

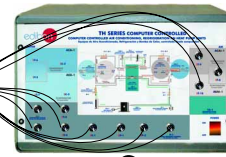


① Unit: THBAAC. Heat Pump Unit (one condenser (air) and one evaporator (air))

Always included in the supply:

Teaching Technique used

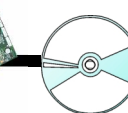
SCADA. EDIBON Computer Control System



② Control Interface Box



③ Data Acquisition Board

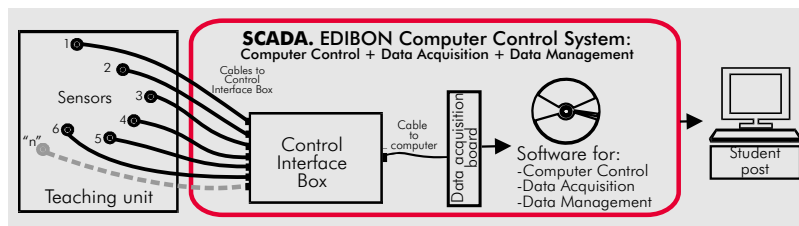


④ Software for:
- Computer Control
- Data Acquisition
- Data Management



Computer (not included in the supply)

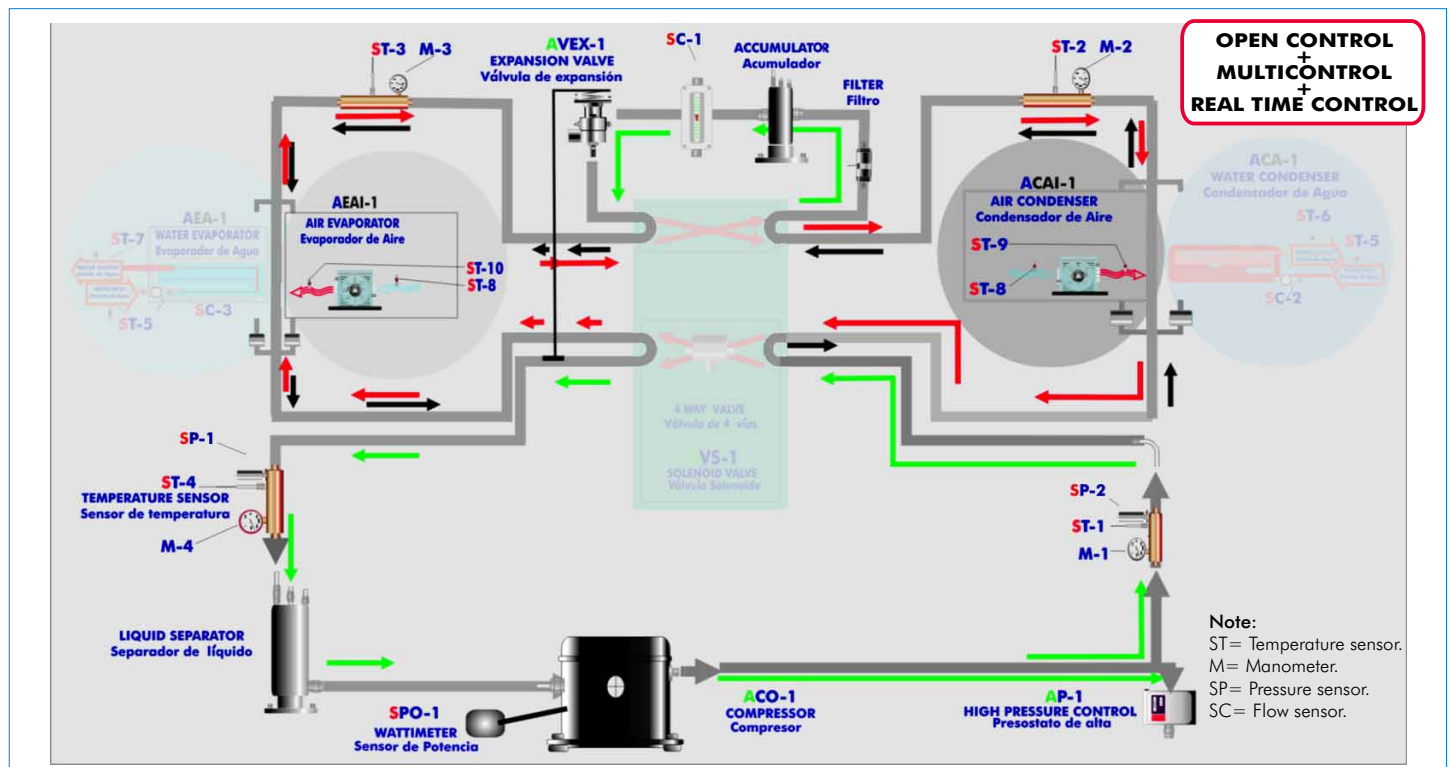
⑤ Cables and Accessories
⑥ Manuals



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Products
Products range
Units
9.-Thermodynamics & Thermotechnics

