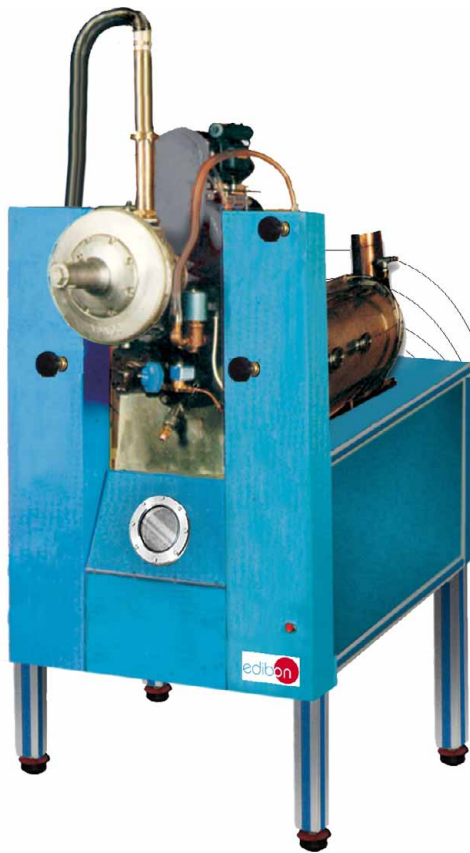


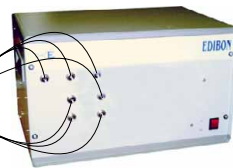
EDIBON PATENT



Always included  
in the supply:

Teaching  
Technique  
used

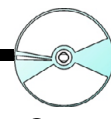
## SCADA. EDIBON Computer Control System



②  
Control  
Interface Box



③  
Data  
Acquisition  
Board



④  
Software for:  
- Computer Control  
- Data Acquisition  
- Data Management



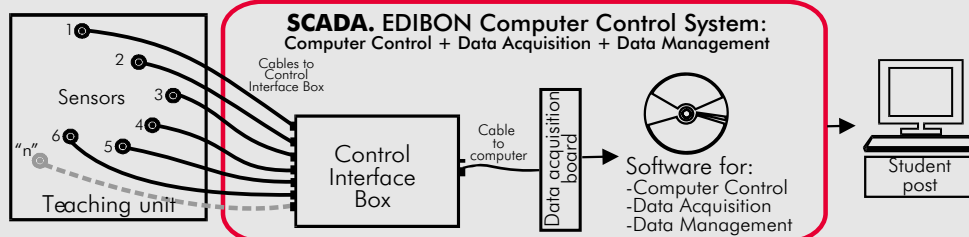
Computer  
(not included  
in the supply)

⑤ Cables and Accessories  
⑥ Manuals

① Unit: TVCC. Combustion Laboratory Unit

**OPEN CONTROL  
+  
MULTICONTROL  
+  
REAL TIME CONTROL**

## Unitary Process Configuration



[www.edibon.com](http://www.edibon.com)

Products  
Products range  
Units  
9.-Thermodynamics  
& Thermotechnics



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

**Items supplied as standard**

**① TVCC. Unit:**

Unit (with oil and/or gas burners) designed for experimenting and studying burner operation and the combustion process.  
 Stainless steel and anodized aluminium structure. Panels and main metallic elements in stainless steel.  
 Diagram in the front panel with similar distribution that the elements in the real unit.  
 Combustion chamber:  
     Water cooled chamber.  
     Dimensions: 460 dia. x 910 mm approx.  
     Either an oil or gas burner can be fired.  
     We can observe the flame through windows.  
 Burner for oil or gas.  
 Fan and regulator.  
 Water, gas and fuel control.  
 Flow sensors for cooling water, air and fuel.  
 Gas flow sensor.  
 Gas analysis.  
 Smoke Number can be determined for the oil burner with the smoke tester.  
 Temperature sensors.

**② TVCC/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 pins 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.**

**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/O. 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/O.  
**Digital Input/Output:**  
     Number of channels=24 inputs/outputs.  
     DO or DI Sample Clock frequency: 0 to 1 MHz.  
**Timing:**  
     Counter/timers=2. Resolution: Counter/timers: 32 bits

**④ TVCC/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.**

**⑤ Cables and Accessories.**

**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: TVCC + TVCC/CIB + DAB + TVCC/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  $\mu$ sec.** 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 VDC).

Relay output: 14 (250 VA 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).

**⑧ TVCC/PLC-SOF. PLC Control Software:**

For this particular unit, always included with PLC supply.



