Cross Flow Heat Exchanger
TIFCB

Technical Teaching Equipment

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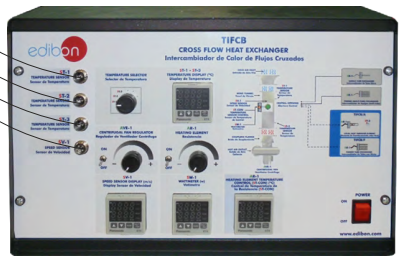
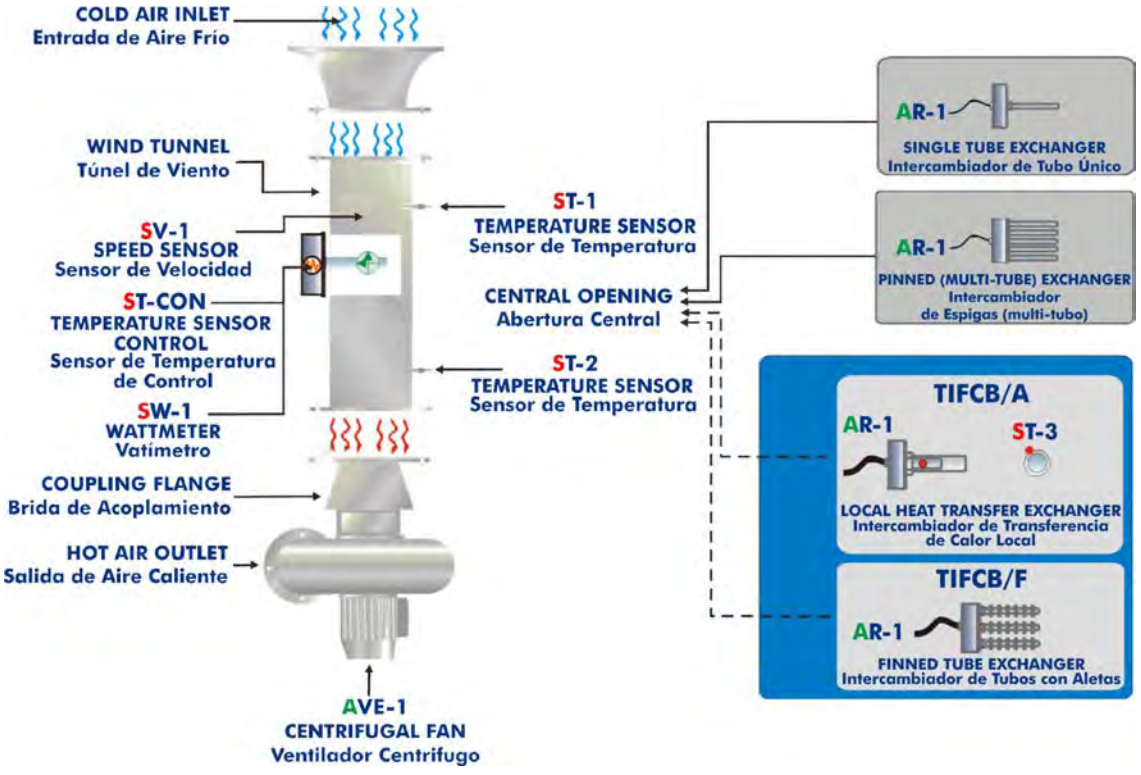
Products
Products range
Units
9.-Thermodynamics & Thermotechnics

Different exchangers in detail



Electronic console

PROCESS DIAGRAM AND UNIT 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 and
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INTRODUCTION

Many types of heat exchangers have been designed to transfer heat between two fluids. In one of the most common systems heat is transferred between one fluid, which flows through a set of tubes, and another fluid, which flows outside in transverse direction.

This arrangement is known as cross flow heat exchanger. The tubes may be arranged in different ways in order to increase the efficiency of the heat exchanger and reduce its size. The objective of the arrangements of all the components is to promote turbulences in the fluid around the set of tubes.

The TIFCB unit designed by EDIBON is a teaching unit used for the study of the heat transfer phenomenon by convection in a cross-flow. The student will have a series of practical exercises to put in practice the knowledge acquired theoretically.

GENERAL DESCRIPTION

The Cross Flow Heat Exchanger (TIFCB) basically consists of a rectangular wind tunnel made of stainless steel, resistant to corrosion. It has a bell-shaped inlet and a central opening arranged longitudinally with two supporting elements made of stainless steel to retain the plates with the different exchangers.

The tunnel is installed over the inlet of a powerful centrifugal fan and connected to it by an elastic coupling flange. This fan aspirates air from the tunnel and expels it outside, making air flow along the tunnel. There is a variable speed drive to control the air flow through the tunnel with the fan control.

The TIFCB unit includes two types of exchangers: a pinned (multi-tube) exchanger and a single tube exchanger, where the heating element is lodged.

To perform all the practical exercises the unit has two temperature sensors to measure the air temperature in the tunnel, before and after passing through the heat exchanger, a control temperature sensor lodged in the heating element and a speed sensor that allows the user to determine the air speed along the tunnel.

Available two optional exchangers: Local Heat Transfer Exchanger (TIFCB/A) and Finned Tube Exchanger (TIFCB/F).

SPECIFICATIONS

Frame made of anodized aluminum and steel and panels made of painted steel.

Main metallic elements made of stainless steel.

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

Stainless steel vertical tunnel of 1200 mm. long of rectangular section (65 x 170 mm.) and resistant to corrosion.

Rectangular central opening of 200 x 150 mm. in the tunnel with two supports made of stainless steel to hold the plates with the exchangers.

Elastic tunnel - fan coupling flange with clamp.

Centrifugal fan, with a variable-speed drive; operating range: 0-10 m/s.

Two "J" type temperature sensors.

Speed sensor to know the air speed, range: 0-15 m/s.

Heating element with a diameter of 16 mm. and 80 mm. long (500W) with control thermocouple.

Wattmeter to measure the power supplied by the heating elements.

Included exchangers:

- Single tube exchanger: one exchangeable plate made of Teflon with flat surface with a central bore to install the single tube heating element.
- Pinned (multi-tube) exchanger: one exchangeable plate made of Teflon with 27 fixed tubes made of PVC of 16 mm. approximately of diameter arranged in an equilateral triangle. The tubes are arranged in six rows and there is a removable tube close to the center of each row. It can be replaced by the heating element to measure the effects of the rows of adjacent tubes on the heat transfer rate of the heating element.

Electronic console:

- Metallic box.
- Connections for temperature sensors. Digital display for temperature sensors. Selector for temperature sensors.
- Connection for speed sensor (to know the air speed).
- Fan speed regulator.
- Digital display for air speed.
- Heating element regulator.
- Digital display for heating element control temperature (ST-CON).
- Digital display for wattmeter.

Cables and Accessories, for normal operation.

Manuals:

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

Optional exchangers (not included in the standard supply):

TIFCB/A. Local Heat Transfer Exchanger.

- Exchangeable plate made of Teflon with a central bore of 40 mm. of diameter that allows to hold the direct transfer heating element (TDC).
- Knurled and marked knob made of Teflon that allows to rotate the TDC circumferentially.
- Heating element with a diameter of 16 mm. and 70 mm. long (500W) and with control thermocouple.
- "J" type thermocouple in the copper surface.

TIFCB/F. Finned Tube Exchanger.

- Plate made of Teflon with 10 copper tubes with finned surface. The exchanger has four rows of finned tubes, so that the tubes are arranged in an equilateral triangle with a distance of 30 mm. between the centers. There is a removable finned tube close to the center of each row. It can be replaced by the finned heating element.
- Heating element with a diameter of 16 mm. and 100 mm. long (500W) with control thermocouple.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Investigation of convective processes.

2.- Determination of heat transfer in a single tube exchanger.

3.- Determination of heat transfer in a pinned (multi-tube) exchanger.

4.- Determination of the average heat transfer in a pinned (multi-tube) exchanger.

5.- Deduction of the relationship between Nusselt, Reynolds and Prandtl numbers.

Practical possibilities with the optional TIFCB/A exchanger:

6.- Determination of the existing relationship between Nusselt and Reynolds number using the direct heat transfer element.

7.- Determination of the local variation in the convective heat transfer coefficient, using the direct heat transfer element.

Practical possibilities with the optional TIFCB/F exchanger:

8.- Effect produced by the external fins in the heat transfer process.

9.- Determination of the heat transfer in a finned tube exchanger.

REQUIRED SERVICES

- Electrical supply: single-phase, 220V/50Hz or 110V/60Hz.

DIMENSIONS & WEIGHTS

TIFCB:

Unit:	-Dimensions:	900 x 450 x 2000 mm. approx. (35.43x17.71 x 78.74 inches approx.).
	-Weight:	100 Kg. approx. (220 pounds approx.).
Electronic console:	-Dimensions:	490 x 330 x 310 mm. approx. (19.29 x 12.99 x 12.2 inches approx.).
	-Weight:	10 Kg. approx. (22 pounds approx.).

OPTIONAL EXCHANGERS

- TIFCB/A. Local Heat Transfer Exchanger.

- TIFCB/F. Finned Heat Exchanger.

AVAILABLE VERSIONS

Offered in this catalogue:

- TIFCB. Cross Flow Heat Exchanger.

Offered in other catalogues:

- TIFCC. Computer Controlled Cross Flow Heat Exchanger.

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

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