PROCESS DIAGRAM AND ELEMENTS ALLOCATION



Items supplied as standard

① **THBAAC. Unit:**

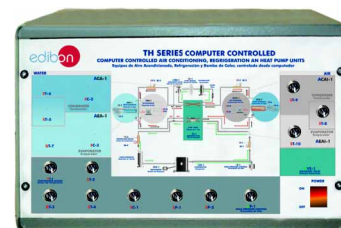
- Bench-top unit.
- Anodized aluminium structure and panels in painted steel.
- Main metallic elements in stainless steel.
- Diagram in the front panel with similar distribution to the elements in the real unit.
- Cooling compressor, computer controlled.
- Air condenser, computer controlled.
- High pressure control.
- Coolant accumulation tank.
- Cooling filter.
- Expansion valve.
- Air evaporator, computer controlled.
- Tank of division of the cooling liquid.
- 4 Manometers.
- 7 Temperature sensors:
 - Temperature sensor, J type (compressor outlet).
 - Temperature sensor, J type (condenser outlet).
 - Temperature sensor, J type (evaporator inlet).
 - Temperature sensor, J type (compressor inlet).
 - Temperature sensor, J type (room air).
 - Temperature sensor, J type (condenser outlet/air).
 - Temperature sensor, J type (evaporator outlet/air).
- Flow sensor.
- 2 Pressure sensors:
 - Cooling pressure sensor (compressor outlet).
 - Cooling pressure sensor (compressor inlet).
- Wattmeter.
- Enthalpy diagram of the refrigerant R134a.



THBAAC. Unit

② **THBAAC/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 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.



THBAAC/CIB

③ **DAB. Data Acquisition Board:**

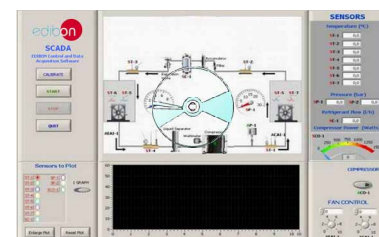
- PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.
- Analog input: Channels= 16 single-ended or 8 differential. Resolution= 16 bits, 1 in 65536. Sampling rate up to: 250 KS/s (Kilo samples per second). Input range (V) = $\pm 10V$. Data transfers=DMA, interrupts, 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) = $\pm 10V$. Data transfers= DMA, interrupts, programmed I/O.
- Digital Input/Output: Channels=24 inputs/outputs. DO or DI Sample Clock frequency: 0 to 1 MHz.
- Timing: Counter/timers=2. Resolution: Counter/timers: 32 bits.



DAB

④ **THBAAC/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 as 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.



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

For this particular unit, always included with PLC supply.



PLC-PI

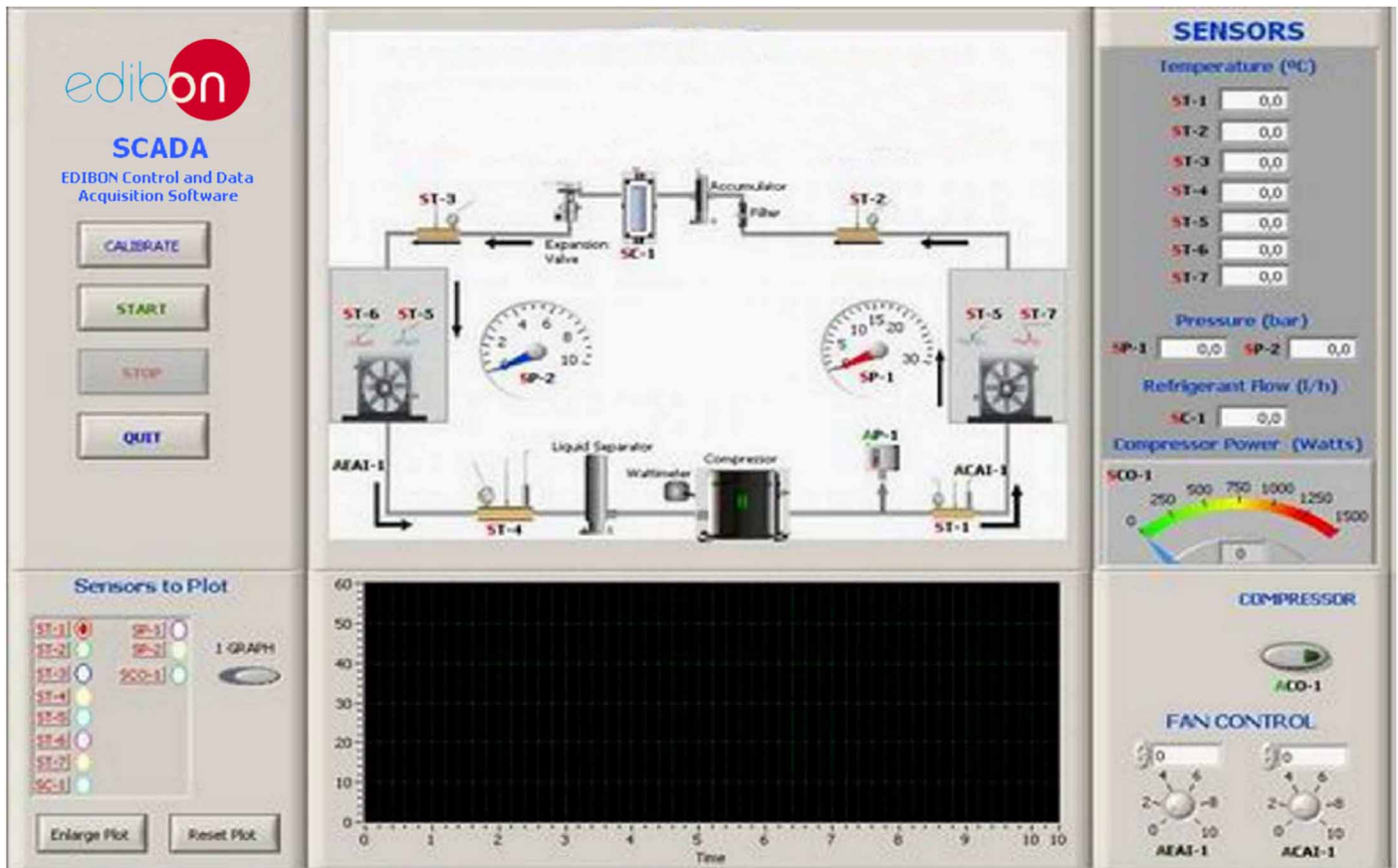
Items available on request

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

⑩ THBAAC/FSS. Faults Simulation System.

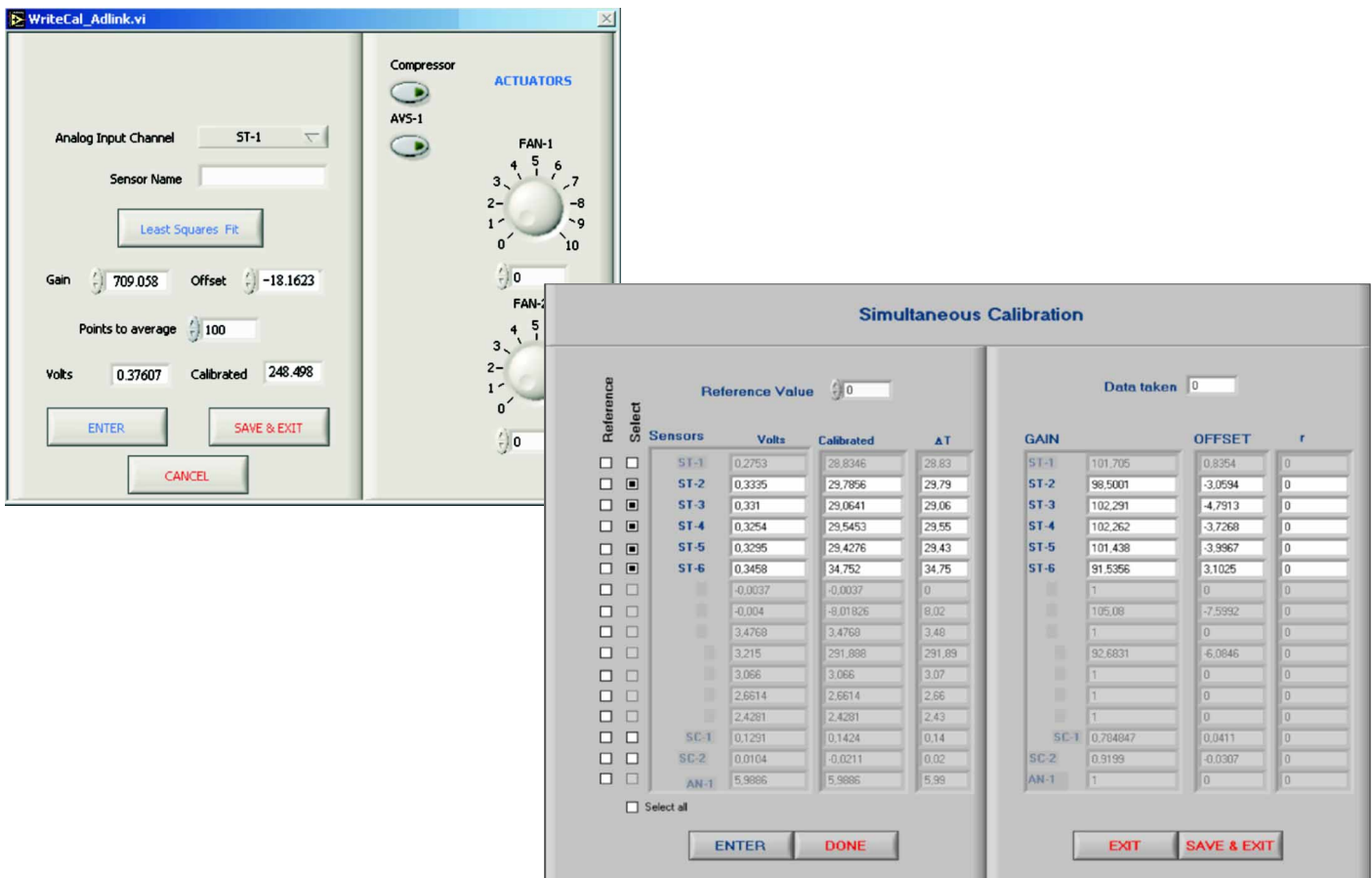
Software Main Screens

Main screen



Note: ST= Temperature sensor. SP= Pressure sensor. SC= Flow sensor. ACO-1=Compressor. AEAI-1= Air evaporator. ACAI-1= Air condenser.

Examples of Sensors Calibration screens



REQUIRED SERVICES

Electrical supply: 220V, 1-phase + neutral + ground, 50 Hz.; or 110V, 1-phase + neutral + ground, 60Hz.; and 1 CV max.

Computer (PC).

DIMENSIONS & WEIGHTS

THBAAC Unit :	-Dimensions: 900 x 600 x 500 mm. approx. -Weight : 75 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

For refilling R134a refrigerant and maintenance, we recommend:

- T/KIT1. Maintenance Kit, containing: vacuum pump, hoses and manometers.
- T/KIT2. Maintenance Kit, containing: leakage detector.
- R134a refrigerant (to be acquired by the customer locally).

AVAILABLE VERSIONS

Offered in this catalogue:

- **THBAAC.** Computer Controlled **Heat Pump Unit (one condenser (air) and one evaporator (air))**.

Offered in other catalogue:

- **THBAAB.** **Heat Pump Unit (one condenser (air) and one evaporator (air))**.

OTHER AVAILABLE HEAT PUMP UNITS

- **THIBAR22C.** Computer Controlled **Heat Pump+ Air Conditioning + Refrigeration Unit with Cycle Inversion Valve**.
- **THIBAR22B.** **Heat Pump+ Air Conditioning + Refrigeration Unit with Cycle Inversion Valve**.
- **THB22C.** Computer Controlled **Heat Pump Unit** (two condensers (water and air) and two evaporators (water and air)).
- **THB22B.** **Heat Pump Unit** (two condensers (water and air) and two evaporators (water and air)).
- **THB2LC.** Computer Controlled **Heat Pump Unit** (two condensers (water and air) and one evaporator (water)).
- **THB2LB.** **Heat Pump Unit** (two condensers (water and air) and one evaporator (water)).
- **THBL2C.** Computer Controlled **Heat Pump Unit** (one condenser (water) and two evaporators (water and air)).
- **THBL2B.** **Heat Pump Unit** (one condenser (water) and two evaporators (water and air)).
- **THBA2C.** Computer Controlled **Heat Pump Unit** (one condenser (air) and two evaporators (water and air)).
- **THBA2B.** **Heat Pump Unit** (one condenser (air) and two evaporators (water and air)).
- **THBLLC.** Computer Controlled **Heat Pump Unit** (one condenser (water) and one evaporator (water)).
- **THBLLB.** **Heat Pump Unit** (one condenser (water) and one evaporator (water)).
- **THBALC.** Computer Controlled **Heat Pump Unit** (one condenser (air) and one evaporator (water)).
- **THBALB.** **Heat Pump Unit** (one condenser (air) and one evaporator (water)).
- **THB2AC.** Computer Controlled **Heat Pump Unit** (two condensers (water and air) and one evaporator (air)).
- **THB2AB.** **Heat Pump Unit** (two condensers (water and air) and one evaporator (air)).
- **THBLAC.** Computer Controlled **Heat Pump Unit** (one condenser (water) and one evaporator (air)).
- **THBLAB.** **Heat Pump Unit** (one condenser (water) and one evaporator (air)).

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



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REPRESENTATIVE:

