edibon
Technical Teaching Equipment

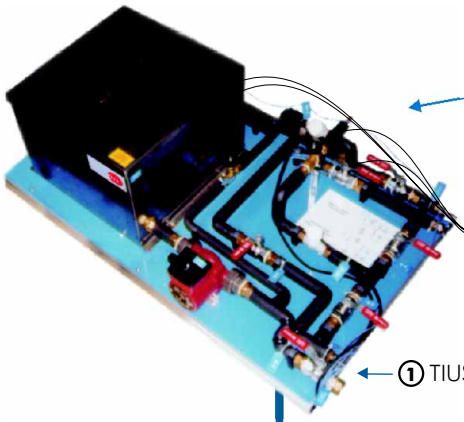
Computer Controlled
Heat Exchangers Training System

TICC

EDIBON PATENT

Always included in the supply:

Teaching Technique used



SCADA. EDIBON Computer Control System

Computer
(not included in the supply)

① TIUS. Base Service Unit

② Control Interface Box

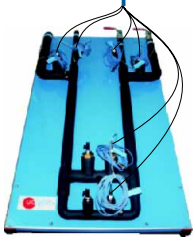
③ Data Acquisition Board

(✦) Computer Control Software for each Heat Exchanger

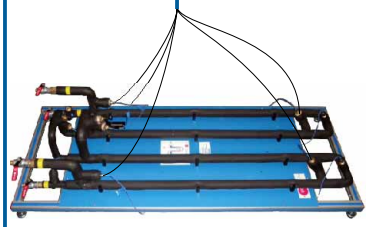
⑤ Cables and Accessories

⑥ Manuals

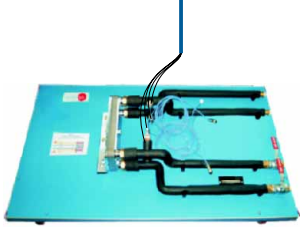
④ Heat Exchangers available to be used with the Base Service Unit:



④.1 TITC. Concentric Tube Heat Exchanger (✦)

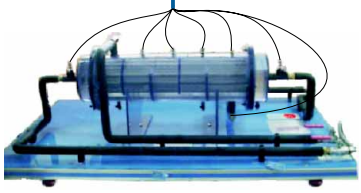


④.2 TITCA. Extended Concentric Tube Heat Exchanger (✦)

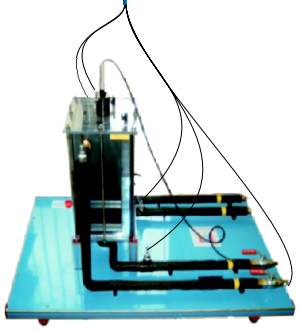


④.3 TIPL. Plate Heat Exchanger (✦)

④.4 TIPLA. Extended Plate Heat Exchanger (✦)

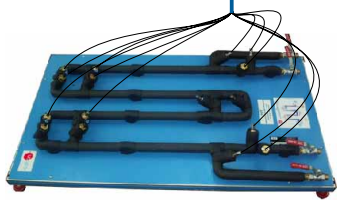


④.5 TICT. Shell & Tube Heat Exchanger (✦)



④.6 TIVE. Jacketed Vessel Heat Exchanger (✦)

④.7 TIVS. Coil Vessel Heat Exchanger (✦)



④.8 TIFT. Turbulent Flow Heat Exchanger (✦)

OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL

www.edibon.com
Products
Products range
Units
9.-Thermodynamics & Thermotechnics

ISO 9000: Quality Management
(for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate
(total safety)

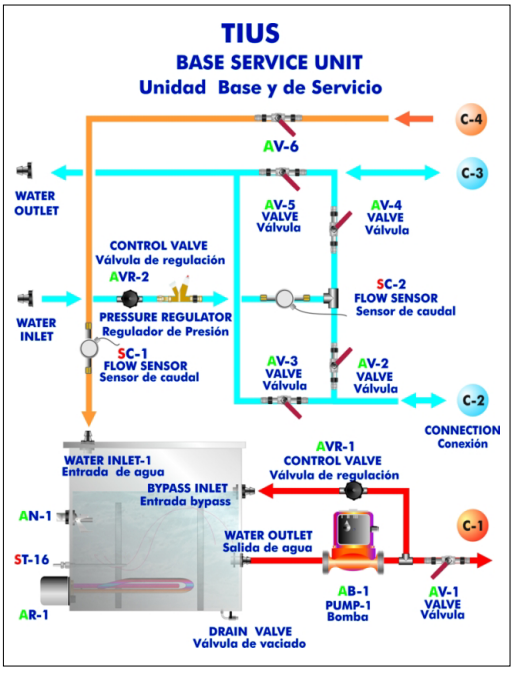
Certificates ISO 14000 and ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter Certificate
(Worlddidac Member)

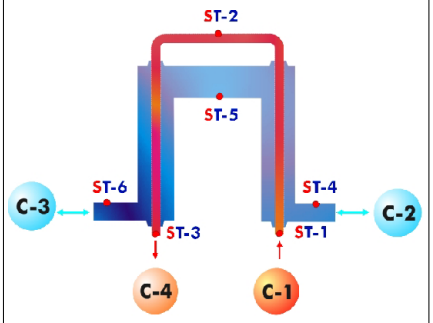
3 actuators and 16 sensors controlled from any computer, and working simultaneously

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL

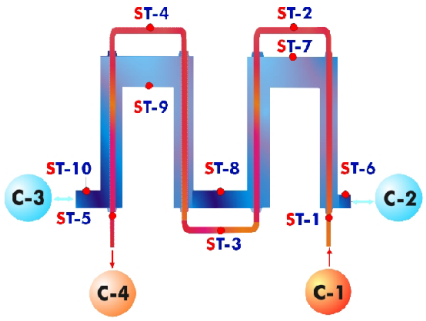
TIUS
BASE SERVICE UNIT
Unidad Base y de Servicio



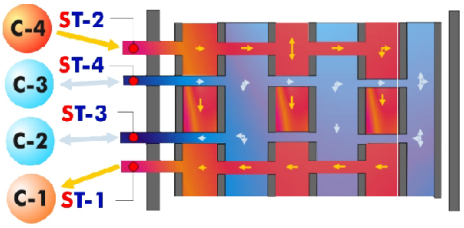
TITC
CONCENTRIC TUBE HEAT EXCHANGER
Intercambiador de calor de tubos concéntricos



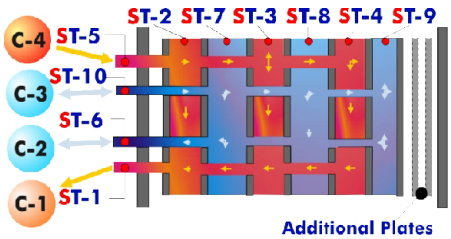
TITCA
EXTENDED CONCENTRIC TUBE HEAT EXCHANGER
Intercambiador de Calor de Tubos Concéntricos ampliado



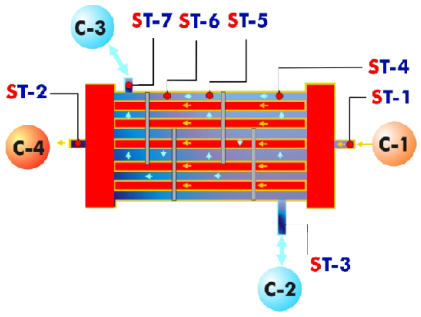
TIPL
PLATE HEAT EXCHANGER
Intercambiador de calor de Placas



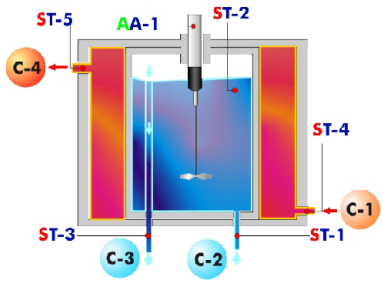
TIPLA
EXTENDED PLATE HEAT EXCHANGER
Intercambiador de Calor de Placas ampliado



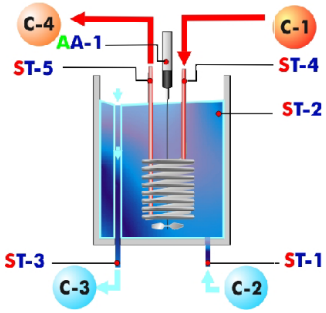
TICT
SHELL & TUBE HEAT EXCHANGER
Intercambiador de calor de carcasa y tubo



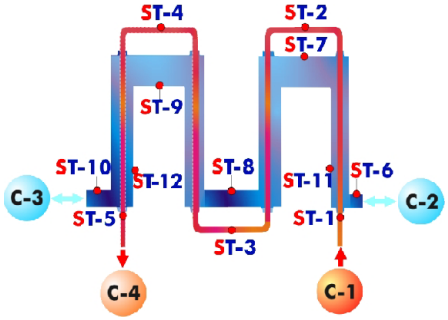
TIVE
JACKETED VESSEL HEAT EXCHANGER
Intercambiador de calor de vasija encamisada



TIVS
COIL VESSEL HEAT EXCHANGER
Intercambiador de calor de vasija con serpentín



TIFT
TURBULENT FLOW HEAT EXCHANGER
Intercambiador de calor de flujos turbulentos



Note:

ST=Temperature sensor. SC= Flow sensor. AR= Heating resistance. AB= Pump. AA=Stirrer. AN=Level switch. AV=Valve. AVR. Regulation valve.
C= Connection between Base Service Unit and Exchanger

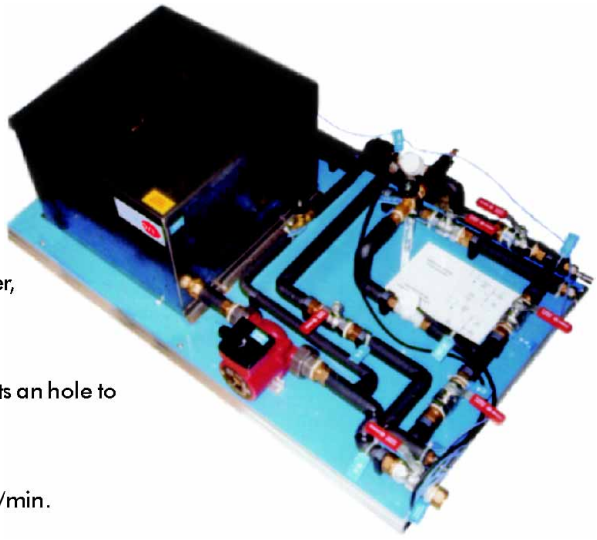
Common items for Heat Exchangers type "TI":

① TIUS.Base Service Unit:

This unit is common for Heat Exchangers type "TI" and can work with one or several exchangers.
This unit performs the following tasks:
- **Heating the water.**
- **Pumping of hot water.**
- **Change in the direction of cold water flows.**
- **Cold and hot water measures.**

Anodized aluminium structure and panel 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.
Stainless steel tank (30 l.), equipped with:
- **Electric heating resistance (3000W) with thermostat (70° C), to heat the water, computer controlled. PID temperature control.**
- **Temperature sensor type "J" to measure the water temperature.**
- **Level switch to control the water level of the tank.**
- **Stainless steel cover to avoid the contact with the hot water. In this cover exists an hole to allows us to visualize the water level and even to stuff the tank.**
- **Draining water valve.**

Centrifugal pump with speed control from computer. Range: 0 - 3 l. /min.
2 Flow sensors, one for hot water and the other for cold water. Range: 0 - 6.5 l./min.
Control valve for the cold water.
4 Ball valves that, depending on how do we manipulate them, they give us parallel or crosscurrent flux in the exchanger.
Regulation pressure valve to avoid the introduction of too much pressure in the exchangers, tared at 0.6bar.
4 flexible tubes to connect with the different exchangers.
Cables and accessories, for normal operation.



TIUS

② TICC/CIB. Control Interface Box:

This control interface is common for Heat Exchangers type "TI" and can work with one or several exchangers.
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 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.
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).
Open control allowing modifications, at any time and in a real time, of parameters involved in the process simultaneously.
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.

TICC/CIB

③ DAB. Data Acquisition Board:

This board is common for Heat Exchangers type "TI".
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. Maximum 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

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit:

④.1 TITC. Concentric Tube Heat Exchanger:

TITC

This Concentric Tube Heat Exchanger allows the study of heat transfer between hot water flowing through an internal tube and cold water flowing in the ring area lying between the internal and external tubes.

This exchanger allows measuring hot and cold water temperatures in different points of the exchanger.

Anodized aluminium structure and panel 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.

The exchanger is formed by two concentric copper tubes with hot water circulating through the interior tube and cold water circulating in the ring space.

This exchanger has 2 equal sections of 500 mm each one, where heat transfer takes place.

Exchange length: L = 2 x 0.5 = 1 m.

Internal tube:

- Internal diameter: $D_{int} = 16 \cdot 10^{-3}$ m.
- External diameter: $D_{ext} = 18 \cdot 10^{-3}$ m.
- Thickness = 10^{-3} m.
- Heat transfer internal area: $A_h = 0.0503$ m^2.
- Heat transfer external area: $A_c = 0.0565$ m^2.

External tube:

- Internal diameter: $D_{int} = 26 \cdot 10^{-3}$ m.
- External diameter: $D_{ext} = 28 \cdot 10^{-3}$ m.
- Thickness = 10^{-3} m.

6 Temperature sensors ("J" type):

- 3 Temperature sensors for measuring cold water temperature:
  - Cold water inlet.
  - Cold water mid-position.
  - Cold water outlet.
- 3 Temperature sensors for measuring hot water temperature:
  - Hot water inlet.
  - Hot water mid-position.
  - Hot water outlet.

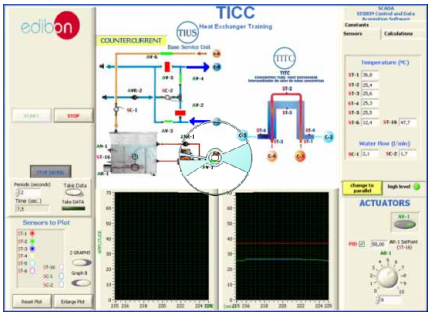
Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Concentric Tube Heat Exchanger (TITC).



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.

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.

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.2 TITCA. Extended Concentric Tube Heat Exchanger:

This Extended Concentric Tube Heat Exchanger allows the study of heat transfer between hot water flowing through an internal tube and cold water flowing in the ring area lying between the internal and external tubes.

This exchanger allows measuring hot and cold water temperatures in different points of the exchanger.

TITCA is a more sophisticated unit than TITC, with four longer tube sections, giving four times the overall heat transfer area and three interim temperature measurement points (temperature sensors) in each fluid stream.

This exchanger has sufficient heat transfer area for demonstrating the typical counter current flow conditions where the outlet of the heated stream is hotter than the outlet of the cooled stream.

TITCA

Anodized aluminium structure and panel 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.

The exchanger is formed by two concentric copper tubes with hot water circulating through the interior tube and cold water circulating in the ring space.

This exchanger has 4 sections of 1000 mm each one, where heat transfer takes place.

Exchange length: L=4x1=4 m.

Internal tube:

- Internal diameter: $D_{int} = 16 \cdot 10^{-3}$ m.
- External diameter: $D_{ext} = 18 \cdot 10^{-3}$ m.
- Thickness = 10^{-3} m.
- Heat transfer internal area: $A_h = 0.0503$ m^2.
- Heat transfer external area: $A_c = 0.0565$ m^2.

External tube:

- Internal diameter: $D_{int} = 26 \cdot 10^{-3}$ m.
- External diameter: $D_{ext} = 28 \cdot 10^{-3}$ m.
- Thickness = 10^{-3} m.

10 Temperature sensors ("J" type):

- 5 Temperature sensors for measuring cold water temperature:
  - Cold water inlet.
  - Cold water in different interim positions (3).
  - Cold water outlet.
- 5 Temperature sensors for measuring hot water temperature:
  - Hot water inlet.
  - Hot water in different interim positions (3).
  - Hot water outlet.

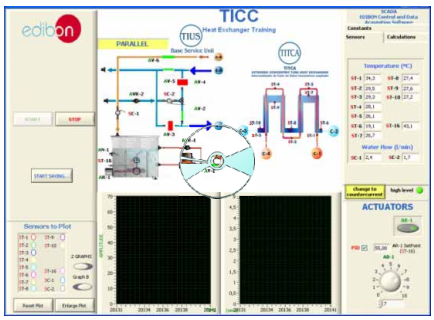
Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Extended Concentric Tube Heat Exchanger (TITCA).



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.

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.

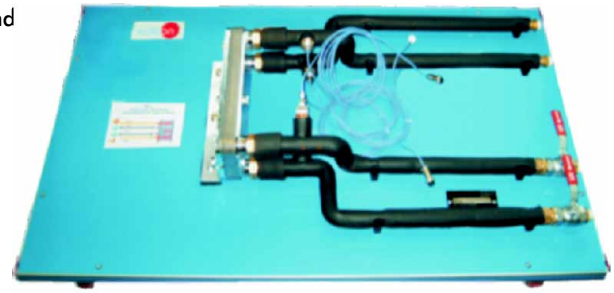
This unit allows that the 30 students of the classroom can visualize simultaneously all results and manipulation of the unit, during the process, by using a projector.

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.3 TIPL. Plate Heat Exchanger:

This Plate Heat Exchanger allows the study of heat transfer between hot and cold water through alternate channels formed between parallel plates.



TIPL

The exchanger allows measuring cold and hot temperatures at the inlet and outlet of the exchanger.

Anodized aluminium structure and panel 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.

Formed by corrugated stainless steel plates. This can be dismantled to observe its structure.

4 ports or connections of input and output of hot and cold water.

Maximum flow: 12m^3/h.

Maximum work pressure: 10 bar.

Maximum work temperature: 100° C.

Minimum work temperature: 0° C.

Maximum number of plates: 20.

Internal circuit capacity: 0.176 l.

External circuit capacity: 0.22 l.

Area: 0.32m^2.

4 Temperature sensors ("J" type):

2 Temperature sensors for measuring cold water temperature (inlet and outlet).

2 Temperature sensors for measuring hot water temperature (inlet and outlet).

Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

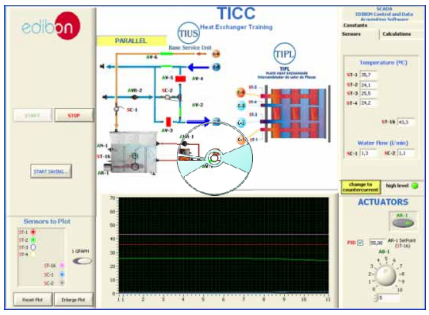
Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Plate Heat Exchanger (TIPL).

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.

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.

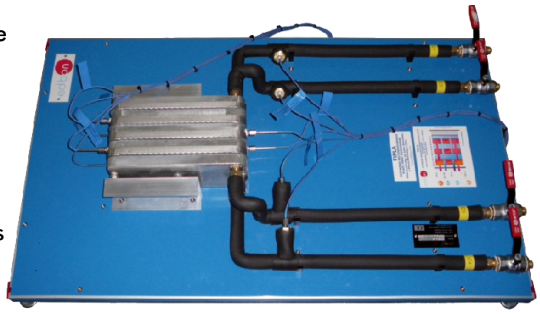
This unit allows that the 30 students of the classroom can visualize simultaneously all results and manipulation of the unit, during the process, by using a projector.

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.④ TIPLA. Extended Plate Heat Exchanger:

This Extended Plate Heat Exchanger allows the study of heat transfer between hot and cold water through alternate canals formed between parallel plates.



TIPLA

The exchanger allows measuring cold and hot temperatures in different points of the exchanger.

Anodized aluminium structure and panel 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.

Formed by corrugated stainless steel plates. This can be dismantled to observe its structure.

4 ports or connections of input and output of hot and cold water.

Maximum flow: 12 m^3/h.

Maximum work pressure: 10 bar.

Maximum work temperature: 100° C.

Minimum work temperature: 0° C.

Maximum number of plates: 20.

Internal circuit capacity: 0.176 l.

External circuit capacity: 0.22 l.

Area: 0.32 m^2.

10 Temperature sensors ("J" type):

- 5 Temperature sensors for measuring cold water temperature (inlet, outlet and interim positions).
- 5 Temperature sensors for measuring hot water temperature (inlet, outlet and interim positions).

Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

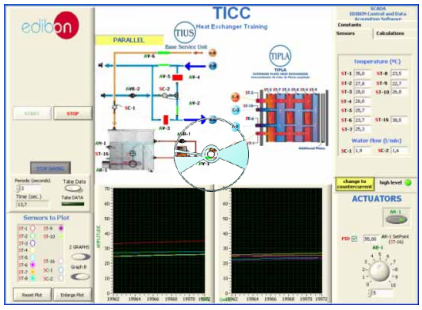
Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Extended Plate Heat Exchanger (TIPLA).

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.

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.

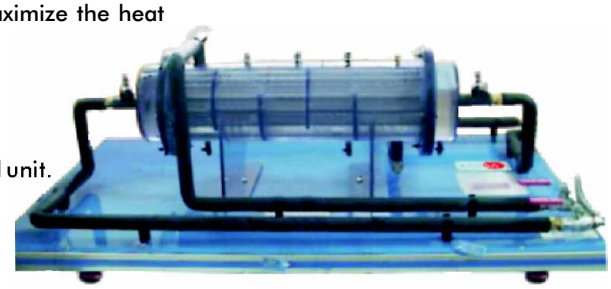
Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.5 TICT. Shell & Tube Heat Exchanger:

It consists of a group of tubes inside the heat exchanger. The hot water flows through the internal tubes and cooling water circulates through the space between the internal tubes and the shell.

