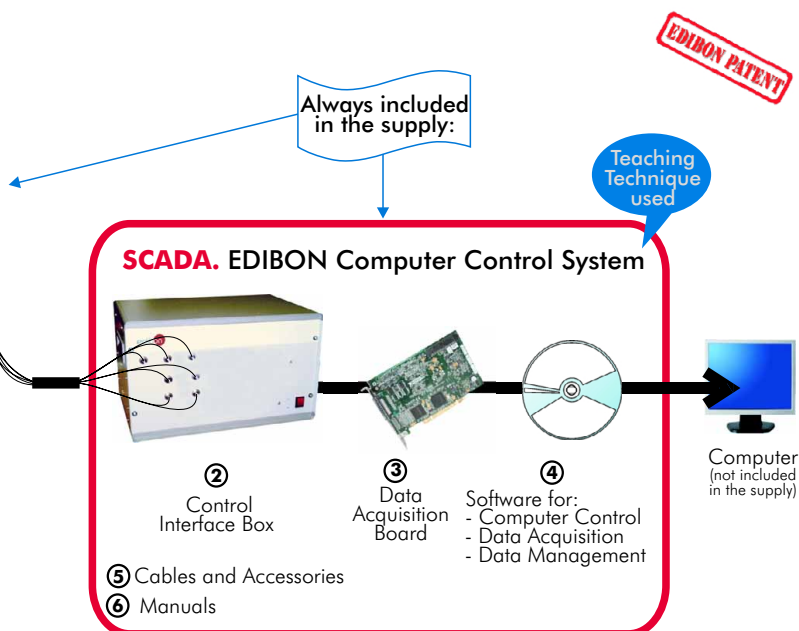
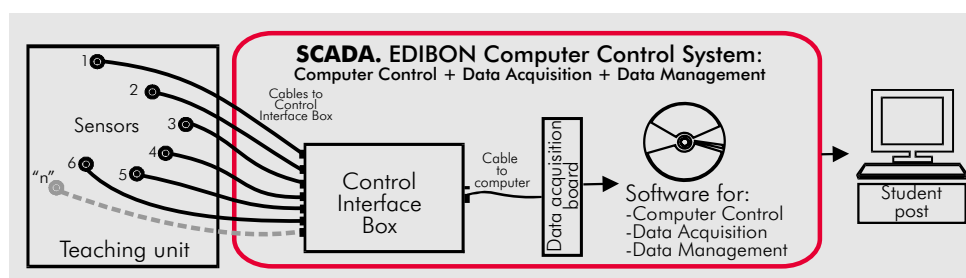


① Unit: TCESC. Separating & Throttling Calorimeter



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



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Products
Products range
Units
9.- Thermodynamics & Thermotechnics



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)

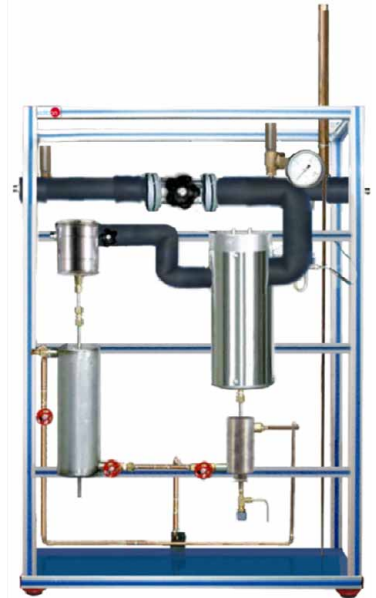


**Worlddidac Quality Charter
Certificate**
(Worlddidac Member)

Items supplied as standard

① TCESC. Unit:

Unit, computer controlled, to determine low and high water contents in two-phase liquid-water mixture and the dryness fraction of steam by means a separating and throttling calorimeters.
It is a combined separating and throttling calorimeters.
Anodized aluminium structure and panels in painted steel (epoxy paint).
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution to the elements in the real unit.
Separating calorimeter with water-cooled re-cooler.
Throttling calorimeter water-cooled with condenser.
Pipes.
Steam line connections.
Steam up to 10 bar and 240°C (approx) maximum can be studied.
Safety valve, 10 bar approx.
2 Graduated glass containers (beakers).
Pressure sensors.
Temperature sensors.
High pressure switch.



