EAU-964

Air conditioning trainer

The trainer incorporates all the components and accessories required for operation under conditions very similar to those found in motor vehicles, but with a number of additional pressure gauges and thermometers to facilitate students understanding of the working of the system. It is mounted on a trolley with wheels for easy transportation and a braking systems for ensuring stability once in place.

It incorporates the following real components, arranged in the logical sequence in which they would be found in a vehicle, motor cavity, front interior and rear interior.

Ref.: 9EQ964EAFC - Trif. 380 V

Ref.: 9EQ964EACC - Trif. 230 V

Educational application concept

The learning model is based on the development of activities involving real vehicle elements, arranged according to strict teaching principles in order to facilitate the training process. They aim to:

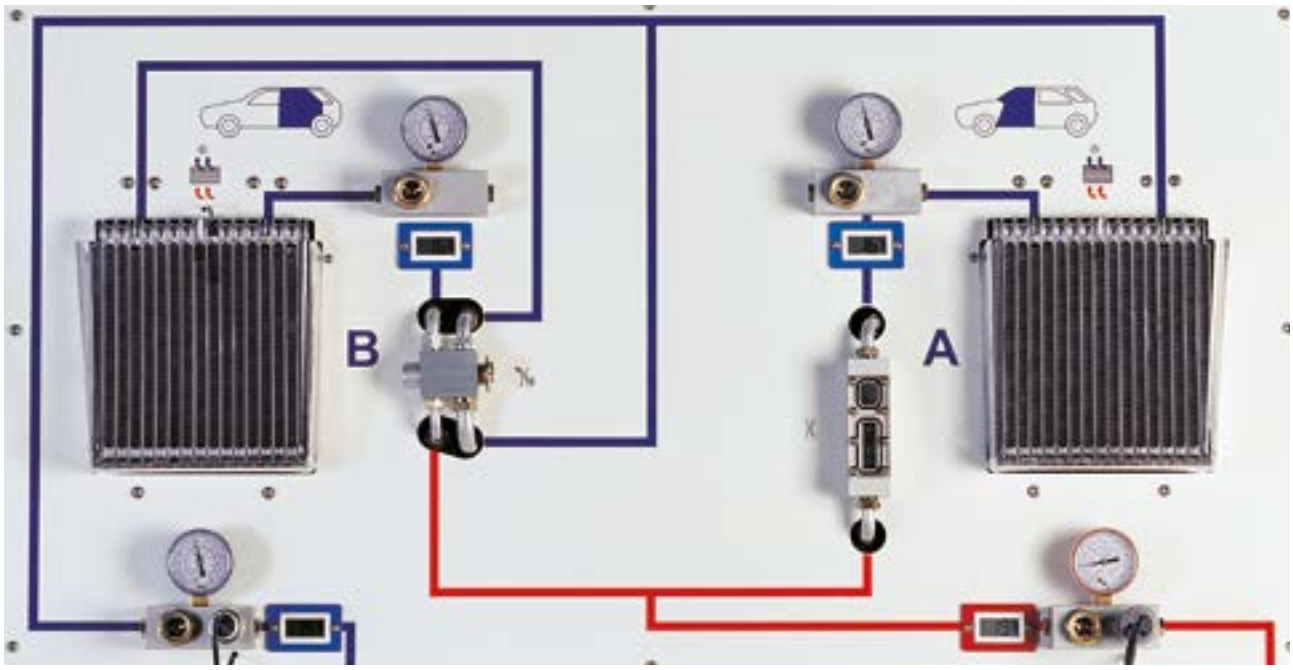
- Be motivating for students.
- Have a real application, combining all aspects of air conditioning systems (components, circuits, loading/ unloading of gas, etc.) logically and effectively.
- Enable the reversal of the classic learning sequence, replacing the component – circuit – application process with that of application – circuit –component.
- Enable students to develop their malfunction diagnosis and repair skills.

