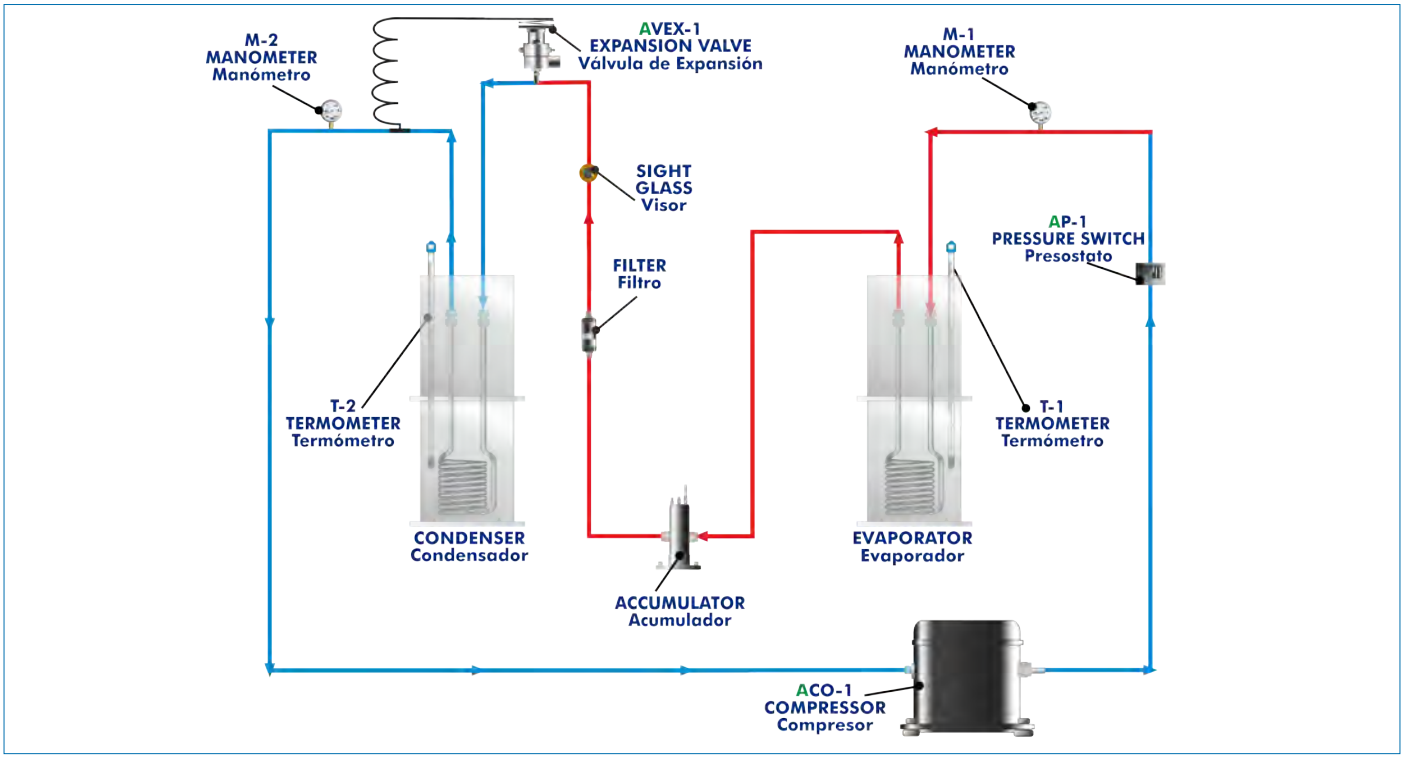
Simple Compression Refrigeration Circuit Unit

TSCR

Engineering and Technical Teaching Equipment

www.edibon.com
PRODUCTS
90.- THERMODYNAMICS & THERMOTECHNICS

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 Certificate and Worlddidac Member

INTRODUCTION

Cooling is the process of reducing and maintaining the temperature of an object or space. A very common refrigeration system is the so-called compression refrigeration system, in which the flowing of a fluid is mechanically forced inside a closed circuit, creating high and low pressure areas so that the fluid can absorb heat in one place and dissipate it in the other place. In this system, the refrigerant flows through four main elements: compressor, condenser, expansion element and evaporator. It is an advantage in a cooling system the fact that the refrigerant has a low boiling temperature at low pressure. For that reason, evaporation takes place at the low pressure side. During the refrigerant evaporation, heat is removed from the environment, that is to say, it is cooled. Condensation takes place at the high pressure side after the evaporator. In this case heat is discharged into the environment. If not the cooling effect but the discharged heat is used, then it is called a heat pump.