There are traverse baffles placed in the shell to guide the cold water maximize the heat transfer.



TICT

Anodized aluminium structure and panel 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.

Formed by tubes of stainless steel with hot water circulating in the interior.

4 segmented baffles located transversal in the shell.

Exchange length of the shell and each tube: L = 0.5m.

Internal tube (21 tubes):

Internal diameter: $D_{int} = 8 \cdot 10^{-3}$ m.

External diameter: $D_{ext} = 10 \cdot 10^{-3}$ m.

Thickness = 10^{-3} m.

Internal heat transfer area: $A_h = 0.0126\ m^2$.

External heat transfer area : $A_c = 0.0157 m^2$.

Shell:

Internal diameter: $D_{int,c} = 0.148$ m.

External diameter: $D_{ext,c} = 0.160$ m.

Thickness = $6 \cdot 10^{-3}$ m.

7 Temperature sensors ("J" type), for measuring cold and hot water temperatures in different points of the exchanger.

Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

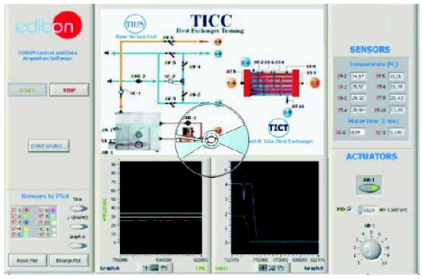
Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Shell & Tube Heat Exchanger (TICT).

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.

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.

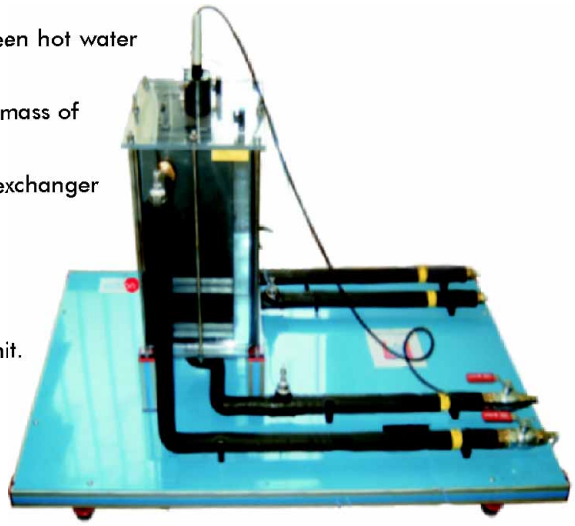
Open software, allowing to the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access at different work levels.

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.

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.6 TIVE. Jacketed Vessel Heat Exchanger:



TIVE

This Jacketed Vessel Heat Exchanger allows the study of heat transfer between hot water flowing through a jacket and the cold water contained in a vessel.

It can work in continuous supply or in a batch process (heating of a constant mass of water containing in a vessel).

The exchanger allows measuring temperatures at the inlet and outlet of the exchanger in cold as well as in hot water.

Anodized aluminium structure and panel 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.

Constituted of a vessel.

Vessel total volume: 14 l.

Interior vessel volume: 7 l. approx.

Jacket volume: 7 l. approx.

An overflow or a pipe that allows the exit of the water in the vessel through its upper part to maintain a constant flow during the process with continuous supply.

A jacket that surrounds the vessel through where hot water flows.

An electric stirrer with a stirring rod of propeller shape and a turn range between 50 and 300 rpm.

5 Temperature sensors ("J" type):

- 3 Temperature sensors for measuring cold water temperature.
- 2 Temperature sensors for measuring hot water temperature.

Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Computer Control Software:

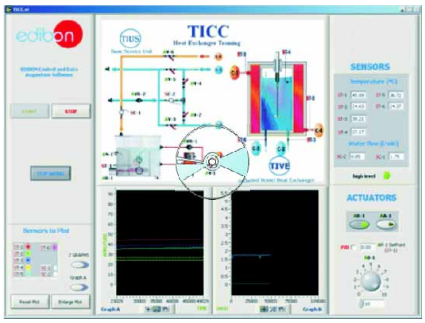
Computer Control+Data Acquisition+Data Management Software for Jacketed Vessel Heat Exchanger (TIVE).

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.

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.

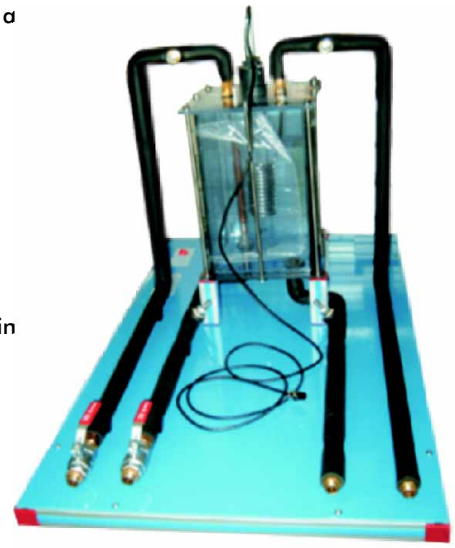
Open software, allowing to the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access at different work levels.

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.

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.7 TIVS. Coil Vessel Heat Exchanger:



TIVS

This heat exchanger allows the study of heat transfer between hot water flowing through a coil and cold water contained in the vessel.

It can work in continuous supply or in a batch process.

Anodized aluminium structure and panel 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.

Formed by a pvc-glass vessel, volume: 14 l.

An overflow or pvc-glass tube lets the output of water from the vessel in the upper part in order to maintain the flow constant for continue supply process.

A copper coil where the water circulates:

- D_{int} = 4.35 mm.
- D_{ext} = 6.35 mm.
- Total longitude of the tube that forms the coil: 5 m.
- Total diameter of coil: 0.1 m.

An electric stirrer using a stirring rod forming a propeller and with a turn range between 50 and 300 rpm.

5 Temperature sensors ("J" type):

- 3 Temperature sensors for measuring cold water temperature.
- 2 Temperature sensors for measuring hot water temperature.

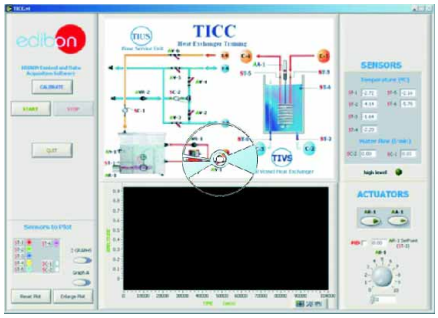
Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Coil Vessel Heat Exchanger (TIVS).



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.

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.

Continue...

④ **Heat Exchangers** available to be used with the Base Service Unit: (continuation)

④.8 TIFT. Turbulent Flow Heat Exchanger:

This Turbulent Flow Heat Exchanger let us the heat transfer study between hot water that circulates through an internal tube and cold water that flows through the annular zone between the internal and the external tubes. This exchanger let us to measure cold water and hot water temperatures in different points of the exchanger.

Anodized aluminium structure and panel 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.

Formed by two copper concentric tubes with hot water circulating through the internal tube and cold water circulating through the annular space.

The exchanger has 4 equal sections of 500 mm each one, where the heat transfer takes place.

Exchange length: L = 4 x 0.5 = 2 m.

TIFT

Internal tube:

- Internal diameter: $D_{int} = 8 \cdot 10^{-3}$ m.
- External diameter: $D_{ext} = 10 \cdot 10^{-3}$ m.
- Thickness = 10^{-3} m.
- Internal heat transfer area: $A_h = 0.0377$ m^2.
- External heat transfer area: $A_c = 0.0471$ m^2.

External tube:

- Internal diameter: $D_{int,c}$ 13 • 10^{-3} m.
- External diameter: $D_{ext,c}$ 15 • 10^{-3} m.
- Thickness = 10^{-3} m.

12 Temperature sensors ("J" type):

- Cold water temperature sensor at the exchanger inlet or outlet.
- Hot water sensor at the exchanger inlet.
- Cold water sensor between the first and second stretch of the exchanger.
- Hot water sensor between the first and second stretch of the exchanger.
- Cold water sensor between the second and third stretch of the exchanger.
- Hot water sensor between the second and third stretch of the exchanger.
- Cold water sensor between the thrid and fourth stretch of the exchanger.
- Hot water sensor between the thrid and fourth stretch of the exchanger.
- Cold water temperature sensor at the exchanger inlet or outlet.
- Hot water sensor at the exchanger outlet.
- Temperature sensor of the exterior surface of the interior tube at the exchanger inlet.
- Temperature sensor of the exterior surface of the interior tube at the exchanger outlet.

Easy connection with the Base Service Unit.

This unit is **supplied with 8 manuals:**

Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

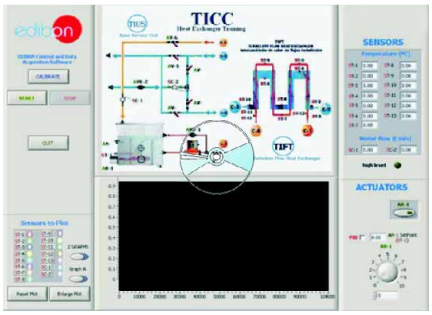
Computer Control Software:

Computer Control+Data Acquisition+Data Management Software for Turbulent Flow Heat Exchanger (TIFT).

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.

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.

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

⑥ **Manuals:** This system is **supplied with 8 manuals for each Heat Exchanger:** Required service, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

Continue...

Additional and optional items

PLC. Industrial Control using PLC (7 and 8):

⑦ PLC-PI. PLC Module:

This unit is common for Heat Exchangers type "TI" and can work with one or several exchangers.

PLC-PI

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 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).

⑧ TICC/PLC-SOF. PLC Control Software:

Always included with PLC supply.
Each Heat Exchanger has its own Software.

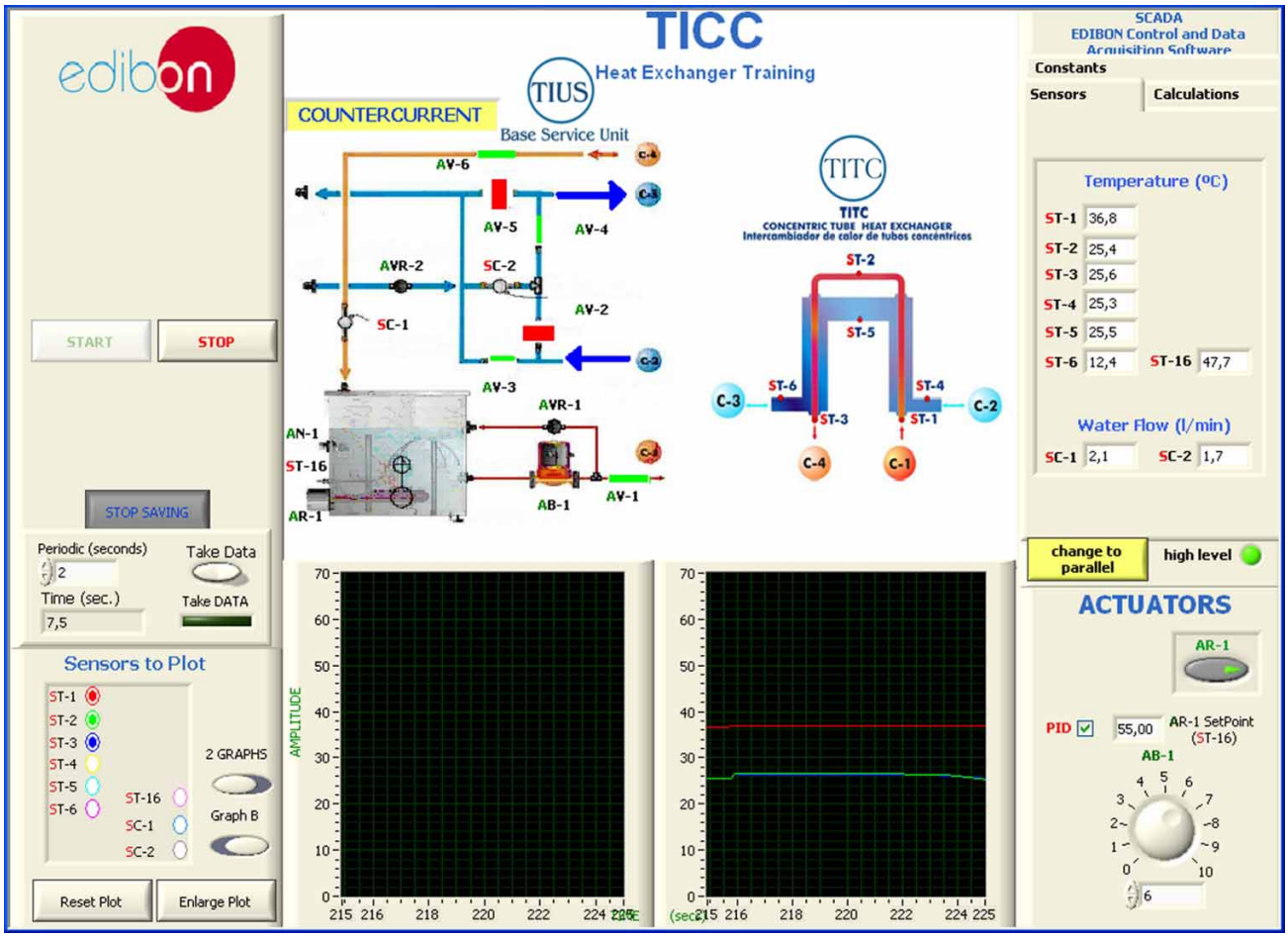
Items available on request

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

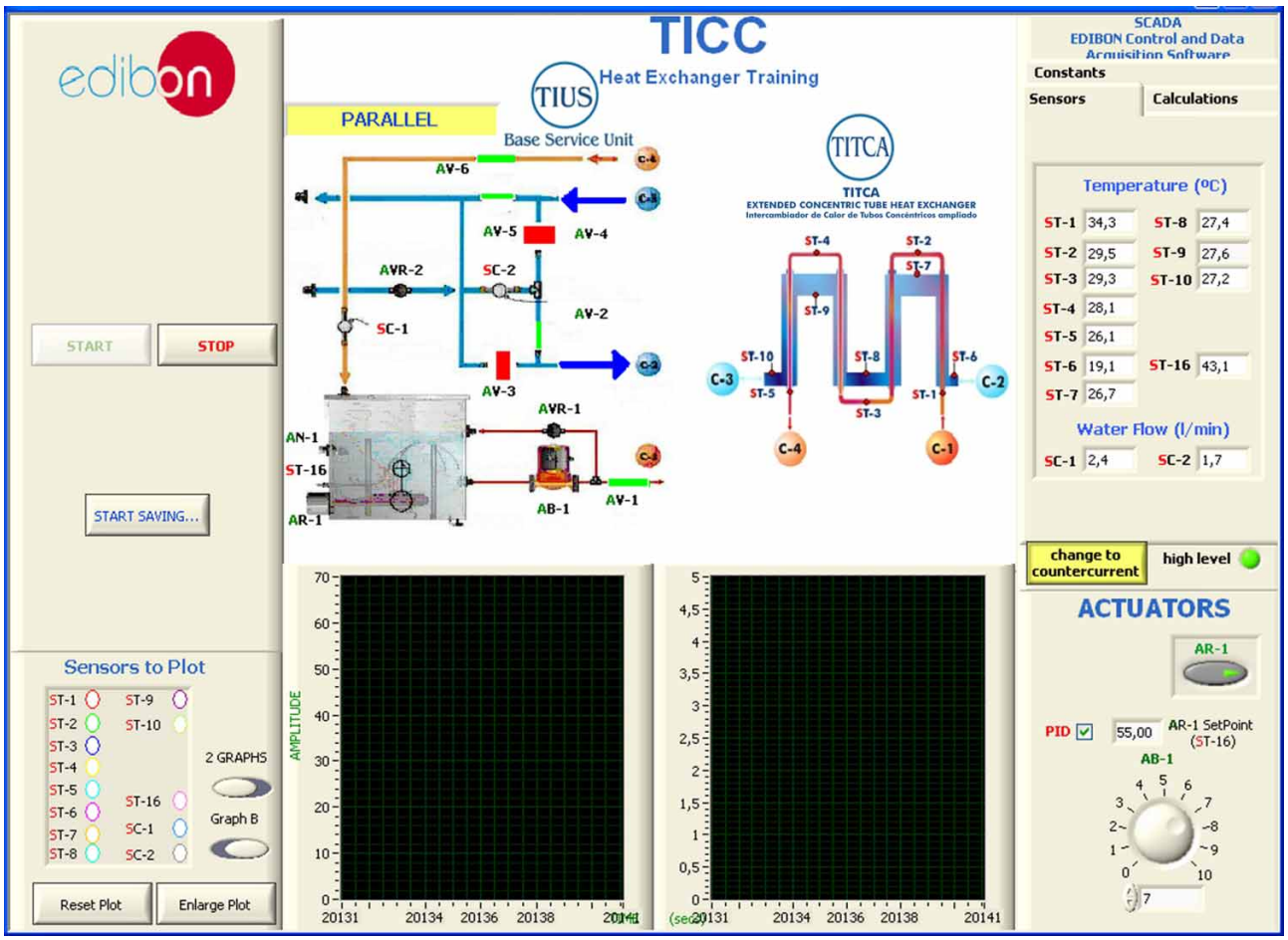
⑩ TICC/FSS. Faults Simulation System.

Software Main Screens

Concentric Tube Heat Exchanger (TITC) Main Screen



Extended Concentric Tube Heat Exchanger (TITCA) Main Screen

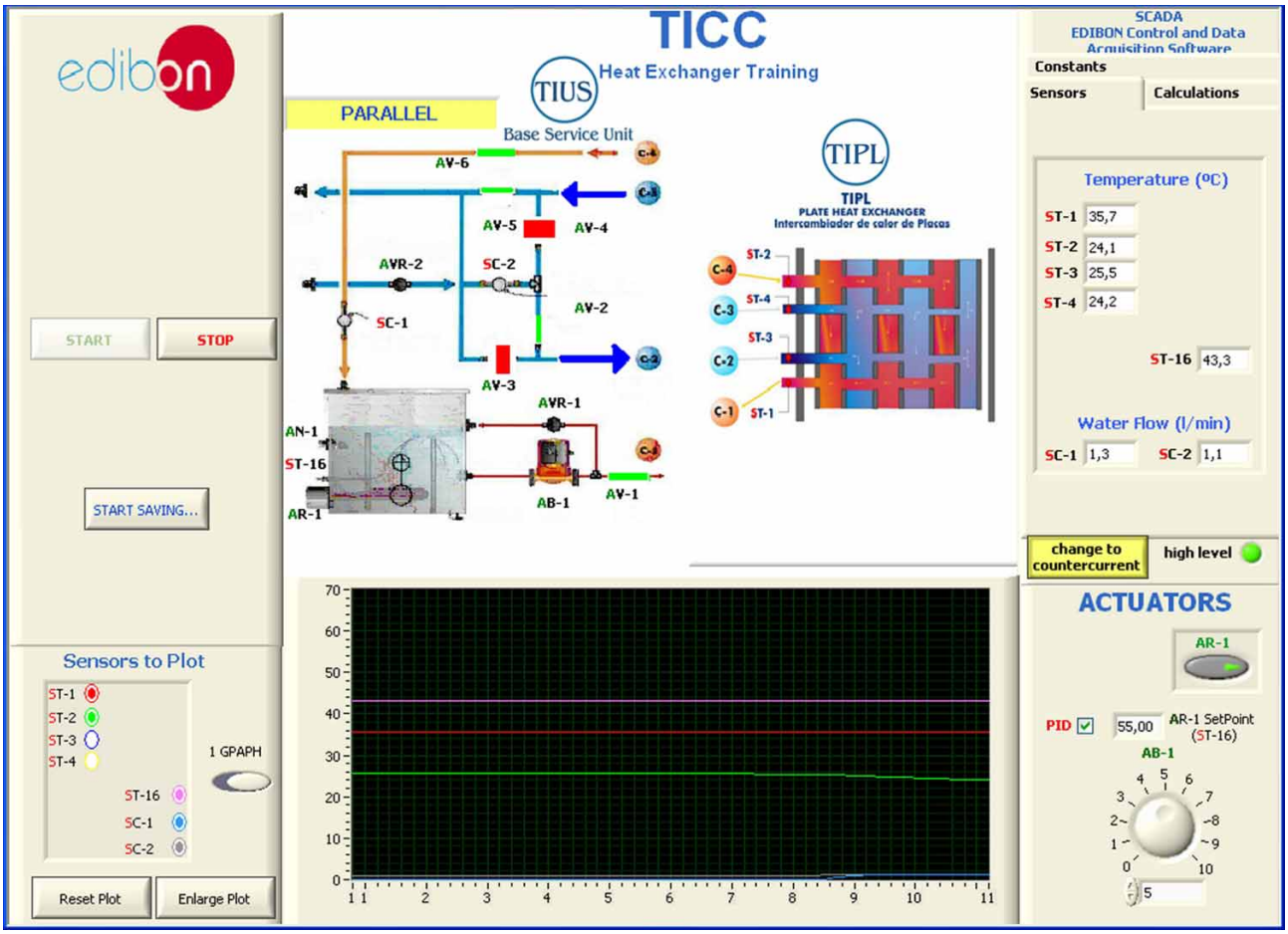


Note: ST=Temperature sensor. SC=Flow sensor. AR=Heating resistance. AB=Pump. AV= Valve. AVR= Regulation valve. AN= Level switch.