TCESC. Unit

② TCESC/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.
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 computer control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process.
Real time computer control for pumps, compressors, resistances, control valves, etc.
Open control allowing modifications, at any time and in a real time, of parameters involved in the process simultaneously.
Three safety levels, one mechanical in the unit, other electronic in control interface and the third one in the control software.



TCESC/CIB

③ DAB. Data Acquisition Board:

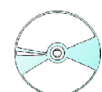
PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.
Analog input: Channels= 16 single-ended or 8 differential. **Resolution= 16 bits**, 1 in 65536.
Sampling rate up to: 250 KS/s (Kilo samples per second). Input range (V)= ± 10 V.
Data transfers=DMA, interrupts, programmed I/O. Number of DMA channels=6.
Analog output: Channels=2. **Resolution= 16 bits**, 1 in 65536. Maximum output rate up to: 833 KS/s.
Output range(V)= ± 10 V. Data transfers=DMA, interrupts, programmed I/O.
Digital Input/Output: Number of 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 TCESC/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.
Management, processing, comparison and storage of data.
Sampling velocity up to 250,000 data per second guaranteed.
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 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.



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

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.

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 μ 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 V DC).

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 TCESC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.



PLC-PI

Items available on request

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

⑩ TCESC/FSS. Faults Simulation System.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

- | | |
|---|--|
| 1.- To determine the dryness fraction of steam. | 16.- PLC program languages. |
| 2.- To use separating calorimeter for high water contents. | 17.- PLC different programming standard languages. |
| 3.- To use throttling calorimeter for high vapour contents. | 18.- New configuration and development of new process. |

Other possible practices: 19.- Hand on an established process.

- 4.- Sensors calibration.

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

21 - Possibility of creating new process in relation with the TCESC unit

- | | |
|---|--|
| 5.- Control of the TCESC unit process through the control interface box without the computer. | 21.- Possibility of creating new process in relation with the TCESC unit. |
| 6.- Visualization of all the sensors values used in the TCESC unit process. | 22.- PLC Programming Exercises. |
| 7.- Calibration of all sensors included in the TCESC unit process. | 23.- Own PLC applications in accordance with teacher and student requirements. |

- 10.- 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).

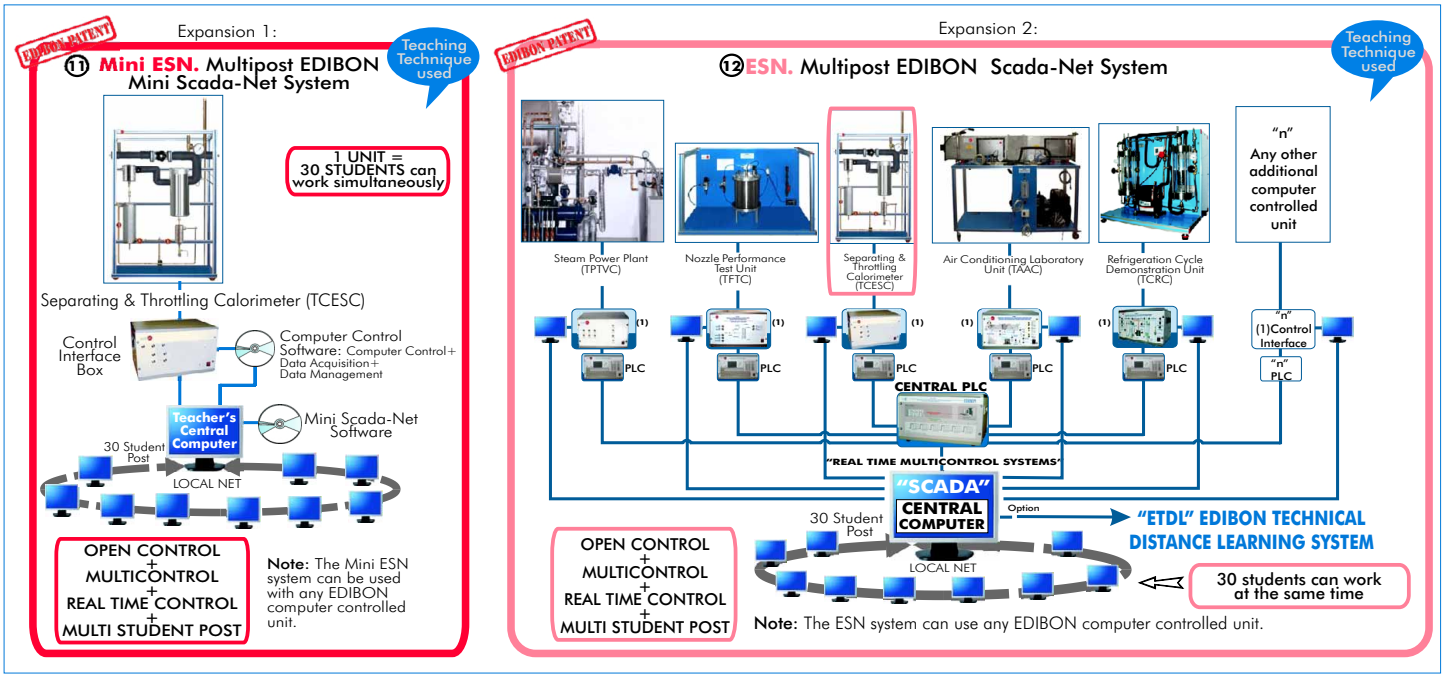
- 11.- PLC hardware general use and manipulation.