Didactic characteristics

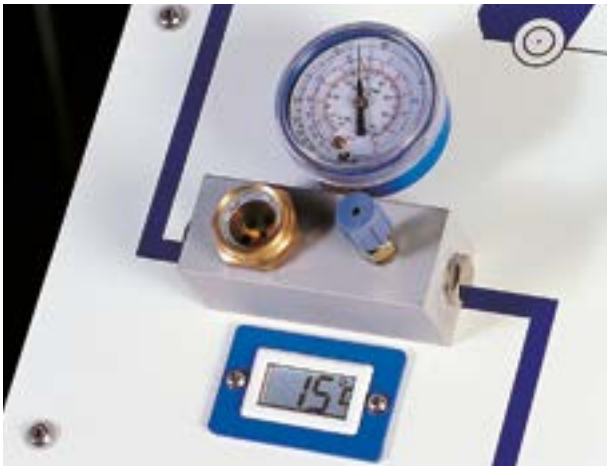
This system enables students to develop the following skills:

1. Analysis of the operating principle of air conditioning systems.
2. Analysis of air conditioning circuits.
3. Interpretation of diagrams.
4. Component control.
5. Malfunction diagnosis and repair.
6. Carrying out of coolant gas loading and unloading processes.
7. Control of air tightness. Leak detection.
8. Use of controls.
9. Use of technical documents.

The system consists of a group of elements that combine to form an air conditioning facility with a double low pressure circuit (A, B). Low pressure circuit A incorporates the fixed calibrated tube system while circuit B encompasses the expansion valve.



The trainer has a series of visual pressure gauges and thermometers that aid the analysis and comprehension of the behaviour of the coolant.



The system is also designed to carry out coolant loading, unloading and recycling operations. The circuit is loaded with coolant R-134a.

Teaching features

The control panel incorporates a system designed and patented by Alecop, which enables the analysis, diagnosis and repair of malfunctions.

- Condenser speed adjustment control (0 to 4000 rpm).
- Terminal block for measuring voltage and current in the system's components.
- Module for generating failures or malfunctions similar to those that may occur in a real vehicle.
- Circuit A or B selector switch.
- Battery ON-OFF switch for carrying out continuity tests.

TEACHING SUPPORT

User Manual.

Contains information about how the equipment operates, standards for using it, characteristics, maintenance, electrical diagrams, list of breakdowns and their symptoms, etc.

Practical activities manual.

Manual containing the various practical activities that can be carried out using the trainer, complete with the corresponding answers or solutions to make the teacher's job easier. Activities include: individual component identification, identification of systems, signal checking, reproduction and identification of malfunction symptoms, search for and location of malfunctions, proposal of solutions and virtual repair, etc.

Technical characteristics

- Variable volume compressor.
- Condenser and double-speed power fan.
- High pressure pressostat.
- Calibrated expansion tube.
- Expansion valve.
- Thermostat.
- 2 evaporators and 2 triple-speed power fans.
- Low pressure pressostat.
- Drier filter.
- Keyswitch.
- A/D drive switch.
- Speed adjustment controls for evaporator air thrusters.
- Condenser speed adjustment control.
- Electric motor with speed variation for driving the condenser.
- 6 coolant status displays, located at the input and output of each component.
- 6 pressure gauges in low and high pressure circuits, for displaying the various pressure levels.
- 6 digital thermometers at the input and output of each component.
- Digital thermometer showing room temperature.
- Specific electrical installation for the A/A system.
- Relay and fuse box.
- Control panel.
- Malfunction generation module.
- Condenser access protection system, with safety microswitch.

BREAKDOWNS

The trainer enables you to generate failures or malfunctions in the various components by means of a programming-repair system.
There are two options:

- Manual malfunction generation system (using switches).
- Intelligent computer-aided virtual malfunction generation system (SIRVAUT), whose interactive software enables students not only to analyse the malfunction, but to repair it virtually as well.

Software SIRVAUT integrado en el equipo.

Teaching characteristics

The student will develop many skills using this equipment:

1. Diagram interpretation.
2. Circuit Analysis.
3. Identification of symbols, connectors, cable coding and component location.
4. Verification and analysis of components and systems.
5. Maintenance and regulation of the auxiliary electrical systems.
6. Use and interpretation of technical documentation.
7. Instrument operation for verification and diagnosis.
8. Diagnosis and repair of break-downs.
9. Simulations of malfunctions, verification and symptom recognition.

Teaching features

A system enabling analysis, diagnosis and repair of breakdowns in different circuits is incorporated into the control panel, and includes:

- A terminal plate for measuring the tension and intensity of current in system components.
- Module to generate malfunctions and breakdowns representative of those that could really appear in a vehicle.
- Equipment usage authorization switch.
- Switch to disconnect the multiplex network on the instrument panel.

TEACHING SUPPORT

User Manual.

This manual contains explanations regarding the workings of different circuits, diagrams of basic principles, real related reference diagrams, fuse characteristic, relays, lamps and electrical boxes, standards regarding light installation, operating standards for the equipment, characteristics, maintenance, etc.

SIRVAUT software integrated in the equipment.

Practice Activities Manual.

The manual proposes different types of activities that can be carried out using the trainer. It includes answers and appropriate solutions to the problems

presented in order to make the teaching process easier. Identification of individual components, identification of systems, verification of sensors and actuators, verification of signals, re-creation and identification of breakdown symptoms, breakdown search and find, proposals for defect resolution, virtual repair, etc.

Wiring diagram manual.

This is a manual of electrical diagrams similar to that used in automobile repair workshops and will help in the activities where circuits are followed, in locating and identifying installations, and in determining the breakdowns that have been initiated in the trainer.

Technical characteristics

- Light system with switch and panel illumination:
  - Automatic front headlights with running lights and turn signal, headlight stabilizer in case of braking.
  - Electrical headlight balancing system.
  - Rear lights.
  - Back and front anti-fog lights.
  - Turn signals.
  - Emergency light.
  - Interior light.
  - Hatchback light.
  - Number plate light.
  - Third break light.
  - Backup lights.
- Door and Hatchback opening and closing systems with a remote control:
  - Centralized locking.
  - Fuel tank lock.
  - Hatchback lock.
- Motors and buttons for the front electric windows openers integrated in the multiplex network.
- Rear-view mirrors:
  - Adjustable heated exterior mirrors.
  - Interior mirror with automatic darkening and light sensor based dazzle control.
- Ultrasound parking sensors.
- Rain and luminosity sensor for automatic headlights and windscreen wipers.
- Front and back windscreen wipers.
- Pump for windscreen cleaning liquid.
- Horn with a button incorporated on the steering wheel.
- Accessories plug-in socket.
- Fuel level sensors.
- Motors for automatic closing of fuel tank.
- Switch for brake, hatchback and backup lights.
- Illuminated instrument panel indicating:
  - Lighting and signalling system.
  - Fuel level.
- Emergency light switch.
- Steering wheel with light and windscreen wiper switches.
- Central Electrical Box and battery, fuse, relay unions.
- Standard EOBD (EOBDII) connection.
- Power Supply (battery substitute).
- Back window heating simulator.
- Terminal plates enabling the measurement of signals in different components of the system for analysis, diagnostics and breakdown repair.
- Module for generating breakdowns.
- Safety systems made up by:
  - Function permission button.
  - Protection with bornier tests.
- The equipment is mounted on wheels.
- Dimensions and weights
  - Equipment dimensions: 1.250 x 1.080 x 1.900 mm.
  - Package dimensions: 1.465 x 1.230 x 2.080 mm.
  - Package weight: 300 kg.

INCLUDED ACCESSORIES:
Safety connectors, test points, fuses and screwdrivers.

BREAKDOWNS

Using a repair program system, the trainer can introduce malfunctions or breakdowns to the motor.

There are two options:

- Interactive computer-aided virtual repair system for breakdowns (SIRVAUT) which enables not only breakdown analysis but also virtual repair generating a history log for evaluation by the instructor.
- Manual breakdown repair system (using switches)

New real components

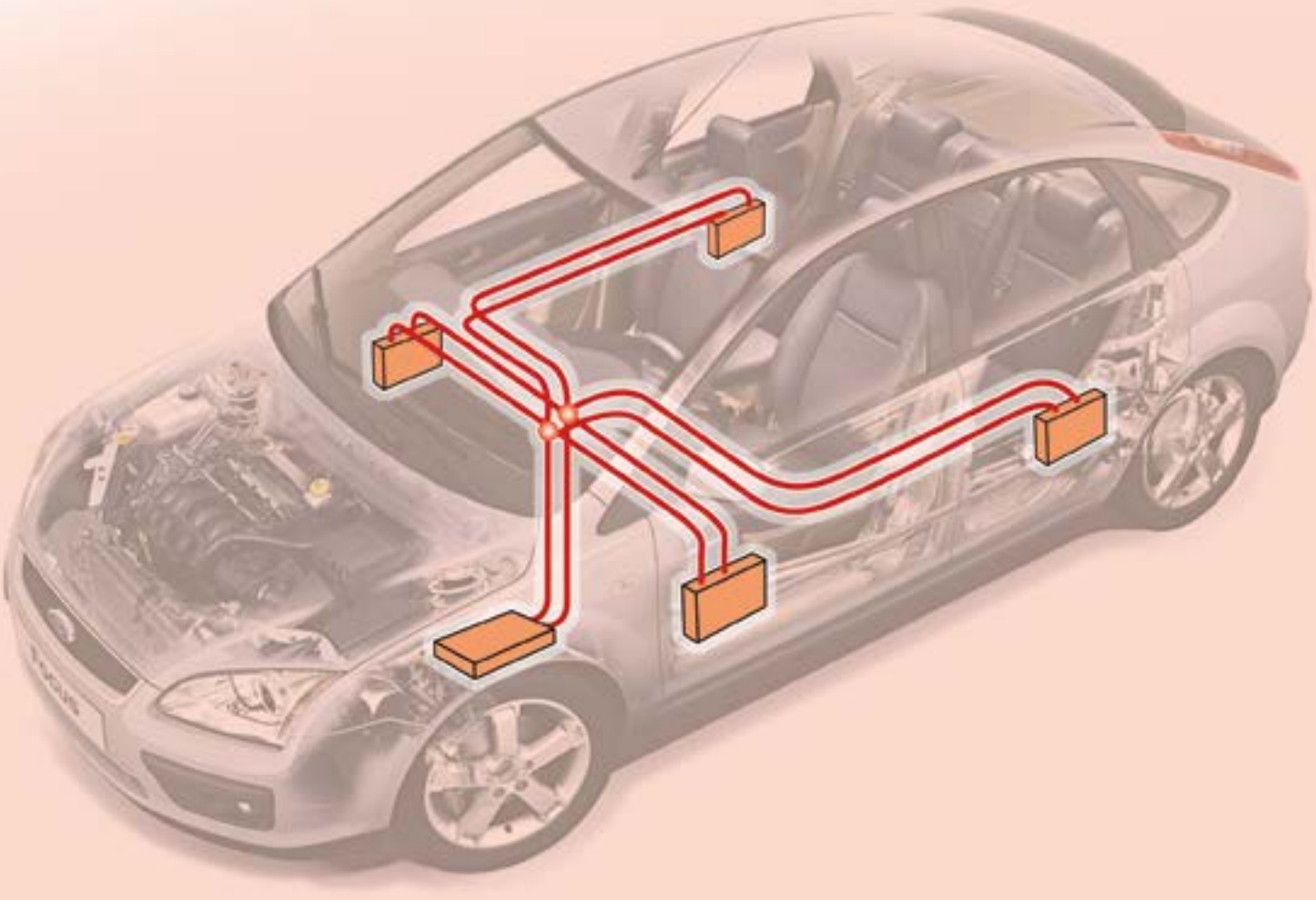
The components used to manufacture the trainer are original and new from the manufacturer, so that the difference between training practice and work in a real workshop will be minimal. Some of the equipment details are presented below:

The components are easily removed with a quick fixing system.

Allows component verification.

AUXILIARY ELECTRICAL SYSTEMS

- **Genuine removable components**
- **Multiplex CAN-BUS network**
- **Lighting and signalling system**
- **Door control system**
- **Electronic window control**
- **Windscreen wiper system**
- **Ultrasound parking sensors**
- **Rain and automatic light sensor**
- **Instrument panel**
- **Diagnosis**
- **Simulation and repair of breakdowns**



Allows making adjustment to the head-lights and anti-fog lights.

Fuse and relay box (GEM module).

Ultrasound parking sensors.