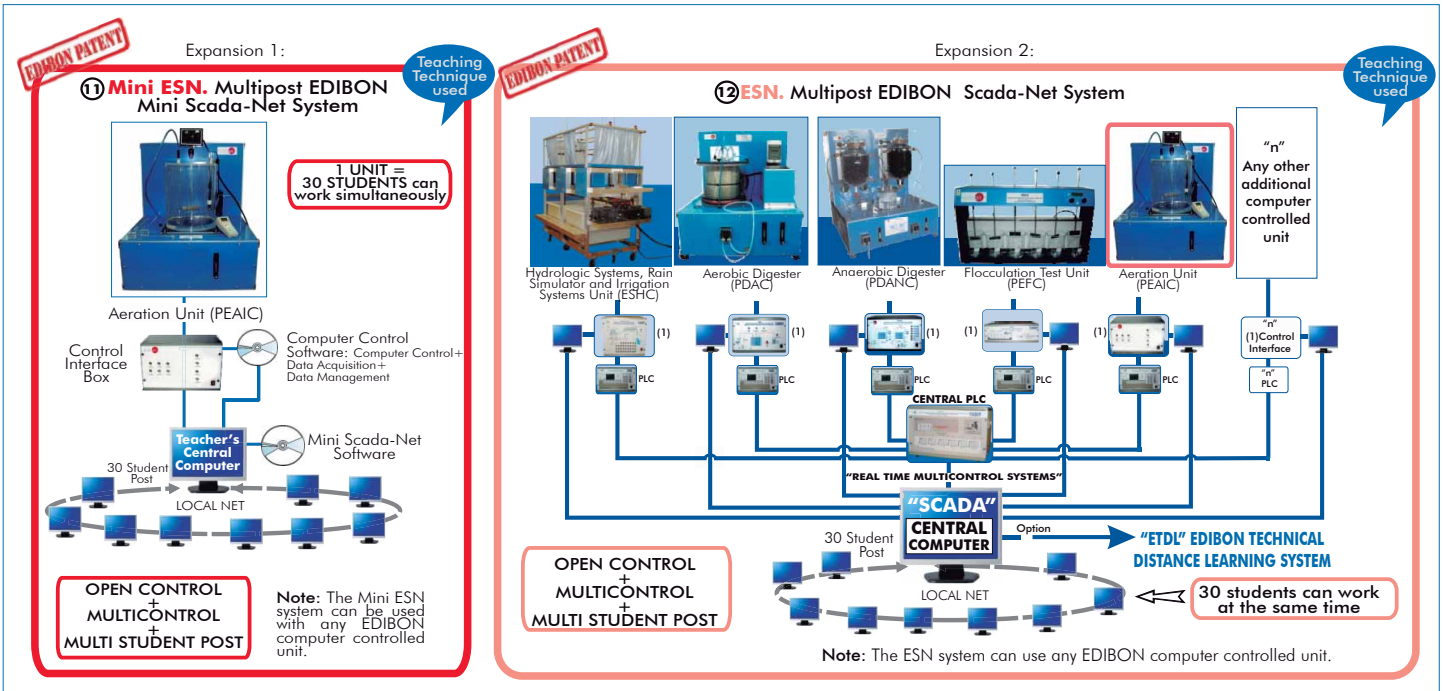
Other possible practices:

10.- Sensors calibration.

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

11.- Control of the PEAIC unit process through the control interface box without the computer.
12- Visualization of all the sensors values used in the PEAIC unit process.
13.- Calibration of all sensors included in the PEAIC unit process.
14.- Hand on of all the actuators involved in the PEAIC unit process.
15.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
16.- 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).
17.- PLC hardware general use and manipulation.
18.- PLC process application for PEAIC unit.
19.- PLC structure.
20.- PLC inputs and outputs configuration.
21.- PLC configuration possibilities.
22.- PLC program languages.
23.- PLC different programming standard languages (literal structured, graphic, etc.).
24.- New configuration and development of new process.
25.- Hand on an established process.
26.- To visualize and see the results and to make comparisons with the PEAIC unit process.
27.- Possibility of creating new process in relation with the PEAIC unit.
28.- PCL Programming Exercises.
29.- Own PCL applications in accordance with teacher and student requirements.

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS



ORDER INFORMATION

Items supplied as standard

Minimum configuration for normal operation includes:

① Unit: PEAIC. Aeration Unit.
② PEAIC/CIB. Control Interface Box.
③ DAB. Data Acquisition Board.
④ PEAIC/CCSOF. Computer Control + Data Acquisition + Data Management Software.
⑤ Cables and Accessories.
⑥ Manuals.

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

Additional and optional items to the standard supply

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

⑦ PCL-PI. PLC Module.
⑧ PEAIC/PLC-SOF. PLC Control Software.
⑨ PEAIC/CAL. Computer Aided Learning Software (Results Calculation and Analysis).
⑩ PEAIC/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: Single-phase, 220 V / 50 Hz or 110 V / 60 Hz.
-Computer (PC).
-Water supply.
-Drainage system.
-Chemicals required:
Sodium sulphite.
Cobaltous chloride.

DIMENSIONS & WEIGHTS

PEAIC Unit:	-Dimensions: 600 x 700 x 850 mm. approx. -Weight: 50 Kg. approx.
Control Interface Box:	-Dimensions: 490 x 330 x 310 mm. approx. -Weight: 10 Kg. approx.
PLC Module (PLC-PI):	-Dimensions: 490 x 330 x 310 mm. approx. -Weight: 30 Kg. approx.

RECOMMENDED ACCESSORIES

- Stop clock.
- Triple beam top loading balance.
- 100 ml measuring cylinder.

AVAILABLE VERSIONS

Offered in this catalogue:

- **PEAIC.** Computer Controlled **Aeration Unit.**

Offered in other catalogue:

- **PEAI. Aeration Unit.**

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

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