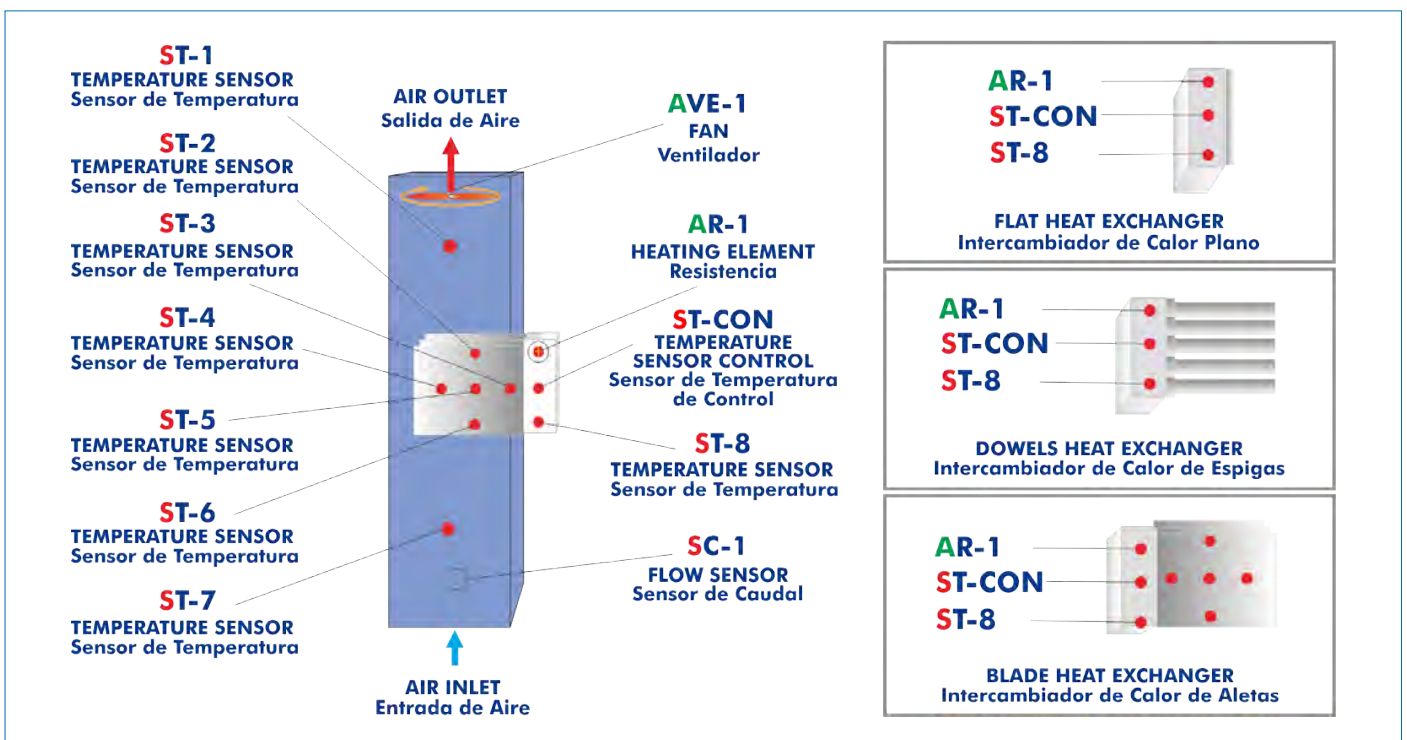


Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



ISO 9001: Quality Management (for Design, Manufacturing, Commercialization and After-sales service)



European Union Certificate (total safety)



Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)



"Worlddidac Quality Charter" and Platinum Member of Worlddidac

INTRODUCTION

Convection is one of the three basic forms of heat transfer. It is characterized by being generated through a fluid (liquid or gas) that transports heat between areas with different temperature. Convection itself is the heat transfer through the movement of fluids.

There are free and forced convection.

In the free or natural heat transfer, a fluid is hotter or colder and when it is in contact with a solid surface it causes a flow due to the difference in densities that result from the temperature gradient in the fluid. Density differences cause a slow flow of the fluid with a more intense heat transfer.

In the forced convection, a blower or a pump generates the flow. In this case, the heat transferred to the fluid particles is lower; however, more heat than with natural convection is transferred due to a higher mass flow.

GENERAL DESCRIPTION

The Free and Forced Convection Heat Transfer Unit, "TCLFB", allows to study the efficiency of different exchangers, analyzing the heat transmission coefficients of each exchanger exposed to different airflows.

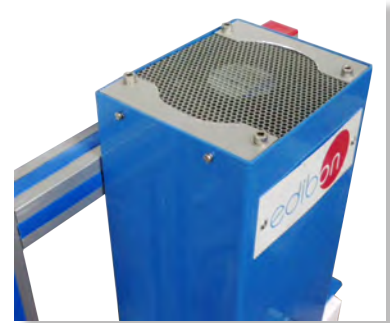
Fan placed in the upper part of the tunnel allows controlling the airflow that goes through the tunnel.

Electronic console contains the control circuits to measure temperatures, electrical control, electrical supply and speed control of the fan.

The airflow is measured with a flow sensor set at the inferior part of the tunnel.

This unit allows making a study of the heat transmission in three different types of exchangers:

- Flat exchanger.
- Pins exchanger.
- Fins exchanger.



TCLFB detail

SPECIFICATIONS

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

Main metallic elements made of stainless steel.

Diagram in the front panel with distribution of the elements similar to the real one.

Stainless steel tunnel of rectangular section, 700 mm long, painted and resistant to corrosion.

In the tunnel three type of different heat exchangers can be set.

Methacrylate viewer that allows a good visualization of the exchanger that is in use.

Stabilizers to guarantee an uniform air flux.

Eight temperature sensors, ("J" type):

Two temperature sensors measure the air temperature at the inlet and outlet of area of heat exchange.

Temperature measurements, at different distances of the base of the pins and fins exchangers, are made by five temperature sensors that are introduced by one side of the tunnel.

Temperature sensor in the exchangers.

Maximum working temperature: 120 °C.

Flow sensor for measuring the air flow generated.

Three aluminum exchangers:

Flat heat exchanger: 100 x 100 mm.

Pins heat exchanger: seventeen pins, each one of 10 mm diameter and 125 mm longitude.

Fins heat exchanger: nine fins, each one of 100 x 125 mm.

Variable power heating element: 150 W for each exchanger.

Variable speed fan, which generates air flux through the tunnel, range: 0 – 1200 l/min.

Power Measurement.

Electronic console:

Metallic box.

Temperature sensors connections.

Selector for the temperature sensors.

Digital display for the temperature sensors.

Flow sensor connector

Heating element connector.

Heating element switch.

Fan switch.

Fan regulator.

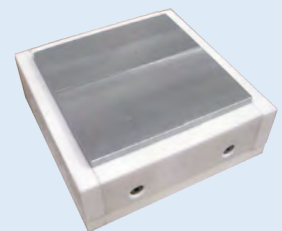
Wattmeter display.

Main switch.

Cables and accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

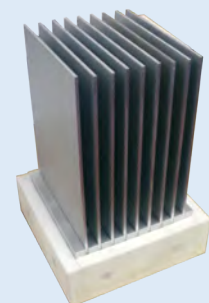
Included exchangers



Flat exchanger



Pins exchanger



Fins exchanger

EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Demonstration of the basic principles of free and forced convection.
- 2.- Comparison between free and forced convection.
- 3.- Free convection in flat surfaces.
- 4.- Forced convection in flat surfaces.
- 5.- Dependence of the heat transmission with the temperature.
- 6.- Dependence of the heat transmission with the speed of the fluid.
- 7.- Dependence of the heat transmission with the exchanger geometry.
- 8.- Temperature distribution in the additional surfaces.
- 9.- Study of the advantage of using pinned and finned surfaces in heat transmission in free convection.
- 10.- Study of the advantage of using pinned and finned surfaces in heat transmission in forced convection.
- 11.- Comparative study between the free convection of a horizontal surface and vertical surface.
- 12.- Determination of the Reynolds and Nusselt numbers.

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.

DIMENSIONS AND WEIGHTS

TCLFB:

Unit:

- Dimensions: 370 x 610 x 920 mm approx.
(14.56 x 24.01 x 36.22 inches approx.)
- Weight: 25 kg approx.
(55.11 pounds approx.)

Electronic console:

- Dimensions: 490 x 330 x 310 mm approx.
(19.29 x 12.99 x 12.20 inches approx.).
- Weight: 10 kg approx.
(22 pounds approx.).

SIMILAR UNITS AVAILABLE

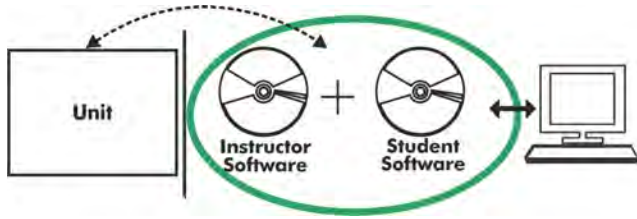
Offered in this catalog:

- TCLFB. Free and Forced Convection Heat Transfer Unit.

Offered in other catalog:

- TCLFC. Computer Controlled Free and Forced Convection Heat Transfer Unit.
- TXC/FF. Free and Forced Convection Heat Transfer Module for TSTCC.
- TXC/FFB. Free and Forced Convection Heat Transfer Module for TSTCB.

TCLFB/ICAI. Interactive Computer Aided Instruction Software:



With no physical connection between unit and computer, this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

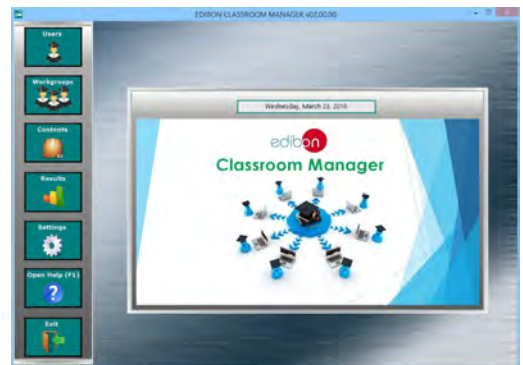
Instructor Software

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

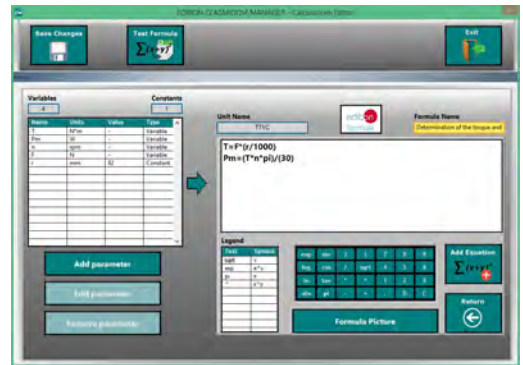
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

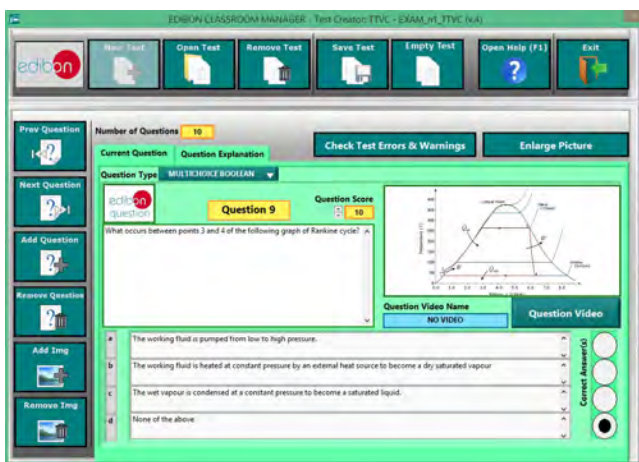
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- Updatable Contents.
- Report generation, User Progression Monitoring and Statistics.



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question



ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

Optional
Student Software

- ESL-SOF. EDIBON Student Labsoft (Student Software).

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

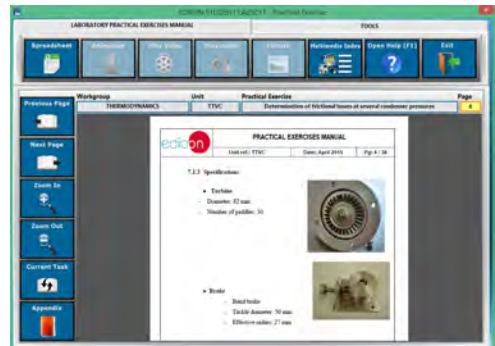
- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.
- Test self-correction.
- Calculations computing and plotting.
- Equation System Solver Engine.
- User Monitoring Learning & Printable Reports.
- Multimedia-Supported auxiliary resources.

For more information see ICAI catalogue. Click on the following link:

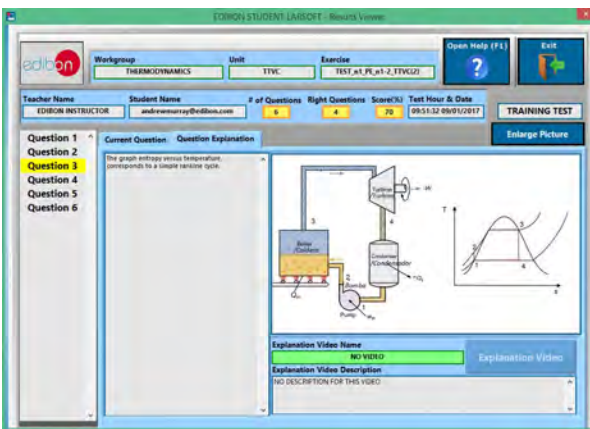
www.edibon.com/en/files/expansion/ICAI/catalog



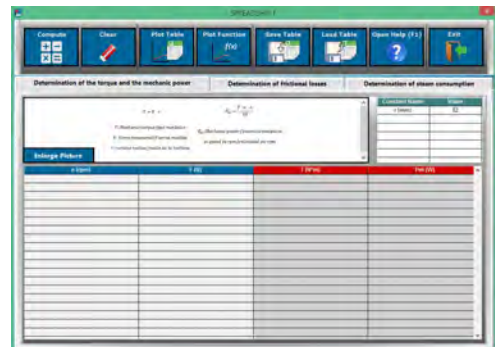
ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

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



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Edition: ED01/20
Date: September/2020

REPRESENTATIVE:

