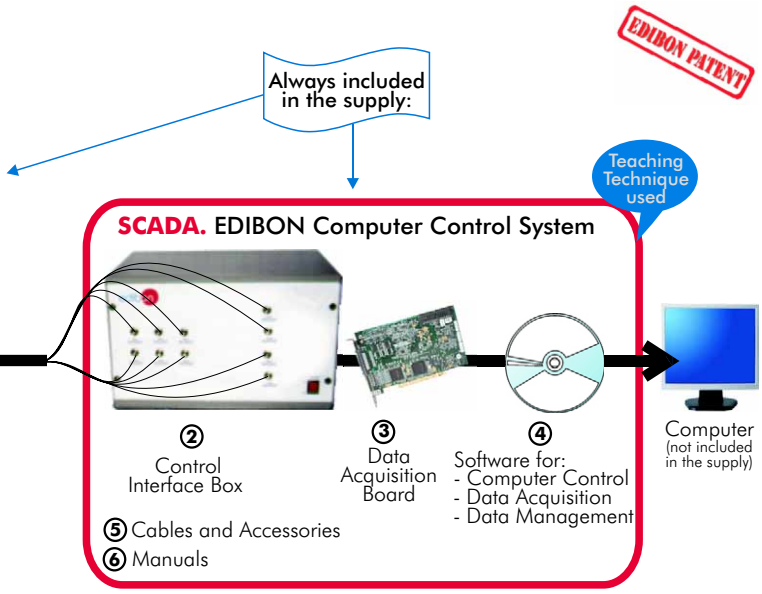
edibon

Technical Teaching Equipment

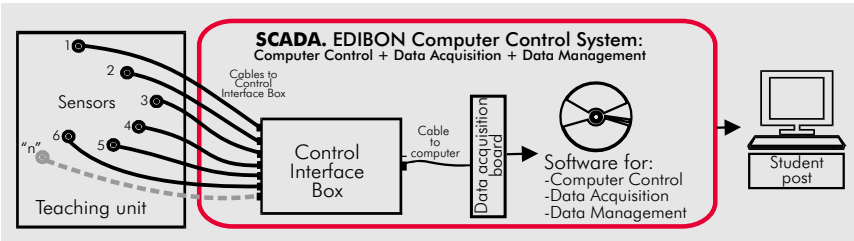
Computer Controlled
Absorption Refrigeration Unit

TRAC



OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL

① Unit: TRAC. Absorption Refrigeration Unit



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Products
Products range
Units
9.-Thermodynamics & Thermotechnics

DESCRIPTION

TRAC Unit, developed by EDIBON, is a complete laboratory unit for the demonstration of absorption refrigeration.

This unit will allow the familiarization of the students with the principles of refrigeration absorption system in use today.

Absorption refrigeration systems are typically used in applications that require lower power usage such as refrigeration in recreational vehicles, domestic refrigerators, etc. Due to their easy adaptability to operate using either electricity or fuel gas, they are useful in remote locations where the supply of electricity is not readily available, and can be easily adapted to LPG, solar power, etc.

This unit is provided with a dual power source (heat source) of LPG and electricity.

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.

ISO 9001:2000 Certificate of Approval

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

TRAC Unit

①TRAC. Unit:

Unit mounted onto a mobile stand that incorporates a work surface.
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 and absorption circuit diagram.
A dual power source is provided which includes both electrical and an LPG source:
The LPG source includes the burner and regulator.
For the electrical source, the unit has a step down transformer to convert the main AC into 12 VDC used to power the electric heater.
Self contained absorption system.
Refrigeration compartment with temperature sensor.
LPG burner with pressure regulator.
Electrical heater with 12 VDC transformer.
Power measurement from the computer (PC). Volt and amp measurement.
Temperature sensors distributed along the unit.
Temperature control system.
Ammonia/water mixture as working medium.
Safety protections.

Optional accessory: (not included in the standard supply)
-TRAC-PS. **Solar Panel accessory,** to convert the unit to work off of solar panel.

②TRAC/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 the 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.

TRAC/CIB

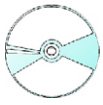
③DAB. Data Acquisition Board:

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. Max. 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.
Timing: **Counter/timers=2**. Resolution:Counter/timers: 32 bits.

DAB

④ TRAC/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.



TRAC/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: TRAC + TRAC/CIB + DAB + TRAC/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 TRAC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

Items available on request

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

⑩ TRAC/FSS. Faults Simulation System.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Study of a absorption refrigeration system.
2.- Familiarisation with the individual components of the absorption refrigeration unit.
3.- Operation of a gas absorption refrigeration unit using either electricity or LPG as the heat source.
4.- Demonstration of the refrigeration process.
5.- Measurement of the electrical power.
6.- Measurement of temperature points along the absorption refrigeration process.
7.- Effect of circulating air on the process temperature.