- 12.- PLC process application for TCESC unit.

- 14 – PLC inputs and outputs configuration

- 15.- PLC configuration possibilities.

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS



ORDER INFORMATION

<u>Items supplied as standard</u>	<u>Complementary items to the standard supply</u>
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Minimum configuration for normal operation includes: PLC. Industrial Control using PLC (7 and 8):

- | | |
|---|---|
| <ol style="list-style-type: none"> ① Unit: TCESC. Separating & Throttling Calorimeter. ② TCESC/CIB. Control Interface Box. ③ DAB. Data Acquisition Board. ④ TCESC/CCSOF. Computer Control + Data Acquisition + Data Management Software. ⑤ Cables and Accessories, for normal operation. ⑥ Manuals. | <ol style="list-style-type: none"> ⑦ PCL-PI.PLC Module. ⑧ TCESC/PLC-SOF. PLC Control Software. ⑨ TCESC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request). ⑩ TCESC/FSS. Faults Simulation System. (Available on request). <p style="text-align: right;"><u>Expansions</u></p> <ol style="list-style-type: none"> ⑪ Mini ESN. Multipost EDIBON Mini Scada-Net System. |
|---|---|

<u>Items supplied as standard</u>	<u>Complementary items to the standard supply</u>
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Minimum configuration for normal operation includes: PLC. Industrial Control using PLC (7 and 8):

- | | |
|--|---|
| ① Unit: TCESC. Separating & Throttling Calorimeter. | ⑦ PCL-PI.PLC Module. |
| ② TCESC/CIB. Control Interface Box. | ⑧ TCESC/PLC-SOF. PLC Control Software. |
| ③ DAB. Data Acquisition Board. | ⑨ TCESC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request). |
| ④ TCESC/CCSOF. Computer Control + Data Acquisition + Data Management Software. | ⑩ TCESC/FSS. Faults Simulation System. (Available on request). |

⑤ **Cables and Accessories**, for normal operation. [Expansions](#)

- ⑥ **Manuals.**
- ⑪ Mini ESN. Multipost EDIBON Mini Scada-Net System.
- ⑫ ESN. Multipost EDIBON Scada-Net System.

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

REQUIRED SERVICES

- Electrical supply: single-phase, 220 V./50 Hz. or 110 V./60 Hz.
- Water supply.
- Computer (PC).

DIMENSIONS & WEIGHTS

TCESC Unit:	-Dimensions: 1000 x 550 x 1650 mm. approx. -Weight: 55 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.

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



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REPRESENTATIVE:



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