The vapor compression refrigeration and the heat pump cycle are very important in food and drug preservation, air conditioning and heat pumps, as well as for other industrial and commercial process.

The Simple Compression Refrigeration Circuit Unit "TSCR" allows a clear visualization of all the processes of a compression refrigeration system and the heat pump cycle and the directly tangible observation of the heat exchangers cooling and heating.

GENERAL DESCRIPTION

The Simple Compression Refrigeration Circuit Unit "TSCR" represents the typical compression refrigeration system with compressor.

The evaporator and the condenser have been designed as a copper pipe coil immersed in a water-filled tank, which simulates the environment.

There is a thermostatic expansion valve working as expansion element and the aggregate state of the refrigerant can be visualized through a sight glass located before the expansion valve.

To make energy balances and calculate the amount of heat removed in the evaporator by the cold water or the amount of heat discharged in the condenser by the hot water to the environment there are:

-Two thermometers that measure the water temperature in the tanks.

-Two manometers that indicate the system pressures in the high and low pressure sides. The evaporation temperature of the refrigerant is indicated in an additional scale in the manometer.

As safety element, the unit includes a pressure switch, which stops the compressor if pressure is high.

SPECIFICATIONS

Experimental unit for the training of apprentices in refrigeration.

Anodized aluminum frame and panels made of painted steel.

The unit includes wheels to facilitate its mobility.

Main metallic elements made of stainless steel.

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

Common compression refrigeration system, consisting of:

- Compressor of piston type:
  - Power consumption: 104W at 5/40°C.
  - Refrigeration capacity: 278W at 5/40°C.
- Thermostatic expansion valve.
- Evaporator: copper pipe coil.
- Condenser: copper pipe coil.
- Receiver.

Four water tanks. Capacity: 2000 ml.

Two thermometers to demonstrate the heating and cooling effect in the water tanks, range: -10 to 60°C.

Two manometers with temperature scale for the refrigerant indicate the values of the refrigerant in the high and low pressure sides:

- Low pressure manometer in the intake side, range: -1 to 13 Bar / -50 to 40°C.
- High pressure manometer in the delivery side, range: -1 to 30 Bar / -40 to 80°C.

A pressure switch to protect the compressor.

A sight glass to monitor the aggregate state of the refrigerant.

The unit has been designed to be used with the environmental friendly CFC-free refrigerant R134a.

Enthalpy diagram of the R134a refrigerant.

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.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Demonstration of the vapor compression refrigeration cycle/ heat pump and visualization of the most important processes.

2.- Analysis of the basic essentials of a compression refrigeration system.

3.- Identification and study of the main components of a compression refrigeration system:

Compressor

Evaporator

Condenser

Expansion valve.

4.- Study of the relationship between pressure and boiling point of a liquid.

5.- Developing a basic understanding of the thermodynamic cycle.

6.- Energy balance.

7.- Operation of a refrigeration system/heat pump.

8.- Learning about the main factors that can affect the refrigeration system performance.

Additional practical possibilities:

9.- Properties of the R134a refrigerant.

10.- Enthalpy-pressure diagram for the R134a refrigerant.

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHT

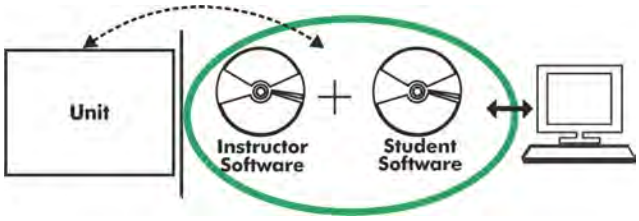
TSCR:

-Dimensions: 730 x 360 x 680 mm. approx.
(28.74 x 14.17 x 26.77 inches approx.)

-Weight: 25 Kg. approx.
(55.11 pounds approx.)

Optional

TSCR/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer (PC), **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 Workgroups, Tasks and Training sessions.

Creation and Integration of Practical Exercises and Multimedia Resources.

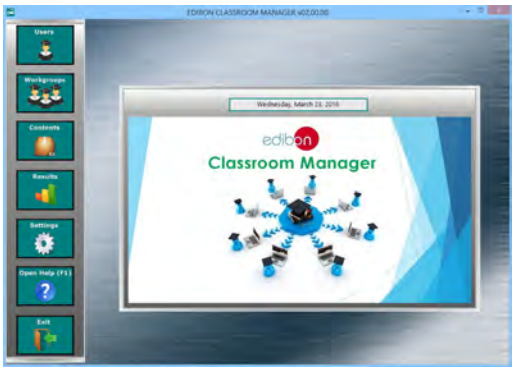
Custom Design of Evaluation Methods.

Creation and assignment of Formulas & Equations.

Equation System Solver Engine.

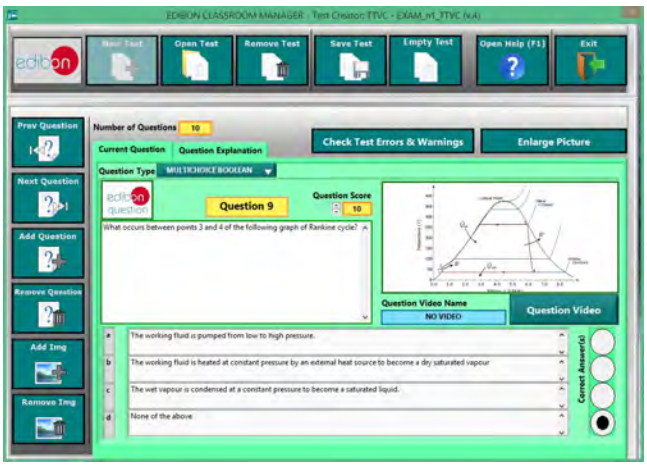
Updatable Contents.

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.

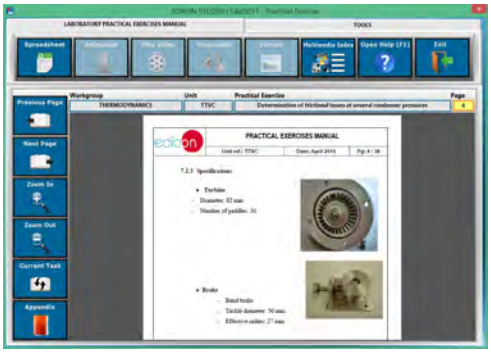
Calculations computing and plotting.

Equation System Solver Engine.

User Monitoring Learning & Printable Reports.

Multimedia-Supported auxiliary resources.

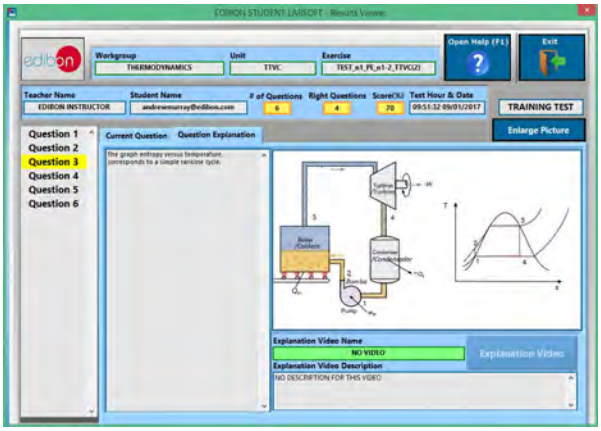
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



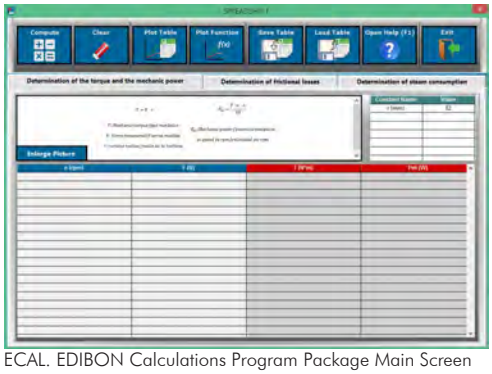
EPE. EDIBON Practical Exercise Program Package Main Screen

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

www.edibon.com/products/catalogues/en/ICAI.pdf



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.

edibon INTERNATIONAL

C/ Del Agua, 14. Polígono Industrial San José de Valderas.
28918 LEGANÉS. (Madrid). SPAIN.
Phone: 34-91-6199363 FAX: 34-91-6198647
E-mail: edibon@edibon.com WEB site: **www.edibon.com**

Edition: ED01/16
Date: October/2016

REPRESENTATIVE