Introduction to Refrigeration Unit

TIR

edibon

Engineering and Technical Teaching Equipment

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⇨PRODUCTS
  ⇨90.- THERMODYNAMICS
     & THERMOTECHNICS

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION
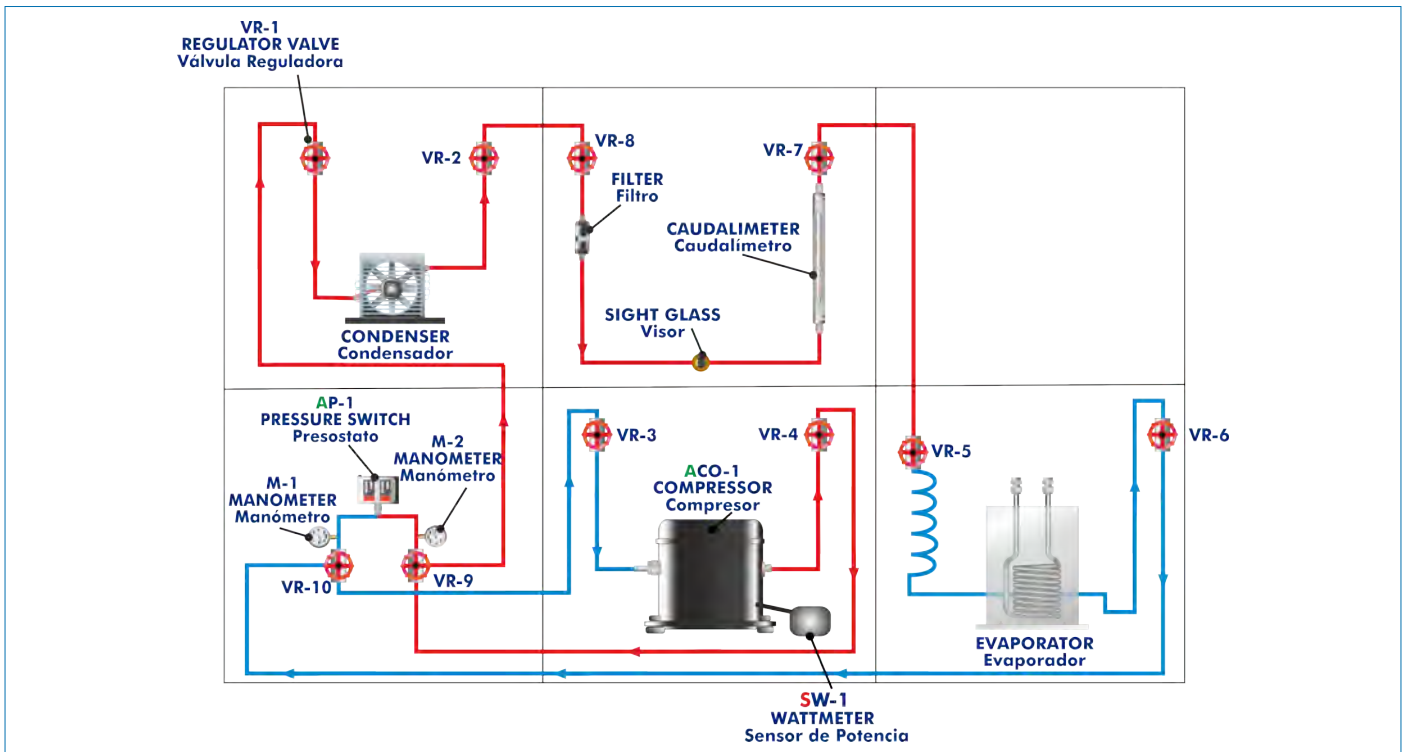
VR-1
REGULATOR VALVE
Válvula Reguladora

VR-2

VR-8

VR-7

FILTER
Filtro

CAUDALIMETER
Caudalímetro

SIGHT GLASS
Visor

CONDENSER
Condensador

AP-1
PRESSURE SWITCH
Presostato

M-2
MANOMETER
Manómetro

M-1
MANOMETER
Manómetro

VR-3

VR-4

ACO-1
COMPRESSOR
Compresor

VR-5

VR-6

VR-10

VR-9

EVAPORATOR
Evaporador

SW-1
WATTMETER
Sensor de Potencia

INTRODUCTION

Refrigeration is the process of reducing and maintaining the temperature of an object or space.

With simple and clear experiments, the Introduction to Refrigeration Unit, "TIR", designed by EDIBON, allows the familiarization with the operation and handling of a refrigeration system and offers a basic introduction to refrigeration.

GENERAL DESCRIPTION

The Introduction to Refrigeration Unit, "TIR", is a system with exchangeable modules in which the components are mounted on plates and are rapidly connected by flexible hoses.