PLC-PI

**Items available on request**

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

**⑩ TVCC/FSS. Faults Simulation System.**

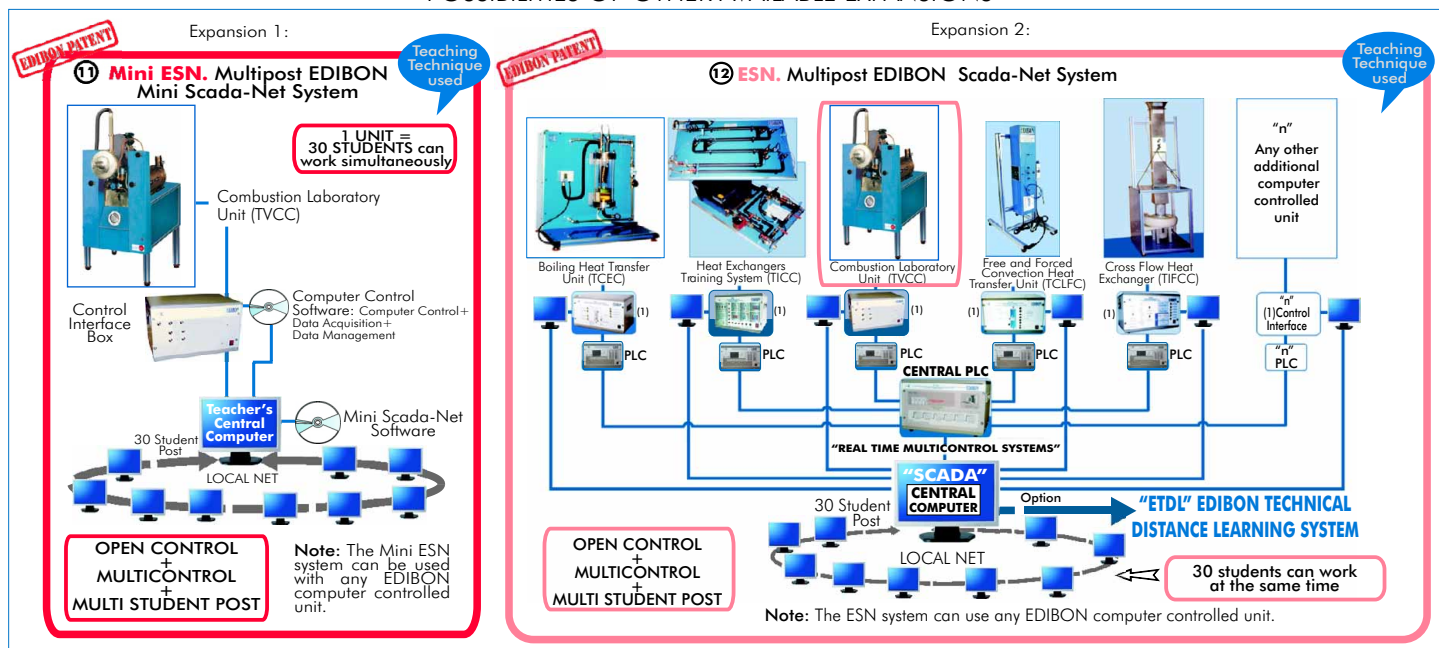
## EXERCISES AND PRACTICAL POSSIBILITIES

### Practical Possibilities of the Unit:

- 1.- To study burner operation and combustion process.
  - 2.- Familiarisation of the adjustment and operation of a commercial oil or gas burner.
  - 3.- Effect of air/fuel ratio on combustion efficiency as measured by flue gas constituents and temperature.
  - 4.- Effect of air/fuel ratio on energy balance.
  - 5.- Effect of air/fuel ratio on heat transfer.
  - 6.- Effect of flame radiation on heat transfer and observed temperature.
  - 7.- Comparison of flue gas analysis with theoretical predictions.
  - 8.- Comparative performance of different fuels or fuel additives.
  - 9.- Assessment of a burner, including:
    - Flame stability.
    - Flame shape.
    - Flame radiation.
    - Firing rate.
    - Turndown range.
    - Smoke emission.
  - 10.-Extraction of gas samples from a range of locations within the combustion chamber.
  - 11.-Comparison of oil and gas burners.
- Other possible practices:
- 12.-Sensors calibration.
- Practices to be done by PLC Module (PLC-PI) + PLC Control Software:
- 13.-Control of the TVCC unit process through the control interface box without the computer.

- 14.- Visualization of all the sensors values used in the TVCC unit process.
- 15.-Calibration of all sensors included in the TVCC unit process.
- 16.-Hand on of all the actuators involved in the TVCC unit process.
- 17.-Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
- 18.-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).
- 19.-PLC hardware general use and manipulation.
- 20.-PLC process application for TVCC unit.
- 21.-PLC structure.
- 22.-PLC inputs and outputs configuration.
- 23.-PLC configuration possibilities.
- 24.-PLC program languages.
- 25.-PLC different programming standard languages (literal structured, graphic, etc.).
- 26.-New configuration and development of new process.
- 27.-Hand on an established process.
- 28.-To visualize and see the results and to make comparisons with the TVCC unit process.
- 29.-Possibility of creating new process in relation with the TVCC unit.
- 30.-PLC Programming Exercises.
- 31.-Own PLC 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: TVCC. Combustion Laboratory Unit.
- ② TVCC/CIB. Control Interface Box.
- ③ DAB. Data Acquisition Board.
- ④ TVCC/CCSOF. Computer Control + Data Acquisition + Data Management Software.
- ⑤ Cables and Accessories.
- ⑥ Manuals.

\* **IMPORTANT:** Under TVCC 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 TVCC/PLC-SOF. PLC Control Software.
- ⑨ TVCC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request)
- ⑩ TVCC/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: 220 V / 50 Hz or 110 V / 60 Hz.
- Water supply.
- Gas: LPG at maximum 2 bar or mains natural gas at maximum 50 mbar. Flow rate 1 to 3 g/s.
- Oil: Kerosene, gas oil or other clean light fuels.
- Exhaust gas outlet pipe.
- Computer(PC).

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

## DIMENSIONS & WEIGHTS

- TVCC Unit: -Dimensions: 2200 x 1000 x 1700 mm. approx.  
-Weight :200 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.

REPRESENTATIVE:



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