Other possible practices:

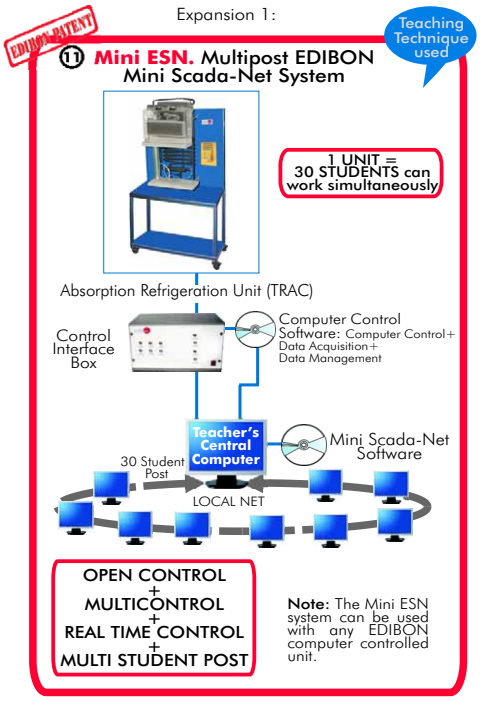
8.- Sensors calibration.

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

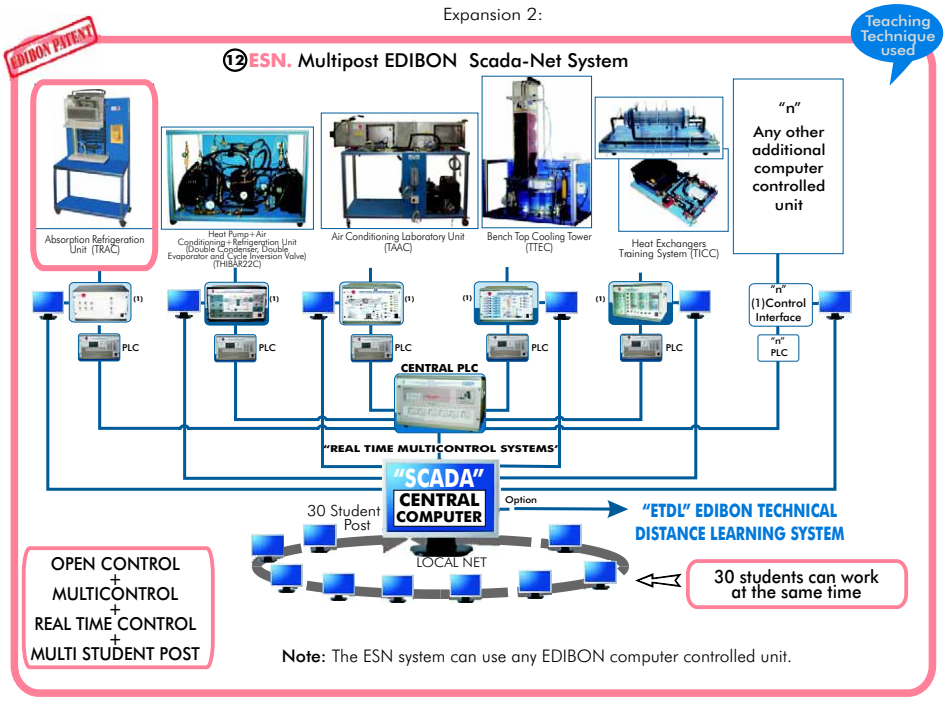
9.- Control of the TRAC unit process through the control interface box without the computer.
10.- Visualization of all the sensors values used in the TRAC unit process.
11.-Calibration of all sensors included in the TRAC unit process.
12.-Hand on of all the actuators involved in the TRAC unit process.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

② **TRAC/CIB.Control Interface Box.**

③ **DAB.Data Acquisition Board.**

④ **TRAC/CCSOF. Computer Control + Data Acquisition + Data Management Software.**

⑤ **Cables and Accessories**, for normal operation.

⑥ **Manuals.**

***IMPORTANT: Under TRAC 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 TRAC/PLC-SOF. PLC Control Software.

⑨ TRAC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request).

⑩ TRAC/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, 220V./50 Hz or 110V./60 Hz.
-LPG gas.
-Computer (PC).

OPTIONAL ACCESSORY

-TRAC-PS. **Solar Panel accessory,** to convert the unit to work off of solar panel.

DIMENSIONS & WEIGHTS

TRAC Unit:	-Dimensions: 1200 x 700 x 1800 mm. approx.
	-Weight: 110 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: