edibon
Technical Teaching Equipment

# Computer Controlled **Air Conditioning Unit**
## (one condenser (air) and one evaporator (air))

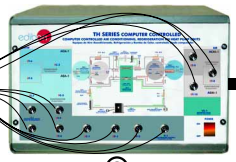
**THAAAC**

EDIBON PATENT

Always included in the supply:

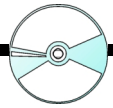
Teaching Technique used

**SCADA.** EDIBON Computer Control System



② Control Interface Box

③ Data Acquisition Board



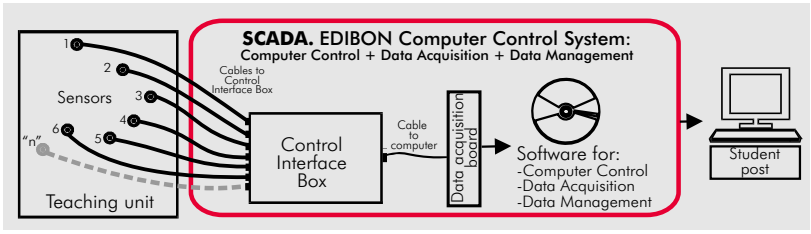
④ Software for:
- Computer Control
- Data Acquisition
- Data Management

Computer (not included in the supply)

⑤ Cables and Accessories

⑥ Manuals

① Unit: THAAAC. Air Conditioning Unit (one condenser (air) and one evaporator (air))

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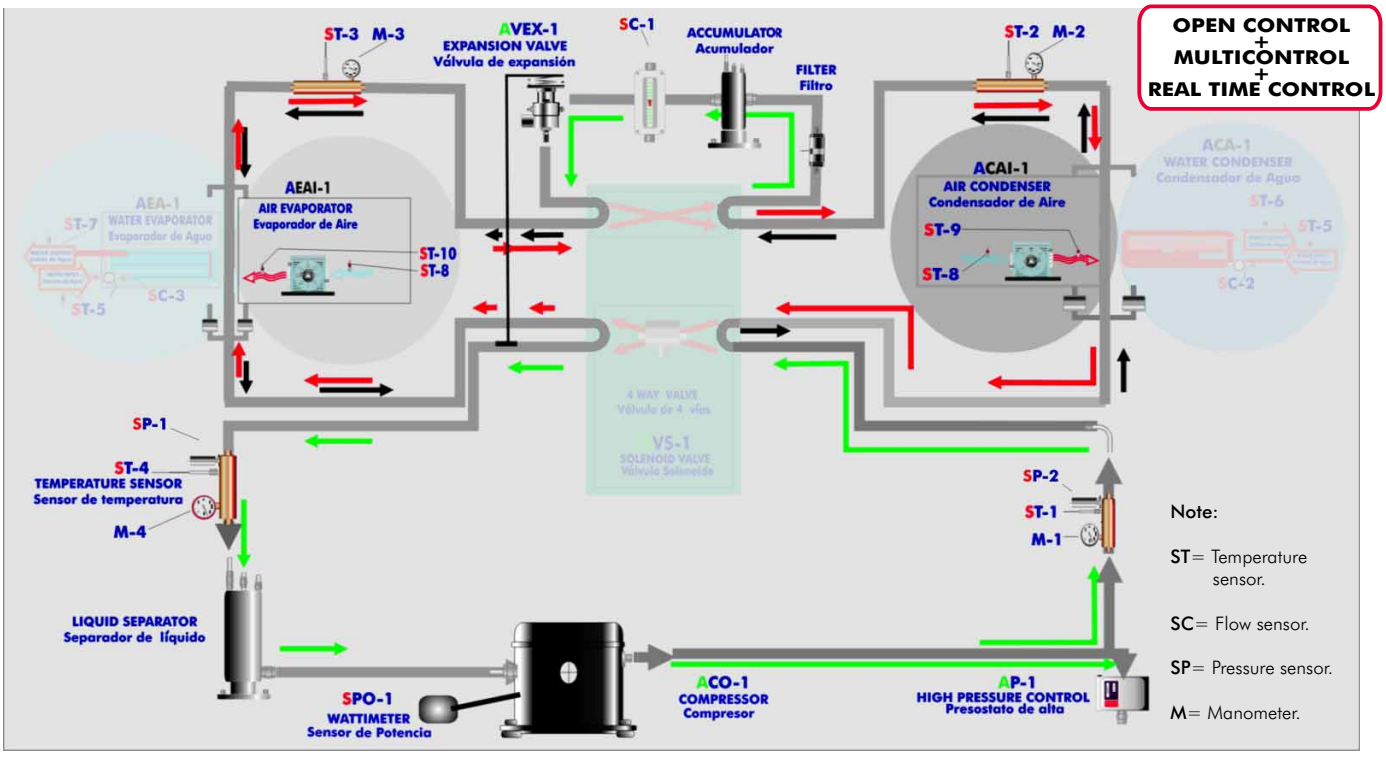
## PROCESS DIAGRAM AND ELEMENTS ALLOCATION




**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 THAAAC. 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).

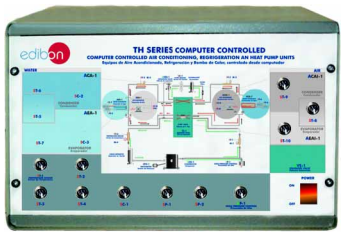
Flow sensor.
2 Pressure sensors:
- Cooling pressure sensor (compressor outlet).
- Cooling pressure sensor (compressor inlet).

Wattmeter.
Enthalpy diagram of the refrigerant R134a.

THAAAC. Unit

### ② THAAAC/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.**




THAAAC/CIB

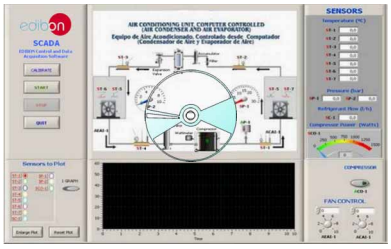
### ③ DAB. Data Acquisition Board:

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)=±10V.
Data transfers=DMA, interrupts, programmed I/0. 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)=±10V. Data transfers=DMA, interrupts, programmed I/0.
**Digital Input/Output: 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 THAAAC/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.**




THAAAC/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: THAAAC + THAAAC/CIB + DAB + THAAAC/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 THAAAC/PLC-SOF. PLC Control Software:**

For this particular unit, always included with PLC supply.

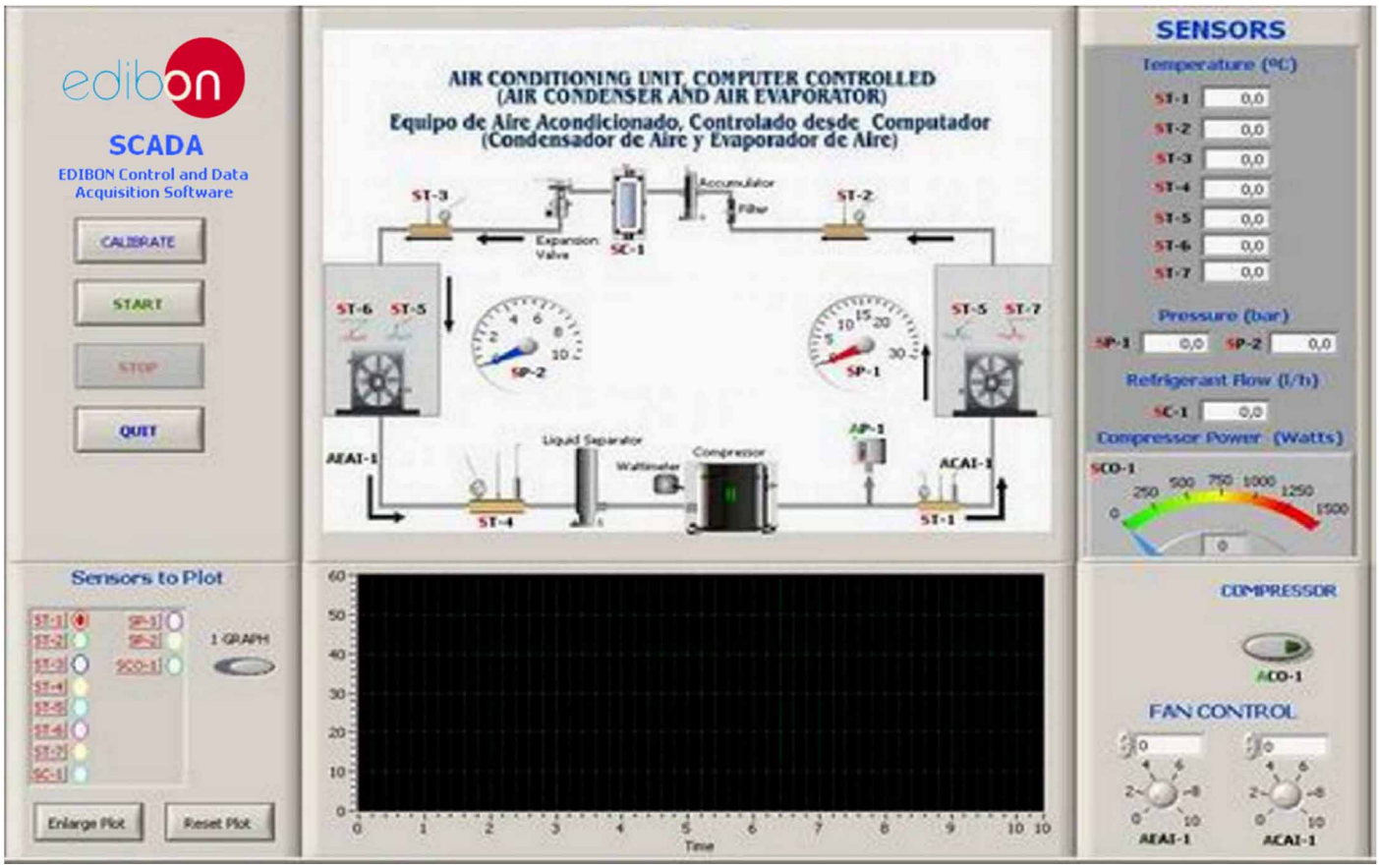
## Items available on request

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

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

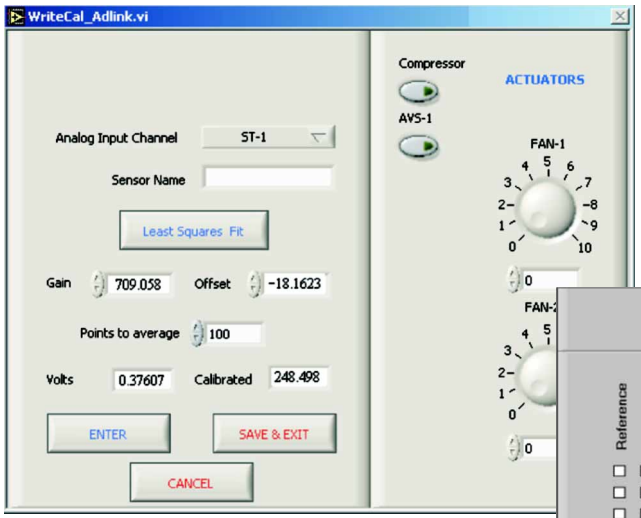
## Software Main Screens

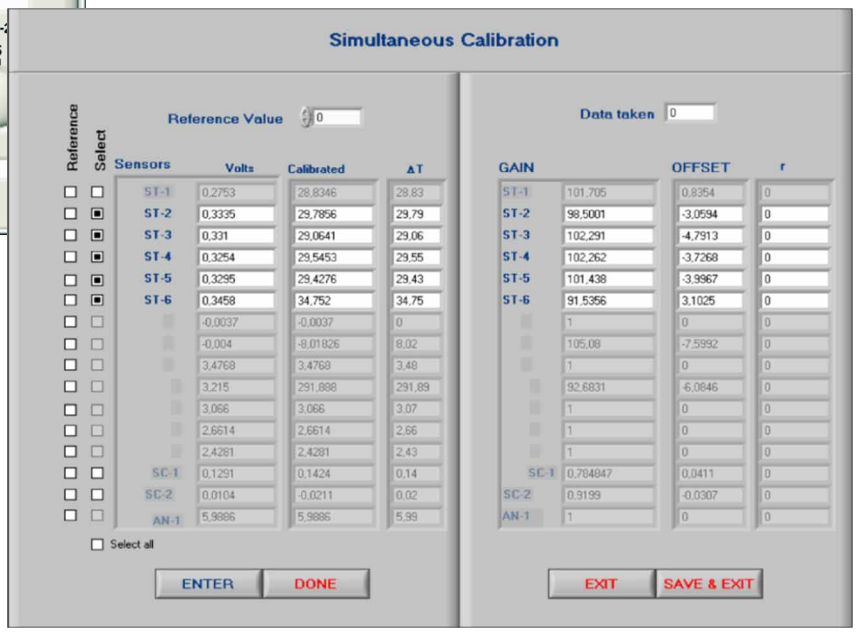
Main screen




**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



## EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Determination of the inlet power, produced heat and performance coefficient. Air as heat source.

2.- Preparation of performances curves of the unit at different inlet and outlet temperatures. Air as a heat source.

3.- Lay out of the steam compression cycle in a diagram P-H and comparison with the ideal cycle. Air as heat source.

4.- Preparation of the performance curves of the unit based on the properties of the refrigerant and at different condensation and evaporation temperatures. Air as heat source.

Other possible practices:

5.- Temperature sensors calibration.

6.- Flow sensor calibration.

7.- Pressure sensors calibration.

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

8.- Control of the THAAAC unit process through the control interface box without computer.

9.- Visualization of all the sensors values used in THAAAC unit process.

10.- Calibration of all sensors included in THAAAC unit process.

11.- Hand on of all the actuators involved in the THAAAC unit process.

12.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).

13.- 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).

14.- PLC hardware general use and manipulation.

15.- PLC process application for the THAAAC unit.

16.- PLC structure.

17.- PLC inputs and outputs configuration.

18.- PLC configuration possibilities.

19.- PLC program languages.

20.- PLC different programming standard languages (literal structured, graphic, etc.).

21.- New configuration and development of new process.

22.- Hand on an established process.

23.- To visualize and see the results and to make comparisons with the THAAAC unit process.

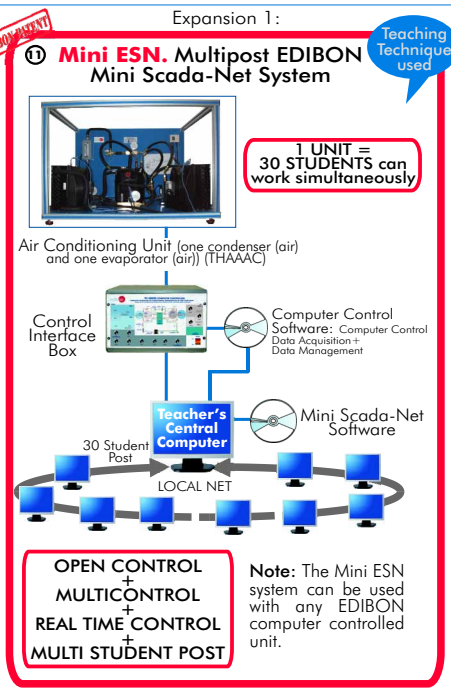
24.- Possibility of creating new process in relation with the THAAAC unit.

25.- PLC Programming Exercises.

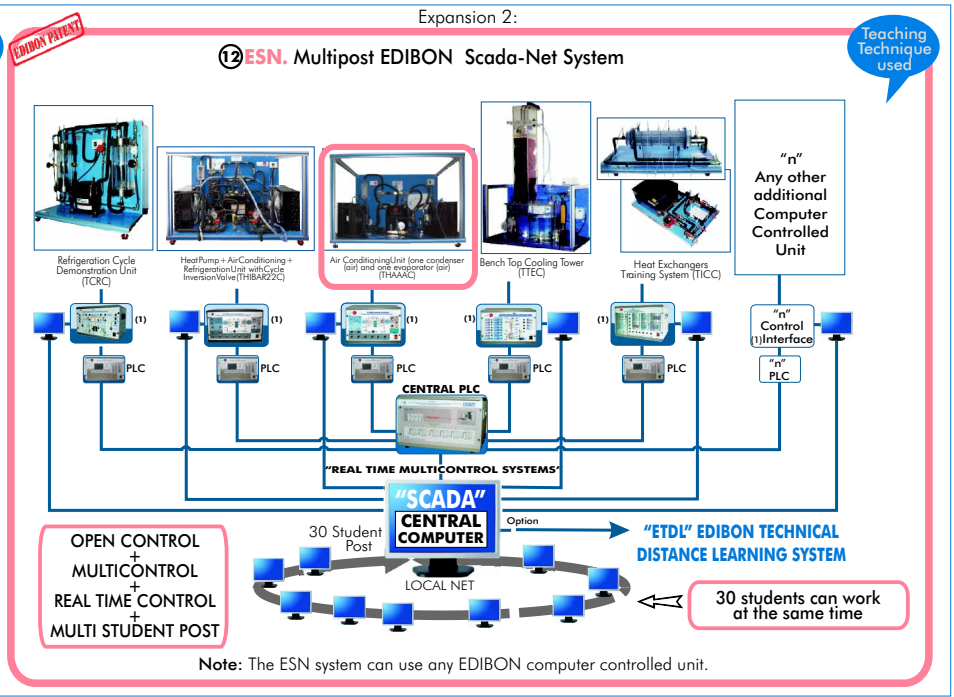
26.- Own PLC applications in accordance with teacher and student requirements.

## POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS

Expansion 1:




Expansion 2:




## ORDER INFORMATION

### Items supplied as standard:

**Minimum configuration** for normal operation includes:

① **Unit: THAAAC. Air Conditioning Unit (one condenser (air) and one evaporador (air)).**

② **THAAAC/CIB. Control Interface Box.**

③ **DAB. Data Acquisition Board.**

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

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

⑥ **Manuals.**

* **IMPORTANT: Under THAAAC 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):

⑦PCL-PI.PLC Module.

⑧THAAAC/PLC-SOF. PLC Control Software.

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

⑩THAAAC/FSS. Faults Simulation System. (Available on request).

Expansions

⑪Mini ESN. Multipost EDIBON Mini Scada-Net System.

⑫ESN. Multipost EDIBON Scada-Net System.

## 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

| | |
|---|---|
| THAAAC Unit : | -Dimensions: 900 x 600 x 500 mm. approx.<br>-Weight: 75 Kg. approx. |
| Control Interface Box: | -Dimensions: 490 x 330 x 310 mm. approx.<br>-Weight: 10 Kg. approx. |
| PLC Module (PLC-PI): | -Dimensions: 490 x 330 x 310 mm. approx.<br>-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:

- **THAAAC.** Computer Controlled **Air Conditioning Unit (one condenser (air) and one evaporator (air)).**

Offered in other catalogue:

- **THAAAB. Air Conditioning Unit (one condenser (air) and one evaporator (air)).**

## OTHER AVAILABLE AIR CONDITIONING UNITS

**Air Conditioning Units:**

- **THA2AC.** Computer Controlled **Air Conditioning Unit** (two condensers (water and air) and one evaporator (air)).
- **THA2AB. Air Conditioning Unit** (two condensers (water and air) and one evaporator (air)).
- **THALAC.** Computer Controlled **Air Conditioning Unit** (one condenser (water) and one evaporator (air)).
- **THALAB. Air Conditioning Unit** (one condenser (water) and one evaporator (air)).

**Refrigeration and Air Conditioning Units:**

- **THAR22C.** Computer Controlled **Refrigeration and Air Conditioning Unit** (two condensers (water and air) and two evaporators (water and air)).
- **THAR22B. Refrigeration and Air Conditioning Unit** (two condensers (water and air) and two evaporators (water and air)).
- **THAR2LC.** Computer Controlled **Refrigeration and Air Conditioning Unit** (two condensers (water and air) and one evaporator (water)).
- **THAR2LB. Refrigeration and Air Conditioning Unit** (two condensers (water and air) and one evaporator (water)).
- **THARL2C.** Computer Controlled **Refrigeration and Air Conditioning Unit** (one condenser (water) and two evaporators (water and air)).
- **THARL2B. Refrigeration and Air Conditioning Unit** (one condenser (water) and two evaporators (water and air)).
- **THARA2C.** Computer Controlled **Refrigeration and Air Conditioning Unit** (one condenser (air) and two evaporators (water and air)).
- **THARA2B. Refrigeration and Air Conditioning Unit** (one condenser (air) and two evaporators (water and air)).
- **THARALC.** Computer Controlled **Refrigeration and Air Conditioning Unit** (one condenser (air) and one evaporator (water)).
- **THARALB. Refrigeration and Air Conditioning Unit** (one condenser (air) and one evaporator (water)).
- **THARLLC.** Computer Controlled **Refrigeration and Air Conditioning Unit** (one condenser (water) and one evaporator (water)).
- **THARLLB. Refrigeration and Air Conditioning Unit** (one condenser (water) and one evaporator (water)).

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

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