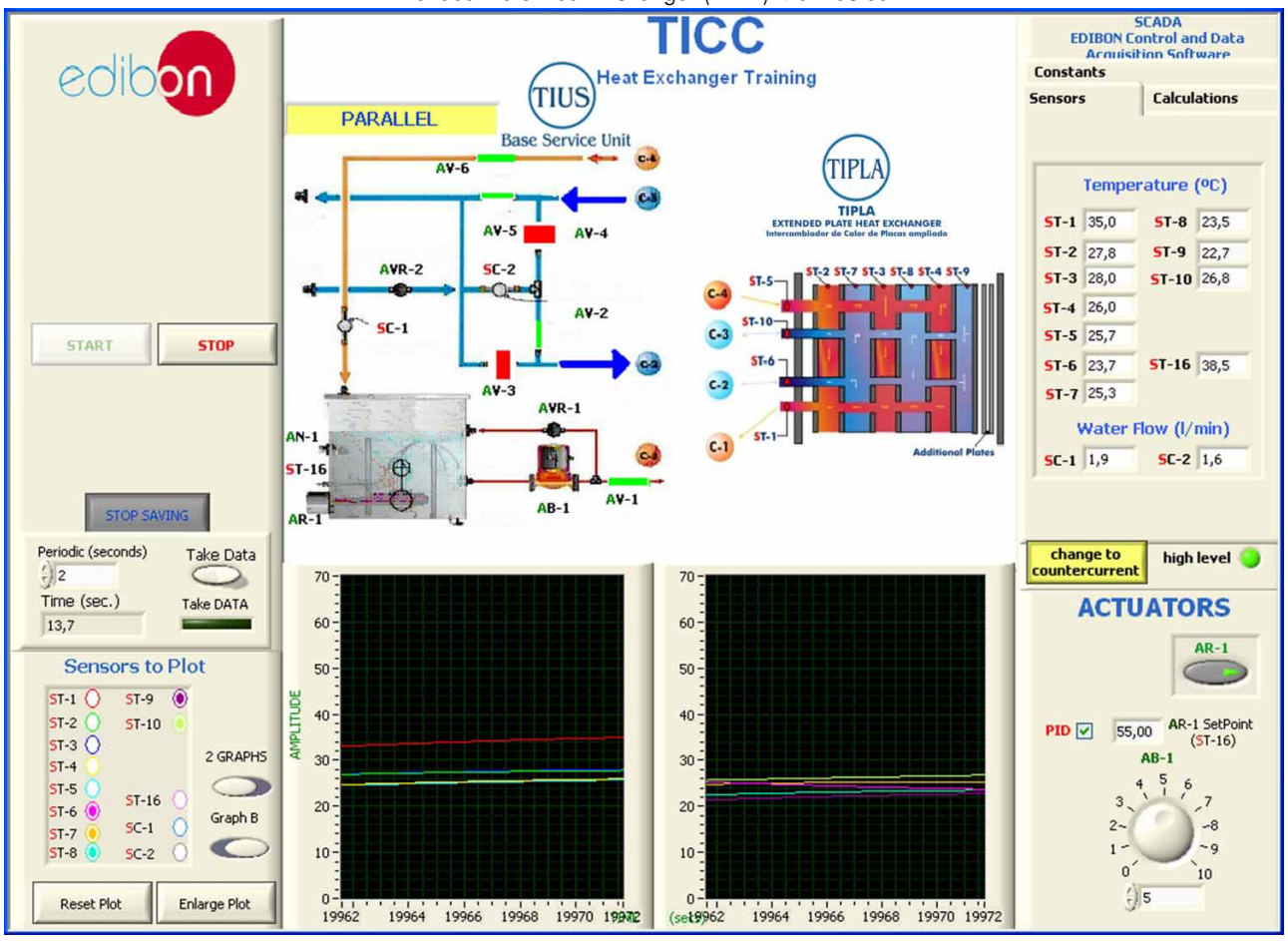
Continue...

Software Main Screens

Plate Heat Exchanger (TIPL) Main Screen



Extended Plate Heat Exchanger (TIPLA) Main Screen

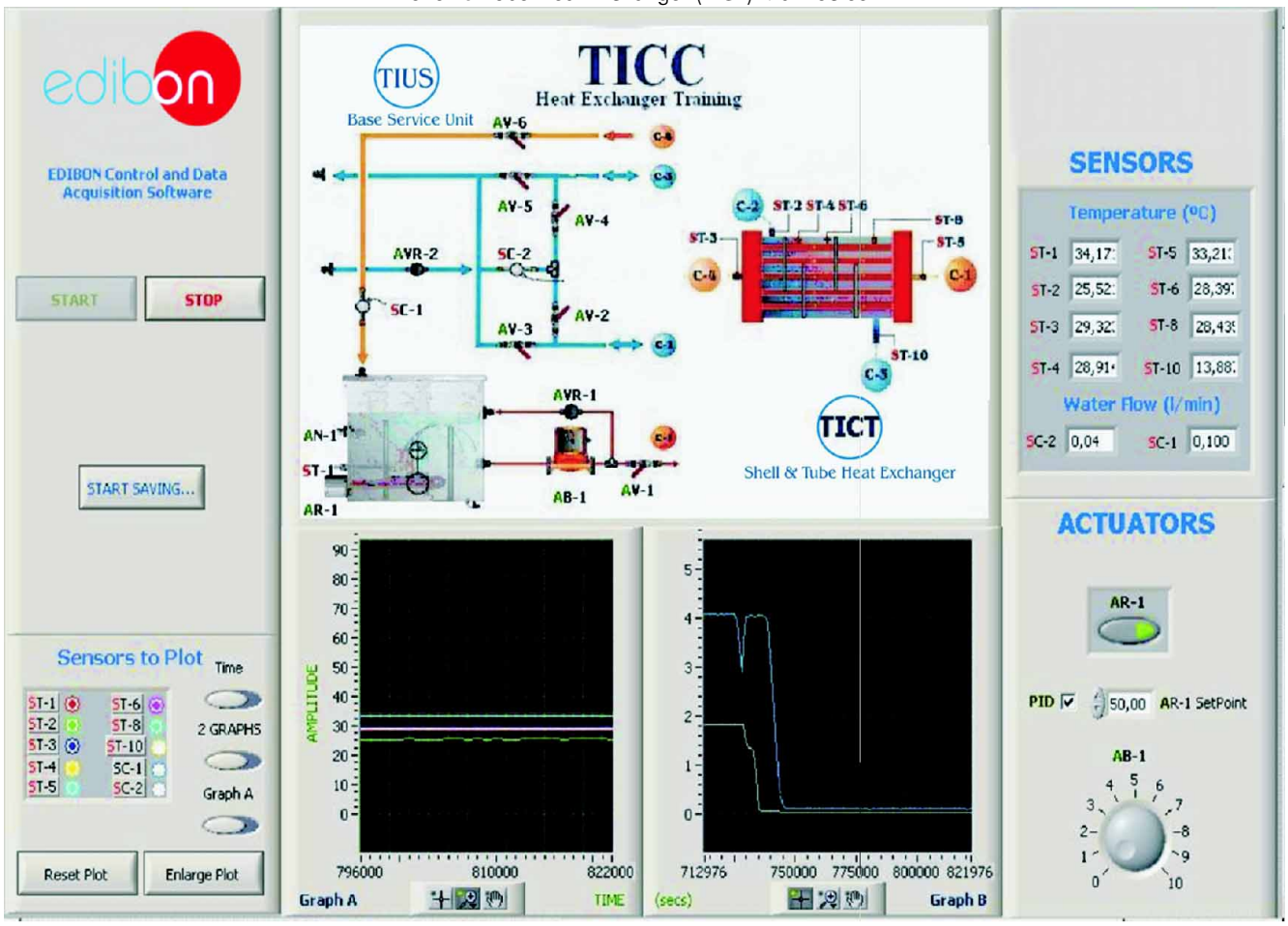


Note: ST=Temperature sensor. SC=Flow sensor. AR=Heating resistance. AB=Pump. AV= Valve. AVR= Regulation valve. AN= Level switch.

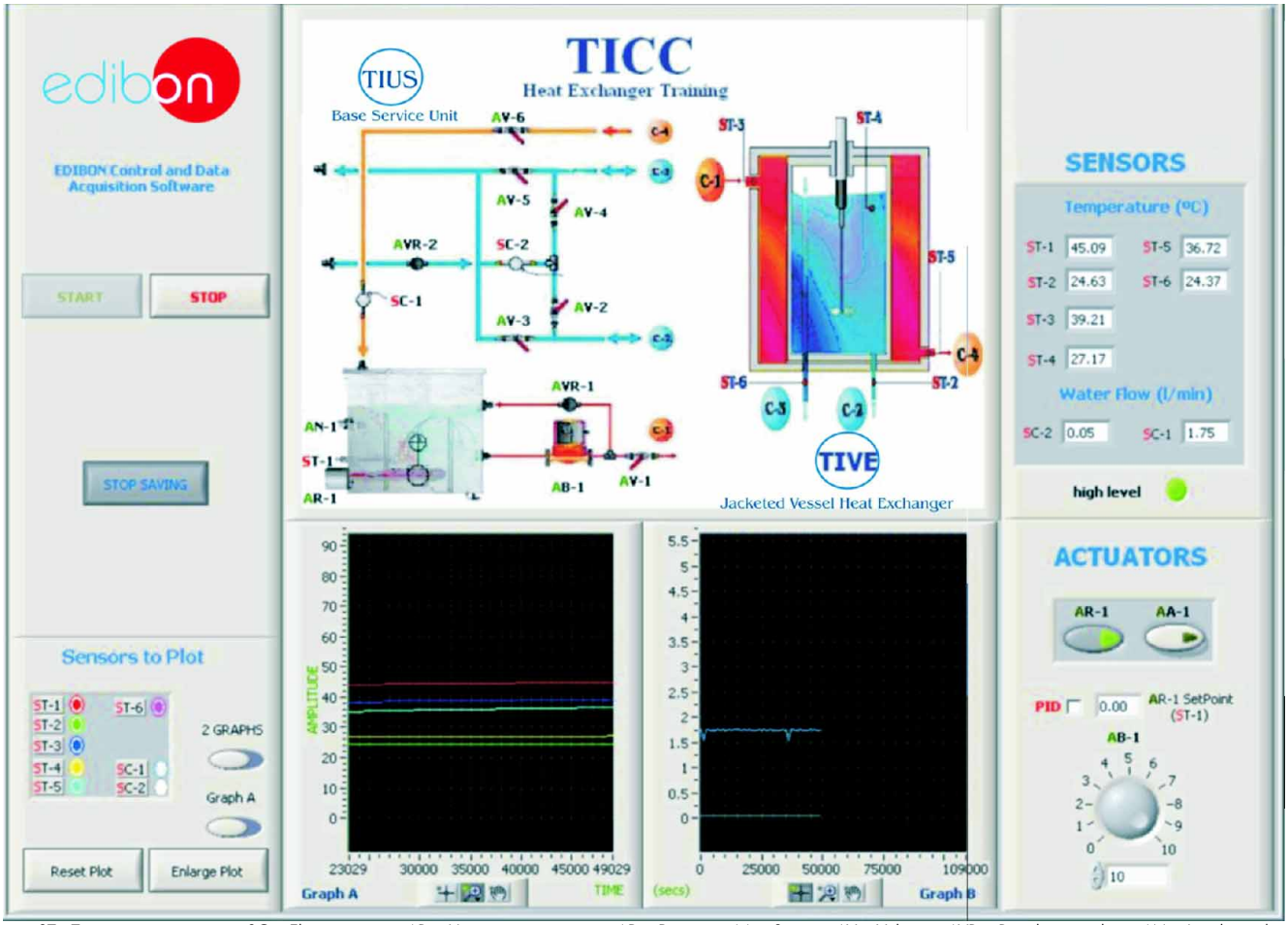
Continue...

Software Main Screens

Shell & Tube Heat Exchanger (TICT) Main Screen



Jacketed Vessel Heat Exchanger (TIVE) Main Screen

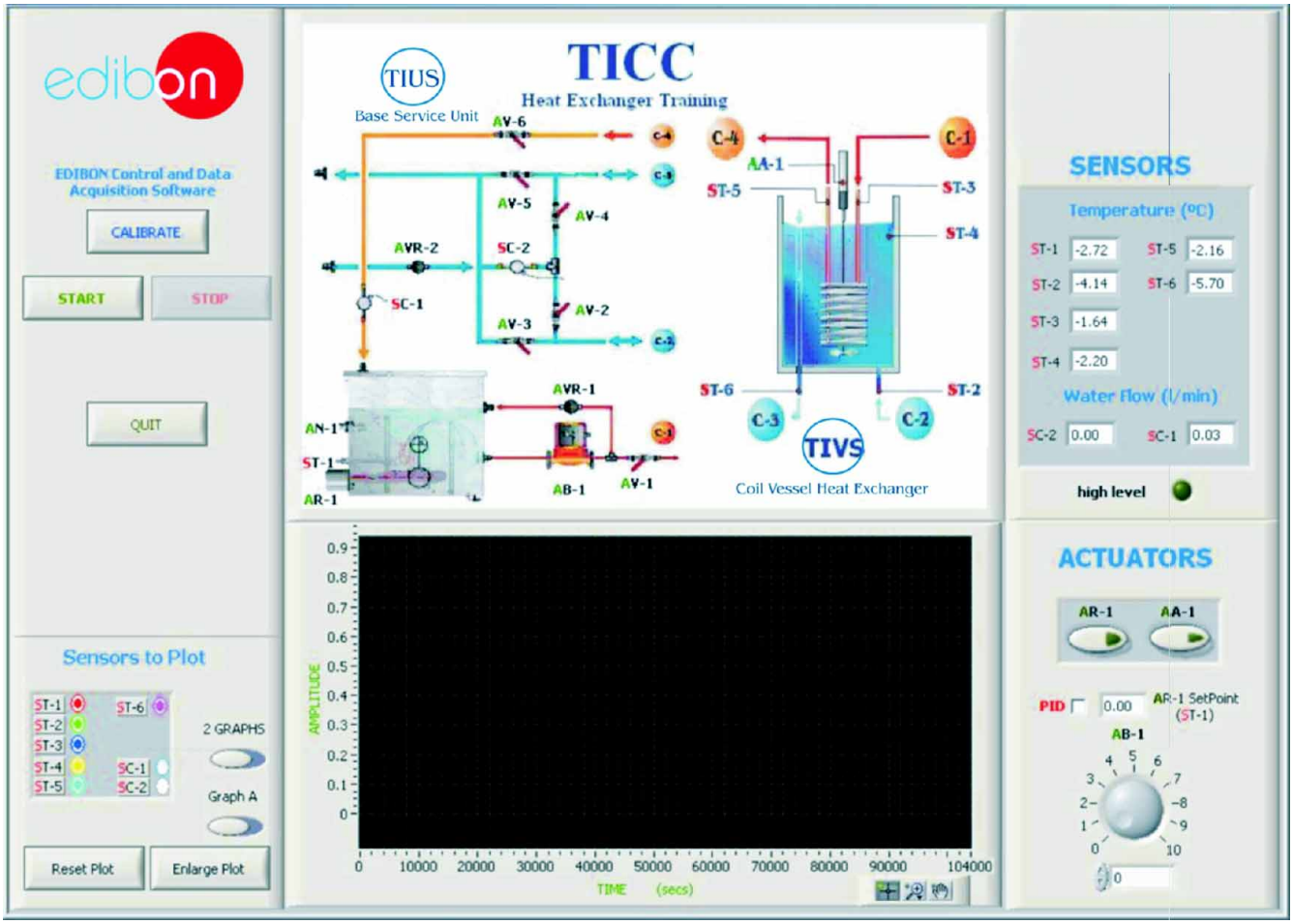


Note: ST=Temperature sensor. SC= Flow sensor. AR= Heating resistance. AB= Pump. AA= Stirrer. AV= Valve. AVR= Regulation valve. AN= Level switch.

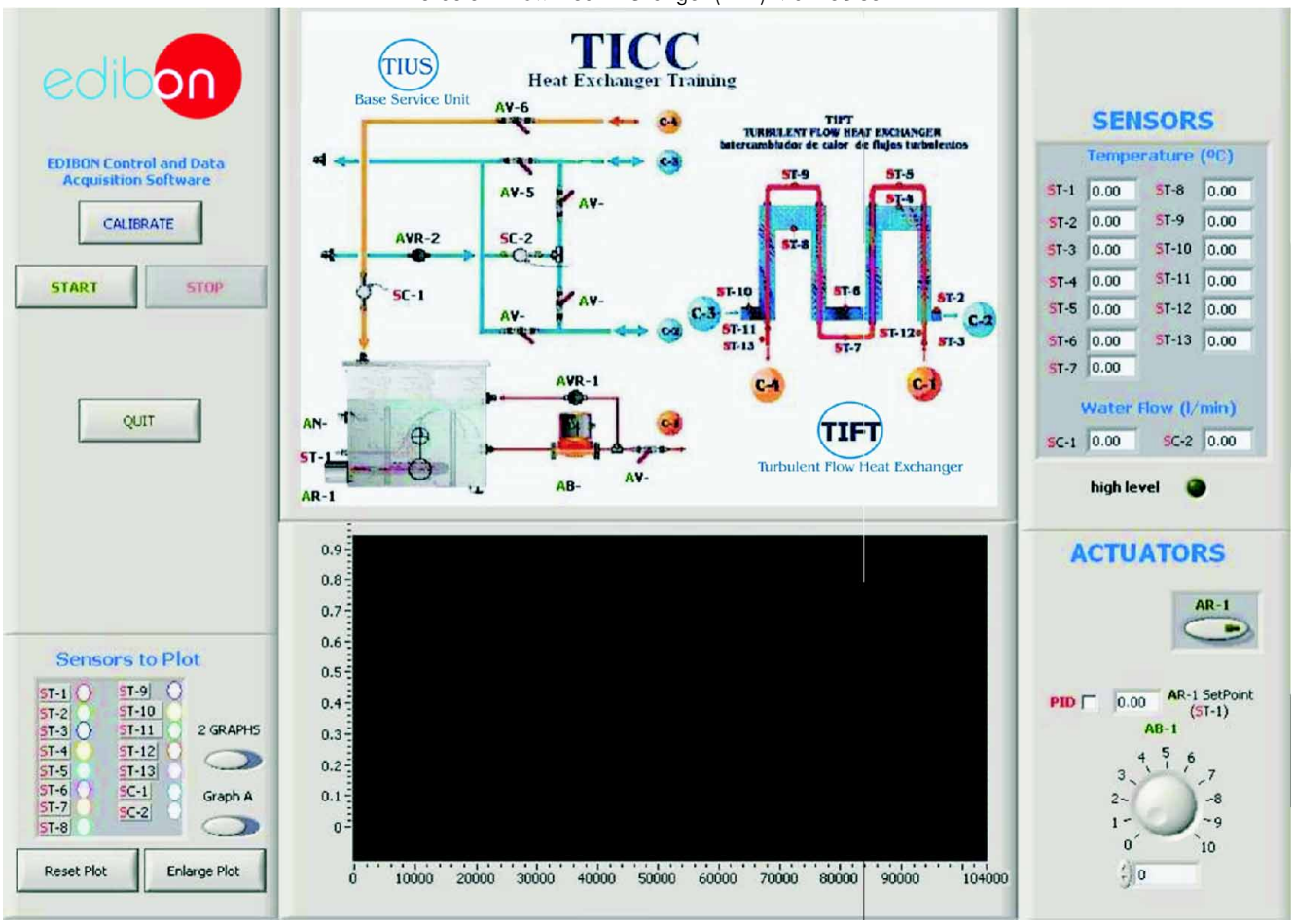
Continue...

Software Main Screens

Coil Vessel Heat Exchanger (TIVS) Main Screen



Turbulent Flow Heat Exchanger (TIFT) Main Screen

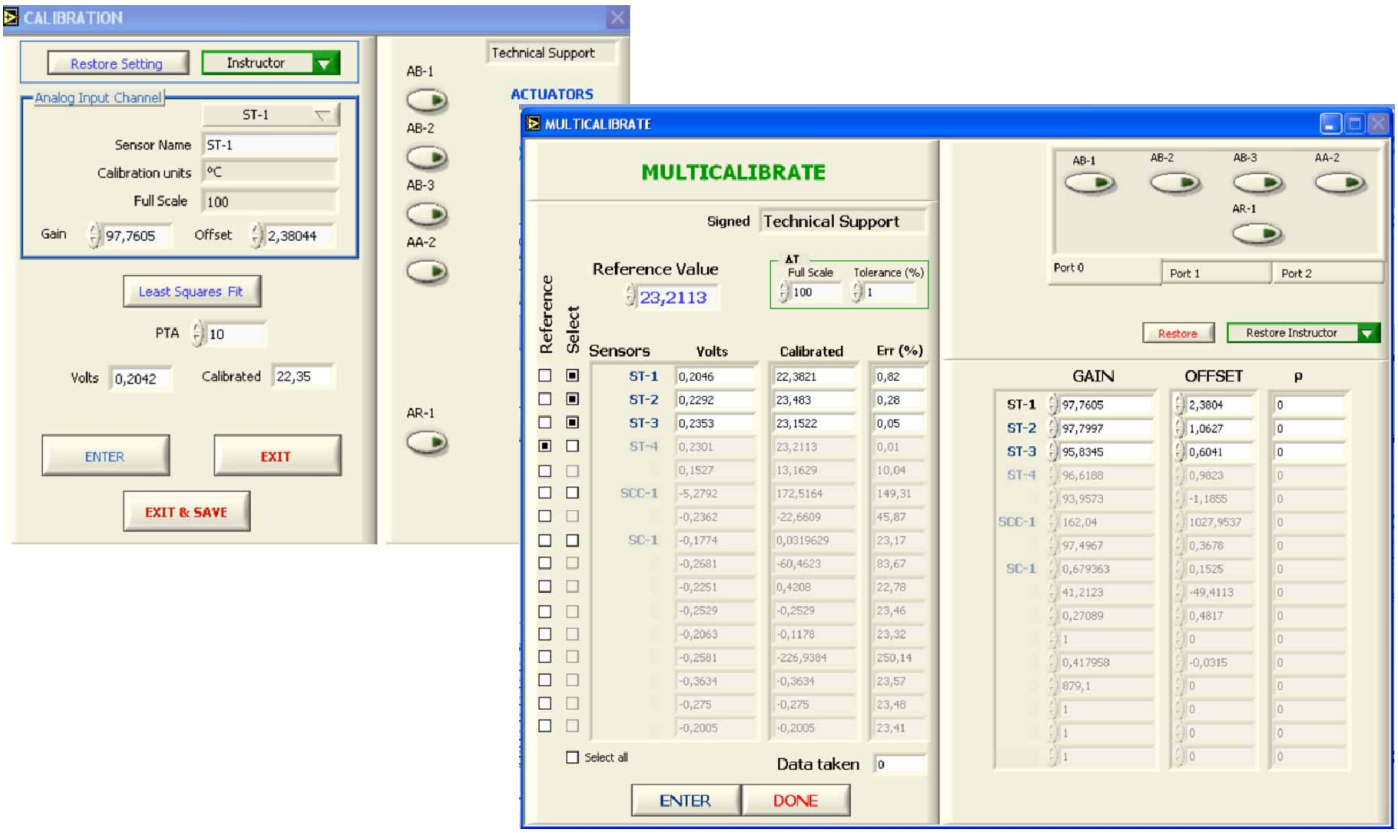


Note: ST=Temperature sensor. SC= Flow sensor. AR= Heating resistance. AB= Pump. AA= Stirrer. AV= Valve. AVR= Regulation valve. AN= Level switch.

Continue...

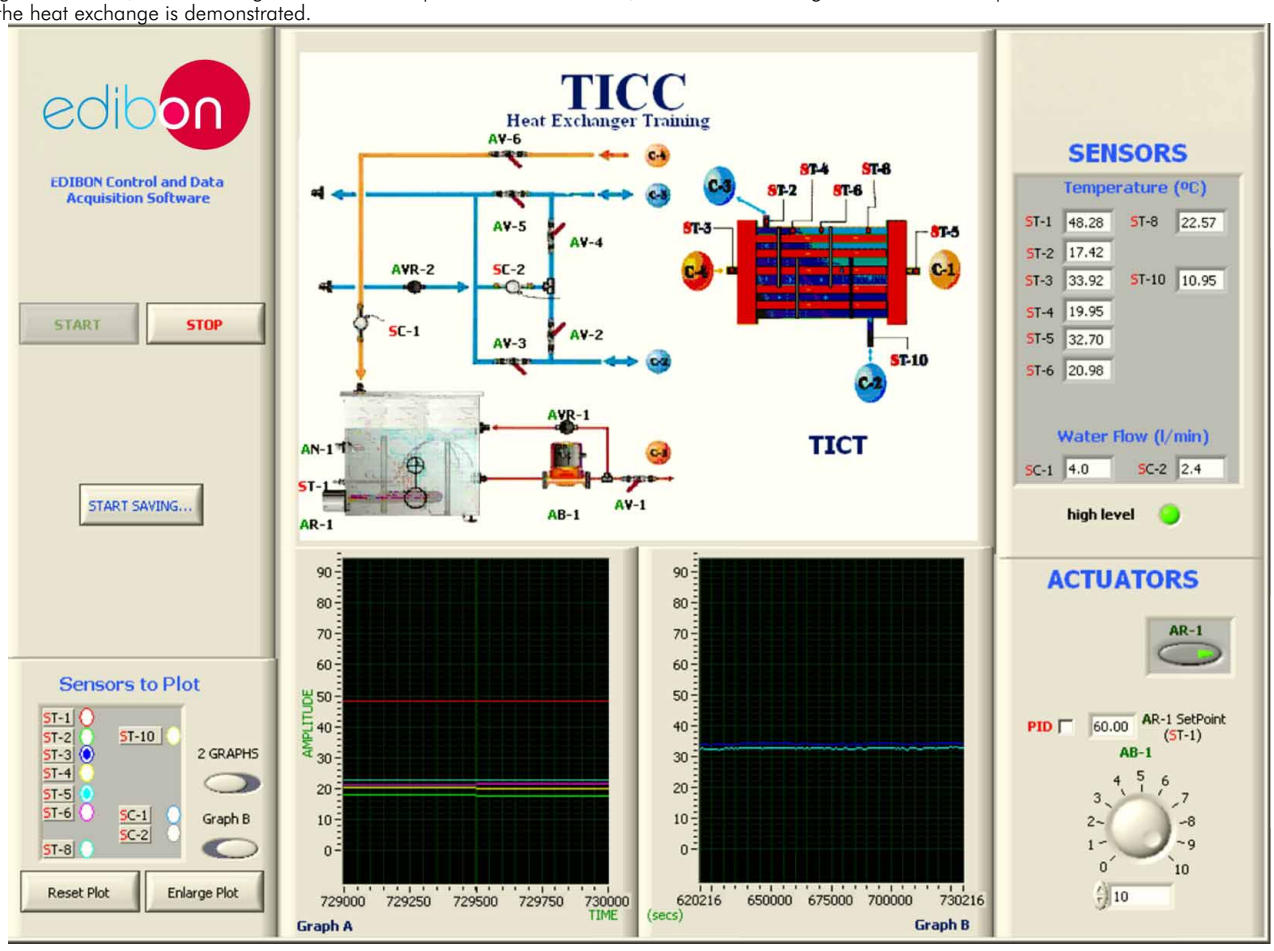
Software Main Screens

Examples of Sensors Calibration Screens



Some typical exercises results

The next figure shows how the heat exchange is produced.
The cold water go in the tube with ST-10. The second measure is ST-2, and, the next ST-4, ST-6, ST-8.
As it can be seen, the temperature of the cold water increases as long as it passes through the tube. In other side, the "hot" water comes from the tank at ST-1, and goes in the tube at ST-3. When it goes out from the tube, its temperature results ST-5.
Looking at the results, the increasing in cold water temperature is about 12°C, while the decreasing of in hot water temperature is 16°C more or less.
Then, the heat exchange is demonstrated.



Some Practical Possibilities of the System:

Practices to be done with the Concentric Tube Heat Exchanger (TITC):

1.- Global energy balance in the exchanger and the study of losses.
2.- Exchanger effectiveness determination. NTU Method.
3.- Study of the heat transfer under of countercurrent and parallel flow conditions.
4.- Flow influence in the heat transfer. Reynolds number calculation.
5.- Control system: Temperature sensors calibration.
6.- Control system: Flow sensors calibration.
7.- Study of the hysteresis of the flow sensor.

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

8.- Control of the TITC unit process through the control interface box without the computer.
9.- Visualization of all the sensors values used in the TITC unit process.
10.- Calibration of all sensors included in the TITC unit process.
11.- Hand on of all the actuators involved in the TITC 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 TITC unit.
16.- PLC structure.
17.- PLC inputs and outputs configuration.
18.- PLC configuration possibilities.
19.- PLC program languages.
20.- PLC different programming standard languages .
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 TITC unit process.
24.- Possibility of creating new process in relation with the TITC unit.
25.- PLC Programming Exercises.
26.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done with the Extended Concentric Tube Heat Exchanger (TITCA):

27.- Global energy balance in the exchanger and the study of losses.
28.- Exchanger effectiveness determination. NTU Method.
29.- Study of the heat transfer under of countercurrent and parallel flow conditions.
30.- Flow influence in the heat transfer. Reynolds number calculation.
31.- Control system: Temperature sensors calibration.
32.- Control system: Flow sensors calibration.
33.- Study of the hysteresis of the flow sensor.

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

34.- Control of the TITCA unit process through the control interface box without the computer.
35.- Visualization of all the sensors values used in the TITCA unit process.
36.- Calibration of all sensors included in the TITCA unit process.
37.- Hand on of all the actuators involved in the TITCA unit process.
38.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
39.- 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).
40.- PLC hardware general use and manipulation.
41.- PLC process application for TITCA unit.
42.- PLC structure.
43.- PLC inputs and outputs configuration.
44.- PLC configuration possibilities.
45.- PLC program languages.
46.- PLC different programming standard languages.
47.- New configuration and development of new process.
48.- Hand on an established process.
49.- To visualize and see the results and to make comparisons with the TITCA unit process.
50.- Possibility of creating new process in relation with the TITCA unit.
51.- PLC Programming Exercises.
52.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done with the Plate Heat Exchanger (TIPL):

53.- Global energy balance in the exchanger and the study of losses.
54.- Exchanger effectiveness determination. NTU Method.
55.- Study of the heat transfer under of countercurrent and parallel flo conditions.
56.- Flow influence in the heat transfer. Reynolds number calculation.
57.- Control system: Temperature sensors calibration.
58.- Control system: Flow sensors calibration.
59.- Study of the hysteresis of the flow sensor.

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

60.- Control of the TIPL unit process through the control interface box without the computer.
61.- Visualization of all the sensors values used in the TIPL unit process.
62.- Calibration of all sensors included in the TIPL unit process.
63.- Hand on of all the actuators involved in the TIPL unit process.
64.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
65.- 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).
66.- PLC hardware general use and manipulation.
67.- PLC process application for TIPL unit.
68.- PLC structure.
69.- PLC inputs and outputs configuration.
70.- PLC configuration possibilities.
71.- PLC program languages.
72.- PLC different programming standard languages.
73.- New configuration and development of new process.
74.- Hand on an established process.
75.- To visualize and see the results and to make comparisons with the TIPL unit process.
76.- Possibility of creating new process in relation with the TIPL unit.
77.- PLC Programming Exercises.
78.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done with the Extended Plate Heat Exchanger (TIPLA):

79.- Global energy balance in the exchanger and the study of losses.
80.- Exchanger effectiveness determination. NTU Method.
81.- Study of the heat transfer under of countercurrent and parallel flow conditions.
82.- Flow influence in the heat transfer. Reynolds number calculation.
83.- Control system: Temperature sensors calibration.
84.- Control system: Flow sensors calibration.
85.- Study of the hysteresis of the flow sensor.

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

86.- Control of the TIPLA unit process through the control interface box without the computer.
87.- Visualization of all the sensors values used in the TIPLA unit process.
88.- Calibration of all sensors included in the TIPLA unit process.
89.- Hand on of all the actuators involved in the TIPLA unit process.
90.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
91.- 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).
92.- PLC hardware general use and manipulation.
93.- PLC process application for TIPLA unit.
94.- PLC structure.
95.- PLC inputs and outputs configuration.
96.- PLC configuration possibilities.
97.- PLC program languages.
98.- PLC different programming standard languages.
99.- New configuration and development of new process.
100.- Hand on an established process.
101.- To visualize and see the results and to make comparisons with the TIPLA unit process.
102.- Possibility of creating new process in relation with the TIPLA unit.
103.- PLC Programming Exercises.
104.- Own PLC applications in accordance with teacher and student requirements.

Continue...

Some Practical Possibilities of the System:

Practices to be done with the Shell & Tube Heat Exchanger (TICT):

105.- Global energy balance in the exchanger and the study of losses.
106.- Exchanger effectiveness determination. NTU Method.
107.- Study of the heat transfer under of countercurrent and parallel flow conditions.
108.- Flow influence in the heat transfer. Reynolds number calculation.
109.- Control system: Temperature sensors calibration.
110.- Control system: Flow sensors calibration.
111.- Study of the hysteresis of the flow sensor.

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

112.- Control of the TICT unit process through the control interface box without the computer.
113.- Visualization of all the sensors values used in the TICT unit process.
114.- Calibration of all sensors included in the TICT unit process.
115.- Hand on of all the actuators involved in the TICT unit process.
116.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
117.- 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).
118.- PLC hardware general use and manipulation.
119.- PLC process application for TICT unit.
120.- PLC structure.
121.- PLC inputs and outputs configuration.
122.- PLC configuration possibilities.
123.- PLC program languages.
124.- PLC different programming standard languages.
125.- New configuration and development of new process.
126.- Hand on an established process.
127.- To visualize and see the results and to make comparisons with the TICT unit process.
128.- Possibility of creating new process in relation with the TICT unit.
129.- PLC Programming Exercises.
130.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done with the Jacketed Vessel Heat Exchanger (TIVE):

131.- Global balance of energy in the exchanger and losses study.
132.- Determination of the exchanger effectiveness. NTU Method.
133.- Influence of the flow in the heat transfer. Calculation of the number of Reynolds.
134.- Influence of the stirring of the vessel on the heat transfer when operating in batches.
135.- Influence of the vessel's water volume on the heat transfer when operating in batches.
136.- Control system: Temperature sensors calibration.
137.- Control system: Flow sensors calibration.
138.- Study of the hysteresis of the flow sensor.

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

139.- Control of the TIVE unit process through the control interface box without the computer.
140.- Visualization of all the sensors values used in the TIVE unit process.
141.- Calibration of all sensors included in the TIVE unit process.
142.- Hand on of all the actuators involved in the TIVE unit process.
143.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
144.- 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).
145.- PLC hardware general use and manipulation.
146.- PLC process application for TIVE unit.
147.- PLC structure.
148.- PLC inputs and outputs configuration.
149.- PLC configuration possibilities.
150.- PLC program languages.
151.- PLC different programming standard languages.
152.- New configuration and development of new process.
153.- Hand on an established process.
154.- To visualize and see the results and to make comparisons with the TIVE unit process.
155.- Possibility of creating new process in relation with the TIVE unit.
156.- PLC Programming Exercises.
157.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done with the Coil Vessel Heat Exchanger (TIVS):

158.- Global balance of energy in the exchanger and the study of losses.
159.- Determination of the exchanger effectiveness. NTU Method.
160.- Influence of the flow in the heating transfer. Calculation of Reynolds number.
161.- Influence of the stirring vessel in the heat transfer with operation in batches.
162.- Influence of the water volume in the vessel about the heat transfer with operation in batches.
163.- Control System: Temperature sensors calibration.
164.- Control System: Flow sensors calibration.
165.- Study of the hysteresis of the flow sensor.

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

166.- Control of the TIVS unit process through the control interface box without the computer.
167.- Visualization of all the sensors values used in the TIVS unit process.
168.- Calibration of all sensors included in the TIVS unit process.
169.- Hand on of all the actuators involved in the TIVS unit process.
170.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
171.- 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).
172.- PLC hardware general use and manipulation.
173.- PLC process application for TIVS unit.
174.- PLC structure.
175.- PLC inputs and outputs configuration.
176.- PLC configuration possibilities.
177.- PLC program languages.
178.- PLC different programming standard languages.
179.- New configuration and development of new process.
180.- Hand on an established process.
181.- To visualize and see the results and to make comparisons with the TIVS unit process.
182.- Possibility of creating new process in relation with the TIVS unit.
183.- PLC Programming Exercises.
184.- Own PLC applications in accordance with teacher and student requirements.

Practices to be done with the Turbulent Flow Heat Exchanger (TIFT):

185.- Global energy balance in the exchangers and loss study.
186.- Determination of the exchanger effectiveness. NTU Method.
187.- Study of the heat transfer in crosscurrent and parallel flow conditions.
188.- Flow influence in heat transfer. Reynolds number calculation.
189.- Obtaining of the correlation that relates Nusselt number with Reynolds number and Prandtl number.
190.- Obtaining of the heat transfer coefficients by convection.
191.- Control system: Temperature sensors calibration.
192.- Control system: Flow sensors calibration.
193.- Study of the hysteresis in the flow sensors.

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

194.- Control of the TIFT unit process through the control interface box without the computer.
195.- Visualization of all the sensors values used in the TIFT unit process.
196.- Calibration of all sensors included in the TIFT unit process.
197.- Hand on of all the actuators involved in the TIFT unit process.
198.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
199.- 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).
200.- PLC hardware general use and manipulation.
201.- PLC process application for TIFT unit.
202.- PLC structure.
203.- PLC inputs and outputs configuration.
204.- PLC configuration possibilities.
205.- PLC program languages.
206.- PLC different programming standard languages.
207.- New configuration and development of new process.
208.- Hand on an established process.
209.- To visualize and see the results and to make comparisons with the TIFT unit process.
210.- Possibility of creating new process in relation with the TIFT unit.
211.- PLC Programming Exercises.
212.- Own PLC applications in accordance with teacher and student requirements.

Continue...

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS

Expansion 1:

EDIBON PATENT

Teaching Technique used

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

8 available Heat Exchangers

1 UNIT = 30 STUDENTS can work simultaneously

Base Service Unit (TIUS)

Control Interface Box

Computer Control Software: Computer Control+ Data Acquisition+ Data Management

Teacher's Central Computer

Mini Scada-Net Software

30 Student Post

LOCAL NET

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL + MULTI STUDENT POST

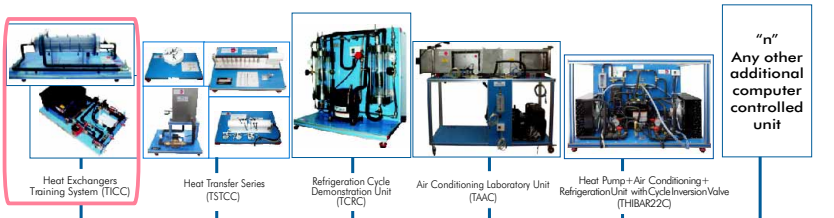
Note: The Mini ESN system can be used with any EDIBON computer controlled unit.

Expansion 2:

EDIBON PATENT

Teaching Technique used

(12) ESN. Multipost EDIBON Scada-Net System



Heat Exchangers Training System (TICC)

Heat Transfer Series (TSTCC)

Refrigeration Cycle Demonstration Unit (TCRC)

Air Conditioning Laboratory Unit (TAAC)

Heat Pump+Air Conditioning+ Refrigeration Unit with Cycle Inversion Valve (THIBAR22C)

"n" Any other additional computer controlled unit

(1)

PLC

CENTRAL PLC

"n" (1)Control Interface

"n" PLC

"REAL TIME MULTICONTROL SYSTEMS"

"SCADA" CENTRAL COMPUTER

Option

"ETDL" EDIBON TECHNICAL DISTANCE LEARNING SYSTEM

30 Student Post

LOCAL NET

30 students can work at the same time

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL + MULTI STUDENT POST

Note: The ESN system can use any EDIBON computer controlled unit.

ORDER INFORMATION

Items always supplied as minimum configuration

Common items for Heat Exchangers type "TI":

(1) TIUS. **Base Service Unit.** (Common for Heat Exchangers type "TI" and can work with one or several exchangers).

(2) TICC/CIB. **Control Interface Box.** (Common for Heat Exchangers type"TI" and can work with one or several exchangers).

(3) DAB. **Data Acquisition Board.** (Common for Heat Exchangers type "TI").

(4) Heat Exchangers available to be used with the Base Service Unit:

- (4.1) TITC. **Concentric Tube Heat Exchanger**, and / or
- (4.2) TITCA. **Extended Concentric Tube Heat Exchanger**, and / or
- (4.3) TIPL. **Plate Heat Exchanger**, and / or
- (4.4) TIPLA. **Extended Plate Heat Exchanger**, and / or
- (4.5) TICT. **Shell & Tube Heat Exchanger**, and / or
- (4.6) TIVE. **Jacketed Vessel Heat Exchanger**, and / or
- (4.7) TIVS. **Coil Vessel Heat Exchanger**, and / or
- (4.8) TIFT. **Turbulent Flow Heat Exchanger.**

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

(6) **Manuals**.

Additional and optional items

PLC. Industrial Control using PLC (7 and 8):

(7) PCL-PI.PLC Module. (Common for Heat Exchangers type "TI" and can work with one or several exchangers).

(8) TICC/PLC-SOF. PLC Control Software. (Each Heat Exchanger has its own Software).

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

(10) TICC/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, 220 V. 50Hz or 110V. 60 Hz.

-Water supply (0 to 6l./min. approx)

-Drainage.

-Computer (PC).

DIMENSIONS & WEIGHTS

TIUS Unit:	-Dimensions: 1100 x 630 x 500 mm. approx. -Weight: 50 Kg. approx.
TITC Unit:	-Dimensions: 1100 x 630 x 320 mm. approx. -Weight: 20 Kg. approx.
TITCA Unit:	-Dimensions: 1500 x 700 x 320 mm. approx. -Weight: 30 Kg. approx.
TIPL Unit:	-Dimensions: 1100 x 630 x 320 mm. approx. -Weight: 20 Kg. approx.
TIPLA Unit:	-Dimensions: 1200 x 700 x 320 mm. approx. -Weight: 25 Kg. approx.
TICT Unit:	-Dimensions: 1100 x 630 x 400 mm. approx. -Weight: 30 Kg. approx.
TIVE Unit:	-Dimensions: 1100 x 630 x 700 mm. approx. -Weight: 35 Kg. approx.
TIVS Unit:	-Dimensions: 1110 x 630 x 700 mm. approx. -Weight: 30 Kg. approx.
TIFT Unit:	-Dimensions: 1100 x 630 x 350 mm. approx. -Weight: 20 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.

AVAILABLE VERSIONS

Offered in this catalogue:

-TICC. Computer Controlled **Heat Exchangers Training System.**

Offered in other catalogue:

-TICB. **Heat Exchangers Training System.**

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

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