The unit consists of a frame where 6 of the 8 modules are positioned at the same time, connecting them by cables and flexible hoses, allowing for the construction of simple compression refrigeration systems.

The modules are formed by the components mounted on plates and are ready to be easily mounted on the frame.

The experimental unit includes all the components required for a fully operational refrigeration circuit, such as compressor, condenser, evaporator and a capillary tube as expansion element. Other additional accessories in refrigeration systems are also included: pressure switch and manometers to protect the compressor against excessive pressure, flow meter and sight glass with filter/drier and display and control panel.

The unit allows for different combinations of the components, since there are two condensers and two evaporators, one as air-refrigerant heat exchanger and the other water-refrigerant heat exchanger.

To fill and drain the system the "T/KIT3", Refrigerant Filling and Evacuation Module, is recommended.

With this unit the student can perform easy experiments that demonstrate the processes in the equipment and the changes in the refrigerant state. Advanced experiments allow the use of the equipment as a refrigeration system and as a heat pump, depending on the configuration of the components.

Pressures, flow rates and power consumption of the compressors are displayed as the most important characteristic variables of refrigeration circuits.

The temperature is measured by thermometers belonging to the laboratory.

SPECIFICATIONS

Training unit with interchangeable modules and components mounted on plates and rapid connection via hoses for the training of apprentices in refrigeration.

The unit includes wheels to facilitate its mobility.

Main metallic elements in stainless steel.

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

Set-up of simple refrigeration circuits with different components.

Light-weight frame made of anodized aluminum to arrange 6 modules.

8 self-contained operational modules mounted on a plate of painted steel each:

    Module 1: Hermetic compressor:

        Power consumption: 67 W at -10/32°C.

        Refrigeration capacity: 151 W at 5/32°C.

    Module 2: Evaporator as air-refrigerant heat exchanger and capillary tube:

        Finned tube heat exchanger.

    Module 3: Evaporator as water-refrigerant heat exchanger and capillary tube:

        With pipe coil.

        Water tank. Capacity: 2 l.

    Module 4: Condenser as air-refrigerant heat exchanger:

        Finned tube heat exchanger.

    Module 5: Condenser as water-refrigerant heat exchanger:

        With pipe coil.

        Water tank. Capacity: 3 l.

    Module 6: Flow meter. Range: 0 – 7 l./h. Sight glass with filter/drier.

    Module 7: Double pressure switch and manometers:

        Pressure switch activation pressure:

            Low pressure: 1 Bar.

            High pressure: 14 Bar.

        Two manometers:

            Low pressure manometer in the intake side, range: 1 to 10 Bar.

            High pressure manometer in the delivery side, range: 1 to 30 Bar.

    Module 8: Display and control panel.

Modules equipped with manual valves and flexible hoses.

Connection of the components with flexible hoses.

The unit is supplied with a set of flexible hoses and cables.

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

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.- Study of the basics of a simple refrigeration circuit.

2.- Construction of simple refrigeration circuits with different components.

3.- Understanding of the thermodynamic cycle.

4.- Identification and visualization of the changes in the refrigerant state.

5.- Representation of the refrigeration circuit in the process diagram.

6.- Study of the different modes of operation in a refrigeration circuit:

Cooling air.

Generating refrigeration water.

Generating hot water (heat pump).

7.- Representation of the thermodynamic process in the log p-h diagram.

8.- Estimating key figures, refrigeration capacity and heat fluxes for different operation modes.

9.- Development of practical exercises:

Draining and filling the refrigeration system (requires the accessory T/KIT3).

Fault finding.

Additional practical possibilities:

10.- Properties of the R134a refrigerant.

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

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

TIR:

-Dimensions: 1295 x 680 x 850 mm. approx.

(51.18 x 26.77 x 33.46 inches approx.)

-Weight: 36 Kg. approx.

(79.36 pounds approx.)

RECOMMENDED ACCESSORIES (Not included)

For refilling R134a refrigerant and maintenance, we recommend:
  - T/KIT1. Maintenance Kit, containing: vacuum pump, hoses and manometers.
  - T/KIT2. Maintenance Kit, containing: leakage detector.
  - T/KIT3. Maintenance Kit, containing: Refrigerant Filling and Evacuation Module.

TIR/ICAI. Interactive Computer Aided Instruction Software System:
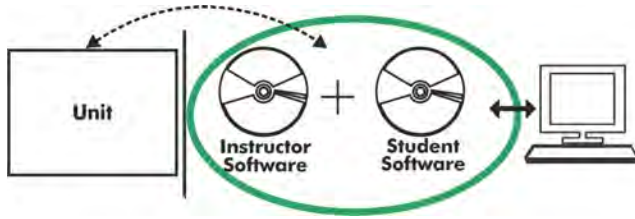
With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF).** Both are interconnected so that the teacher knows at any moment 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 Workgroups, Tasks and Training sessions.

   Creation and Integration of Practical Exercises and Multimedia Resources.
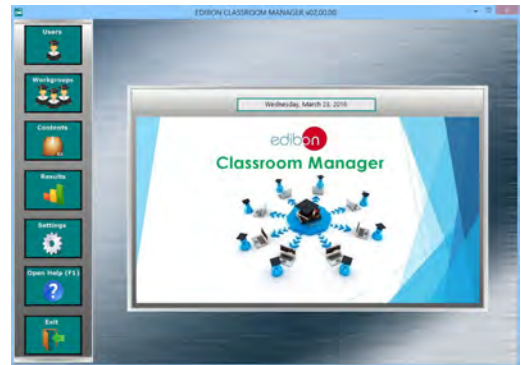
   Custom Design of Evaluation Methods.

   Creation and assignment of Formulas & Equations.
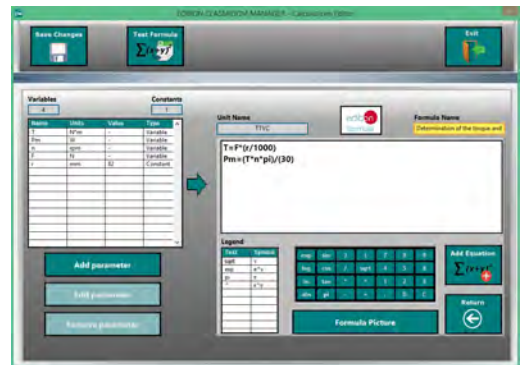
   Equation System Solver Engine.

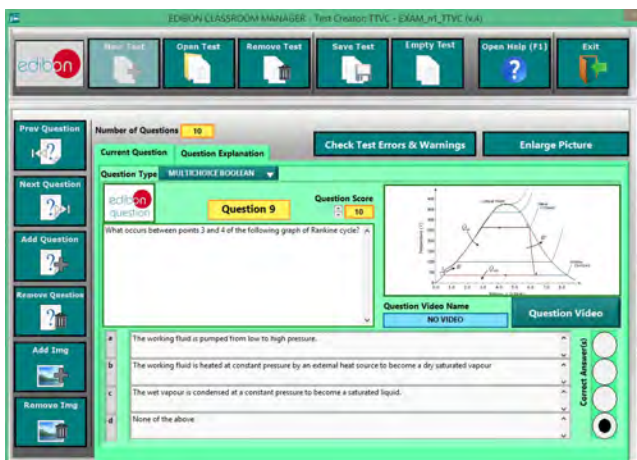   Updatable Contents.

   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

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-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.
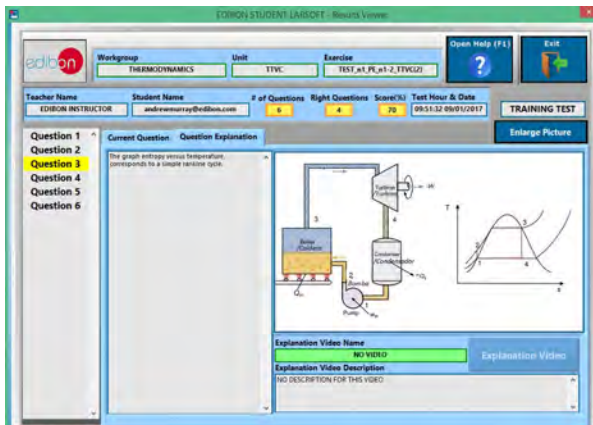
Multimedia-Supported auxiliary resources.

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

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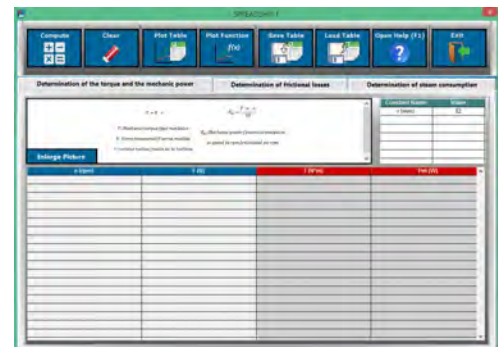

ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen
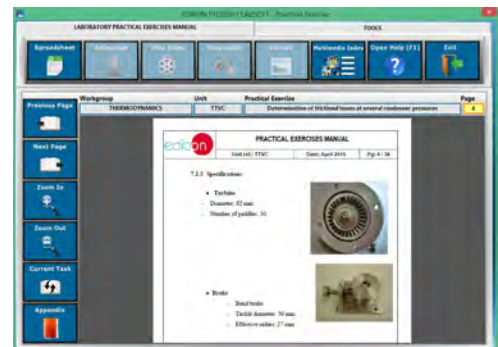
EPE. EDIBON Practical Exercise Program Package Main Screen

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.

REPRESENTATIVE: