AUTOTRONICS / AUTO ELECTRICAL ENGINEERING

AMTEC TECHNIQUIP

Focused on a Better Future

Suppliers of Technical Training Equipment & Accessories

LEVEL 2 BBBEE

Uplifting Our Country Together

ESTABLISHED 1995

Amtec Techniquip has over 25 years' experience in the design, manufacture and import of educational engineering equipment, accessories, instrumentation and consumables.

During this time, we have been a market leader in innovation, bringing many new concepts and products to the educational industry while expanding our comprehensive range of quality teaching equipment to a level unsurpassed by any other company in the industry.

This includes unique new methods of introducing and educating the learners in all facets of modern engineering. Our products are visual and/or demonstrational to best teach and explain concepts from basic engineering, all the way up to research and thesis levels in the most advanced forms of engineering.

Amtec Techniquip's commitment to the end user…

AMTEC offers a personal approach to each and every end user as we are always available to meet and discuss any requirements face-to-face basis to provide a tailor-made solution.

AMTEC have a large footprint throughout Southern Africa and regularly visit the countries and provinces we service while also keeping our customers up-to-date with any new products and innovations we bring to the market.

AMTEC supplies expert training on all our products. Our team of experts offer training at the end user or alternately at our head office in Jhb. All our products are supplied with their relevant manuals, course materials and exercise guides.

AMTEC offers unmatched after-sales service and customer support. All our equipment is supplied complete with ICT (Installation, Commissioning & Training). Our sales and support teams are at the end user's disposal should any assistance be needed during the life of a product.

AMTEC offers an extended Service and Maintenance plan to make sure that your equipment and apparatus are maintained to ensure a long lifespan with little or no downtime.

AMTEC makes use of only quality components to ensure reliability and longevity of all our manufactured equipment. This provides the end user with peace of mind and a product that will stand the test of time in an educational environment.

AMTEC has the manufacturing capability to R+D and manufacture "one-off" designs and customise any equipment within our range to meet the end users requirements. We have many accessories, add-ons and tooling that can work in conjunction with our equipment and trainers.

AMTEC offers a 24-month factory warranty on all our products supported by the backing of our local & international suppliers.

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AMTEC AUTO ELECTRICAL TRAINER

AMTEC AUTO ELECTRICAL TRAINING PANEL

- MOUNTED ONTO A POWDER COATED WORKSTATION WITH RUBBER WORKING SURFACE AND LOCKABLE CASTOR WHEELS.
- ALL COMPONENTS ARE MOUNTED ON ELECTRICAL GRADE PHENOLIC BOARD 1600 X 1200
- INCLUDES MANUAL AND 100 STACKABLE LEADS VARIOUS SIZES
- POWER SUPPLY 13.8V FIXED

- COMPONENTS INCLUDED

  - IGNITION
  - HEADLIGHTS AND BRIGHTS
  - INDICATORS
  - DOOR PIN
  - RELAYS
  - SPARK PLUGS
  - DISTRIBUTOR
  - BRAKE LIGHTS
  - NUMBER PLATE LIGHT
  - HAZARD SWITCHES
  - REVERSE LIGHT
  - WINDSCREEN WIPER
  - FUSE BOX
  - FAN SWITCH
  - HOOTER
  - FUEL GAUGE
  - TEMPERATURE GAUGE
  - REV COUNTER
  - BATTERY

AUTOMOTIVE ELECTRICAL / ELECTRONICS SYSTEM TRAINING PANEL

DL DM96

LEARNING EXPERIENCE

This demonstration panel is based on the electric system of a Volkswagen Passat B5 to display the structure and operation of the meter, lighting, wiper, horn, ignition, electric window, electric door lock, sound, start-up, and charging systems.

The device applies to theoretical teaching and maintenance training of the automobile electric equipment for secondary vocational skill schools.

GENERAL CHARACTERISTICS

- Dim. mm (HxLxW) : 1900x2400x700
- Weight approx. 200 kg
- Input power supply: A.C. 220V ± 10% 50Hz
- Operating voltage: 12V DC
- Operating functioning temperature: -40°C to +50°C

MAIN CHARACTERISTICS

The didactic system shows a real and operable car electric structure used to illustrate the components of the system.

When the electric equipment system powers on, switches and buttons of various electric equipment are shown to demonstrate the operation of the meter, rear and front lighting, wiper, horn, ignition, electric window, electric door lock, sound, start-up and charging systems.

Components on panel:

- Detection control panel (with various detection terminals)
- Engine ECU
- Diagnosis socket
- Ignition switch / Dashboard / Combination switch
- Left and right headlight assembly
- Left and right front fog lights
- Left and right turn lights
- Left and right turn side lights
- Left and right combination taillights
- License plate light / High-mount brake light
- Light switch / Brake light switch
- Reversing light switch /Hazard light switch
- Wiring harness
- Wiper controller / Horn / Horn relay
- X contact point relay / Fog light relay
- Distributorless ignition system

ACCESSORIES

Suggested instruments for best practice:

- Digital Multimeter (not included)
- Automotive Oscilloscope (not included)
- OBD Fault diagnosis Scanner (not included)

- Simulated injector indicator light
- Fuel pump relay / Fuel pump indicator
- Crankshaft position sensor and signal wheel
- Power window main switch
- Left and right front doors control unit
- Comfort system control unit
- Right front door lock motor
- Left and right rear power window motor
- Left and right rear power window switch
- Left and right rear door lock motor
- Car audio assembly
- Speaker / Fuses

Components on shelf:

- Wiper assembly
- Spray motor
- Spray bottle
- Starter
- Generator
- Three-phase asynchronous motor
- Battery
- Main Power Switch

OTHER CHARACTERISTICS

a) The trainer is made of advanced aluminum-plastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyze the working principle of the control system by looking and analysing the diagram and the real-life components.

b) The training panel has installed detection terminals to identify electric signals, such as resistance, voltage, current, and frequency, of circuit components of the electric equipment system of the finished automobile.

c) The training panel has installed a diagnosis socket to which an automobile decoder can be connected to read and clear fault codes, read data stream from the engine control unit(ECU).

d) The training base frame is made of steel and the surface is paint-coated. Pivoting wheels are mounted.

e) Equipped with intelligent fault setting system, include fault setting and troubleshooting.

Amtec Alternator & Starter Trainer

An alternator is an electrical machine. Its function is to charge the battery on a regular basis. However, if the battery is dead, the alternator cannot charge it. It regulates voltage and supplies power used to operate the car. The electricity used by various parts of the car is generated by the alternator; not by the battery which we usually believe.

It is connected to the engine with the help of a belt. With the start of the engine, the alternator generates electricity which is used to recharge the car battery.
Usually, alternators do not show any sign of damage; they can suddenly stop working without any warning. One indication which can highlight the alternator problem is the indicator light which turns on when the former is not able to charge the battery. The normal life span of an alternator is 8-12 years.
The starter is an electric motor placed on the side of the engine. Bendix Mechanism is used here. This automatically allows the pinion gear to engage the flywheel of the engine. Starter rotates and starts the engine. The name actually suits best as the starter sounds exactly what it does. It starts the car.

AUTOMOTIVE ACTUATOR AND SENSOR TRAINING STAND

DL DM92

LEARNING EXPERIENCE

This demonstration panels can show the main sensors and actuators in a car system.

The device applies to theoretical teaching and maintenance training of the car actuators and sensors for secondary vocational skill schools.

GENERAL CHARACTERISTICS

- Main panel : Dim. mm (HxLxW) : 1800x1600x800
  Weight approx. 100 kg
- Component bench:
  Dim. mm (HxLxW) : 1300x1800x900
  Weight approx. kg 200
- Input power supply: A.C. 220V ± 10% 50Hz
- Operating voltage: 12V DC
- Operating functioning temperature: -40°C to +50°C

MAIN CHARACTERISTICS

The didactic system is composed of one training panel and one training bench that include :

- Throttle control unit,
- Accelerator pedal position sensor,
- Air-fuel ratio oxygen sensor,
- Hall sensor,
- Coolant temperature sensor,
- Air flow meter,
- Ignition coil and ignition module,
- Canister solenoid valve,
- Oxygen sensor,
- Intake air temperature sensor,
- Knock sensor,
- Boost air recycle solenoid valve,
- Boost pressure sensor,
- Boost pressure limit solenoid valve,
- Camshaft regulating valve,
- Crankshaft position sensor,
- Oil pressure switch
- Coolant level switch
- Oil level & temperature sensor

The components on the training bench can be connected to the corresponding terminals on the training panel by connecting wires.

ACCESSORIES

Suggested instruments for best practice:

- Digital Multimeter (not included)
- Automotive Oscilloscope (not included)
- OBD Fault diagnosis Scanner (not included)

OTHER CHARACTERISTICS

(a) The trainer is made of advanced aluminum-plastic plate with characteristics of not less than 4mm thick. The plate is corrosion resistant, impact resistant, pollution resistant, fireproof, and moisture proof. The panel surface is processed by special craft and spraying primer. The circuit diagrams are painted with never fade colour and the boards are coated with varnish. The trainees can learn and analyze the working principle of the control system by looking and analysing the diagram and the real-life components.

(b) The adjustable-speed motor controlled by throttle percentage drives crankshaft sensor signal wheel to simulate the engine operation, then actuators can start to work (Such as spark plug ignition, fuel pump and fuel injection pump works, idle speed motor rotates). It demonstrates the working process of engine sensors and actuators.

(c) The sensors and actuators are equipped with the original vehicle wire harness plug. Trainees can directly detect the electrical signal of each circuit element, such as resistance, voltage, current and frequency signal.

(d) The training panel has installed a diagnosis socket to which an automobile decoder can be connected to read and clear fault codes, read data streams, components testing, conduct wave analysis for the engine electrical control system.

(e) The training base frame is made of steel and the surface is paint-coated. Pivoting wheels are mounted. A small table top shelf is fixed on the base frame to place material and testing devices

(f) The didactic panel does not use accumulators or battery and it does not require any charging. It can be connected to a 220V AC voltage which changes to a 12V DC voltage through the internal circuit. The 12V DC voltage protects the training panel against short circuit.

(g) Equipped with intelligent fault setting system, include fault setting and troubleshooting.

VEHICLE SENSOR SYSTEM

DL DM21

LEARNING EXPERIENCE

The trainer enables the knowledge of combination, test and evaluation of the parameters of the vehicle system subassemblies. It can be configured in different ways.

Training includes the learning of the marks and graphics symbols of the sensors and their testing with measuring instruments.

GENERAL CHARACTERISTICS

- Dim. mm approx (HxLxW) : 1700x1000x500
- Weight approx. kg 150
- Input power supply: AC 220V±10% 50/60 Hz
- Operating voltages: 2x12V -15A
- Working temperature: -40°C ~ +50°C.

MAIN CHARACTERISTICS

This demonstration trainer includes the following systems:

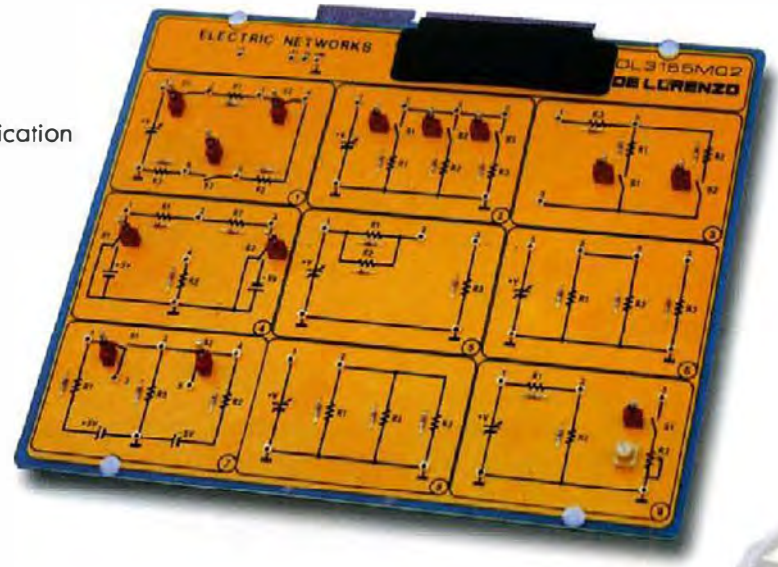
- Mass and volume air flow meters check system
- MAP sensor check system
- Knock sensor
- Engine and air temperature sensor
- Lambda sensor
- Rotation speed active sensor
- Speedometer sensor
- Acceleration sensor
- Rotation direction sensor
- Set of the main vehicle system sensors
- Differential pressure sensor
- Oil pressure sensor
- Fuel level sensor

Complete with user manual that will allow teachers to develop their own experiments.

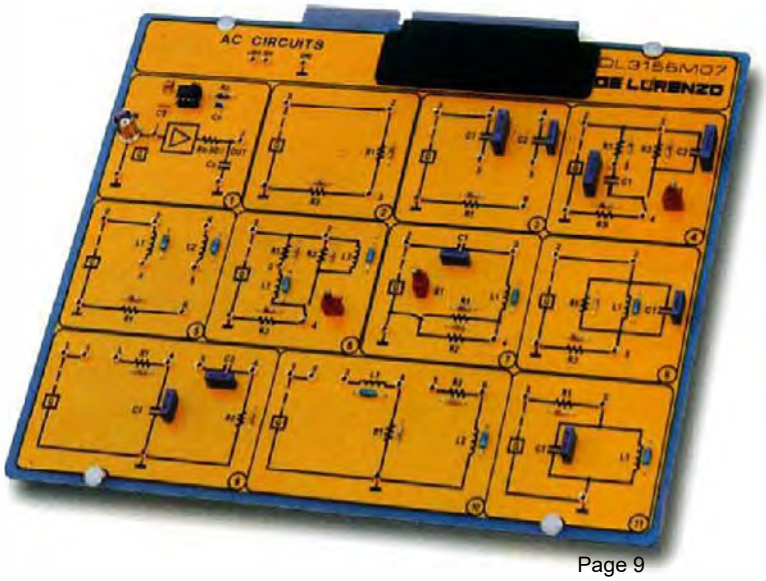
MODULES FOR THE STUDY OF BASIC ELECTRICITY

This section of the laboratory is composed of four printed circuit boards with, on the upper side, the graphical simplified representation of electric circuits and components of both general type, for the study of basic electricity, and specific type, relevant to the electric circuits found in automobiles.
The student must study a circuit, understand the relevant theory, analyze the operating conditions and verify, by means of suitable instrumentation, the situation at the various test points of the circuit. Once completed the experiment, the student must identify some simulated malfunction conditions on the basis of measurements and tests.
The modules can be inserted in a base frame able to provide:
- *power supply to the modules*
- *connecting interface to a PC to allow the use of a dedicated CAI software that provides the theoretical background, introduces simulated faults, interrogates the student through tests and evaluates his learning progress*

The four modules in this section are relevant to:



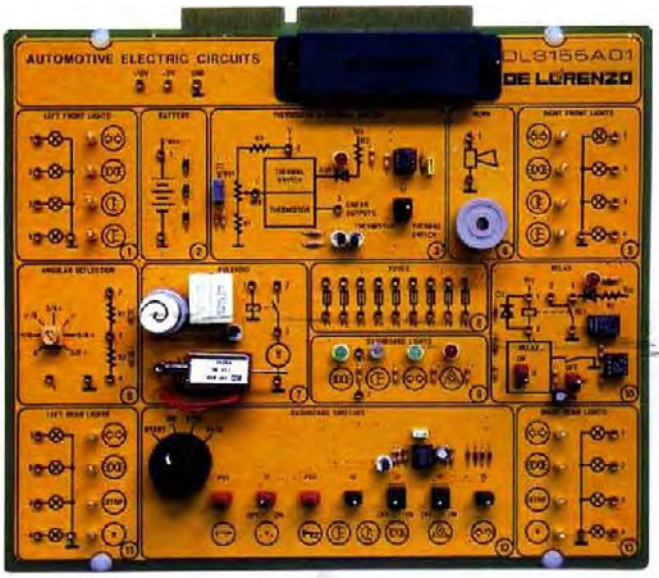
DL 3155M02
DC CIRCUITS
- Voltmeter
- Resistances and their identification
- Ohm's Law
- Conductivity
- Resistors in series
- 1st Ohm's Law
- Voltage dividers
- Resistors in parallel
- 2nd Kirchoff's Law
- Current dividers
- Circuits in parallel - series
- Thevenin theorem
- Norton theorem
- Potentiometers
- Hyperthesis theorem
- Voltage sources
- Maximum power transfer
- Star and delta connection



DL 3155M07
AC CIRCUITS
- AC waveforms
- Alternating current
- Capacitors
- RC circuits
- Coils
- RL circuits
- Resonance
- RC filters
- RL filters
- Band pass filters
- Transformers
- Electromagnets

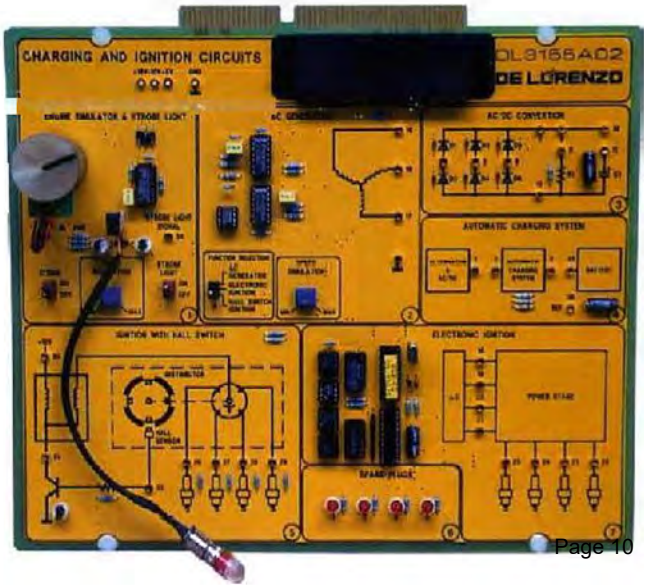
DL 3155A01
AUTOMOTIVE ELECTRIC COMPONENTS AND CIRCUITS

- Voltage drop in series connection
- Lamps
- Automotive lights circuits
- Relay operating principles
- Circuits with relays
- Delay circuits with relay
- Stop lights circuits (brakes)
- Flash light circuits (direction indicators)
- Diodes in light circuits
- Diodes for circuit separation
- Thermistors in automotive circuits
- Thermal switches
- Angular deflection measurement using potentiometer
- Fault finding

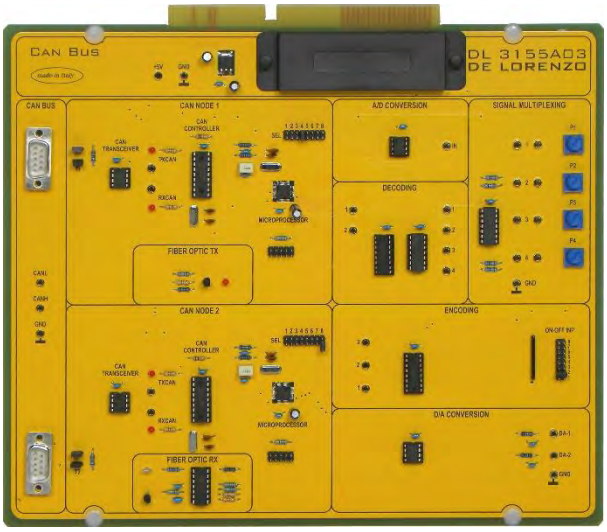


DL 3155A02
CHARGING AND IGNITION CIRCUITS

- AC generator (alternator)
- Tachogenerator
- AC to DC conversion
- Automatic charging system
- Hall effect switch
- Strobe lights
- Ignition excitation circuit with Hall switch
- Induction coil
- Ignition system
- Fault finding



CAN BUS



DL 3155A03

The design and construction of electronic circuits to solve practical problems is an essential technique in the fields of electronic engineering and computer engineering.

With this board the students can study and analyse the CAN (Controller Area Network) BUS and its application in automobiles:

THEORETICAL TOPICS

- Introduction to CAN BUS and its standards
- Characteristics and functioning
- Implementation of CAN BUS
- Multiplexing and A/D Conversion
- D/A Conversion
- Transmission / reception with fibre optic

CIRCUIT BLOCKS

- Can bus
- Can node 1
- Can node 2
- A/D conversion
- Decoding
- Signal multiplexing
- Encoding
- D/A conversion

Complete with theoretical and practical manual.
Dimensions of the board: 297x260mm

AUTOTRONICS - MODULES

CAI SOFTWARE:
Each board of the TIME system can be supplied complete with a Student Navigator software that allows students to perform their learning activities through a Personal Computer, without the need for any other documentation.
Ordering code: please add SW after the code of the board (i.e. DL 3155M07SW)

Required:
POWER SUPPLY NOT INCLUDED
Base frame with power supply (completed with connecting cables):
- **DL 3155AL2RM** - Base frame with power supply and interface to pc and virtual instrumentation
- **DL 3155AL2** - Base frame with power supply and interface to pc

Basic power supply (connecting cables not included):
- **DL 2555ALG -** DC power supply ±5 ±15 Vdc, 1A
- **TL 3155AL2 -** Connecting cables

Choosing this power supply, for the execution of the experiments, it is normally required the use of an oscilloscope and two multimeters.

CHARACTERISTICS OF THE BASE FRAME DL 3155AL2

POWER SUPPLIES:

		6 Vac,	1 A
		12 Vac,	1 A
	+	5 Vdc,	1 A
	-	5 Vdc,	1 A
	+	15 Vdc,	1 A
	-	15 Vdc,	1 A
0 ÷	+	15 Vdc,	1 A
0 ÷	-	15 Vdc,	1 A

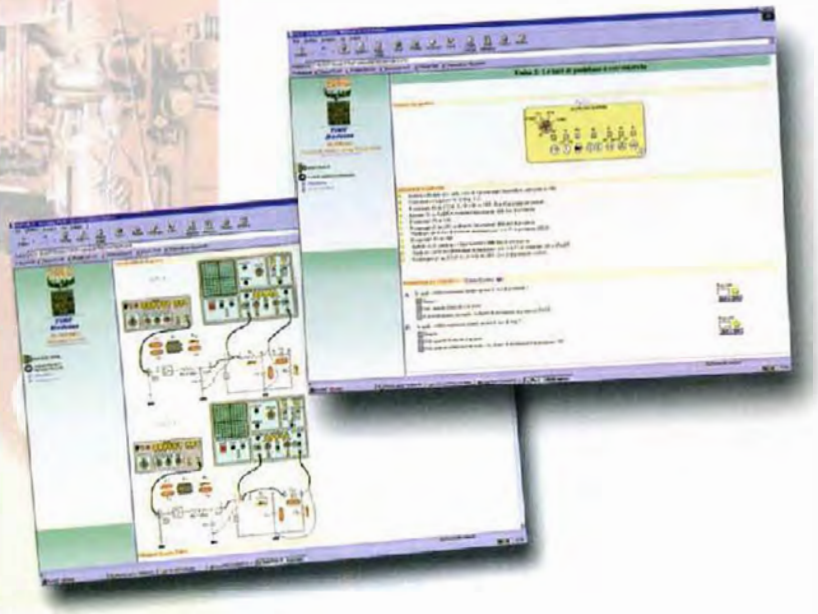
- Interface board for connection to PC
- Robust structure and modern design
- Gold plated terminals
- Voltage regulation and protection against overvoltage or short circuit

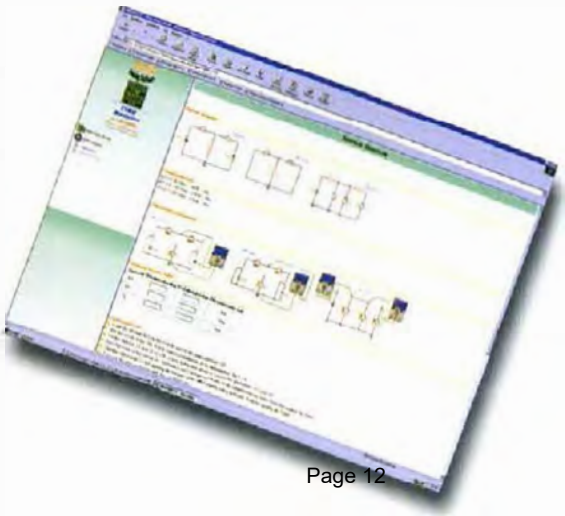
CAI SOFTWARE

Each software, installed on a personal computer, is composed of a set of lessons with a theoretical description of the relevant subject and a guide to the performance of the simulation. Each software is subdivided in lessons; therefore, it is easy for the teacher to plan the whole training course as well as to repeat one particular lesson or only part of it (theory, experiments, fault finding).

The hypertexts help in analyzing the proposed subjects in a personal way as a function of the knowledge of each student.

Through a set of questions with multiple choice answer it is possible to verify the learning progress of the student.





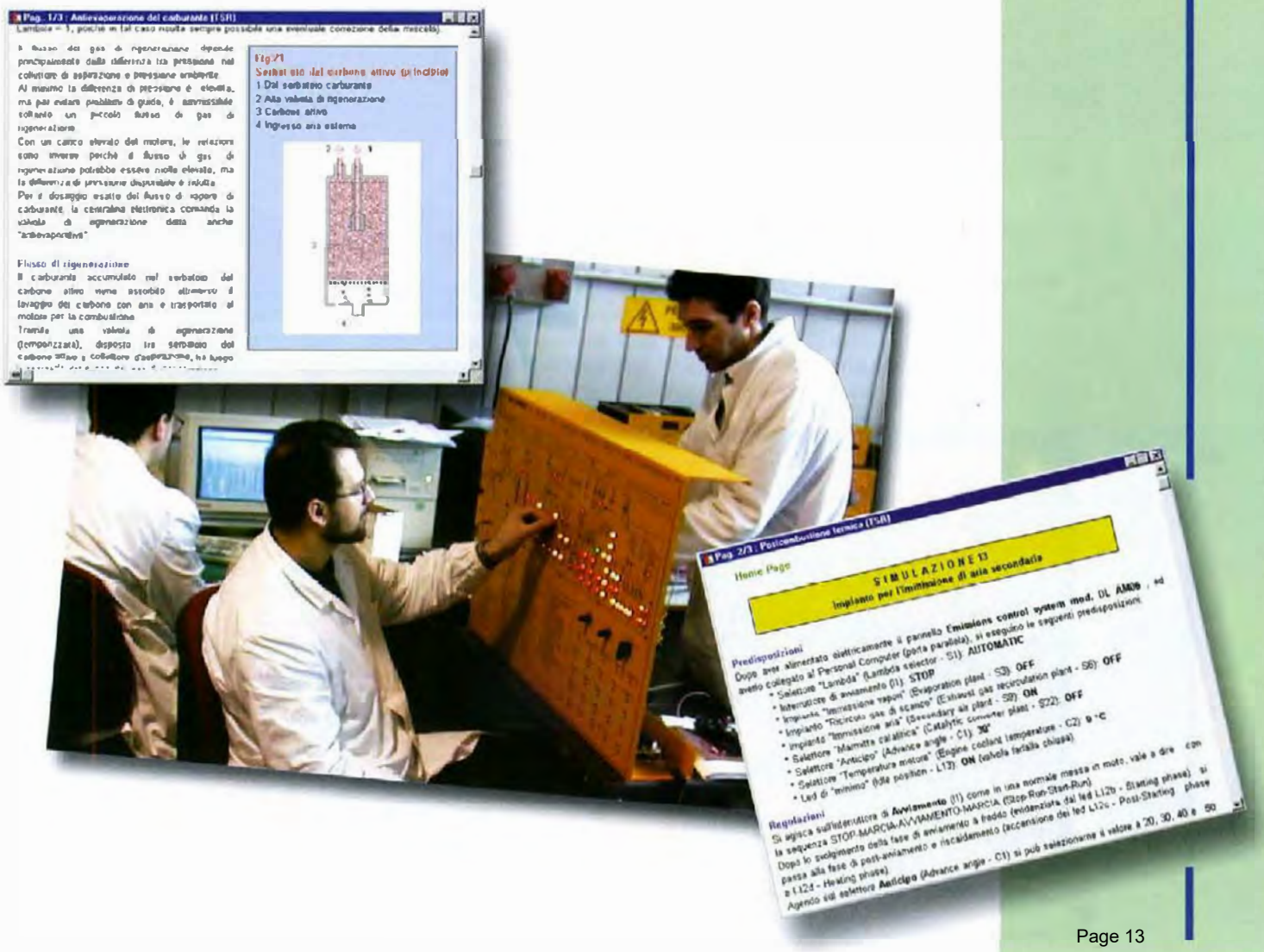
SIMULATION PANELS

This section of the laboratory consists of a set of 14 panels for the simulation of the electrical and electronic systems which can be found in modern automobiles and industrial vehicles.

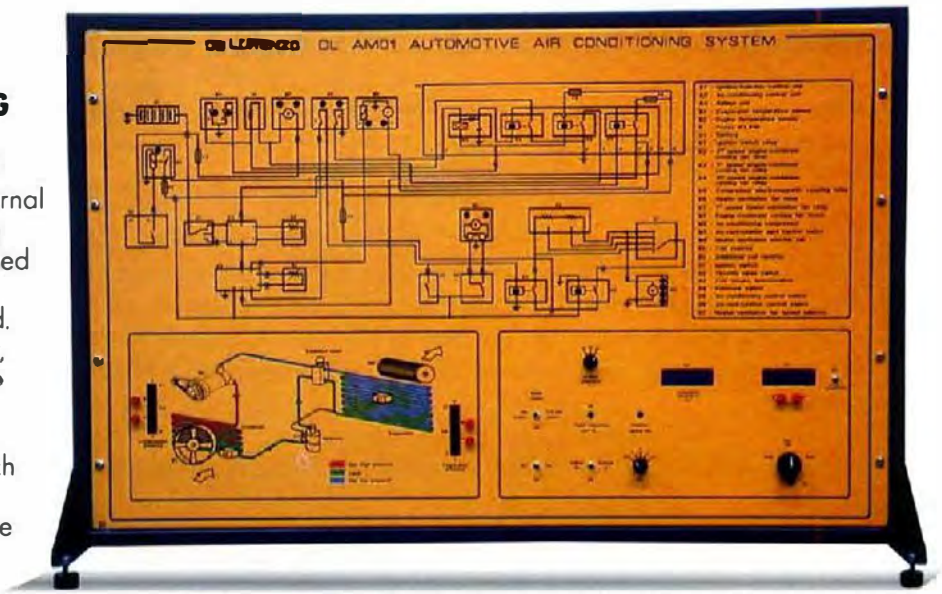
Each panel analyzes a specific subject and reproduces, by means of a colour synoptical diagram, the mechanical part and the electrical/electronic circuits. In this way, the panel allows the analysis of the real operation of both the components and the circuits, by simulating their behaviour on the basis of the controls and the operating conditions that the student and the teacher choose, directly operating on the panel or through the personal computer.

Each component of the synoptical diagram can be easily found thanks to a clear list on the panel.

The simulation is constantly kept under control by the personal computer and is visualized on the panel by means of analog/digital indicators; the student, through suitable tests and measurements, can proceed on troubleshooting.
The connection to the personal computer, through a parallel port, allows a quick setup on any PC without additional boards in the computer.
The panels are made of fire varnished and silk screened metal.
External dimensions: 1041 x 690 x 150 (470 with the base) mm



DL AM01 AIR CONDITIONING FOR AUTOMOBILES



To cool the external air refrigerating compressor based systems are exclusively used. The compressor, activated by the engine, compresses the refrigerant which consequently warms up; in the condenser the working fluid is cooled until it reaches the liquid phase. The cooling is obtained by giving heat to the exterior in the zone around the compressor. The cooled fluid expands in the expansion valve and in the evaporator and is transformed in gas. The heat necessary for such transformation is subtracted from the entering cool air.

The simulator analyzes all the phases of the refrigeration cycle. In particular:

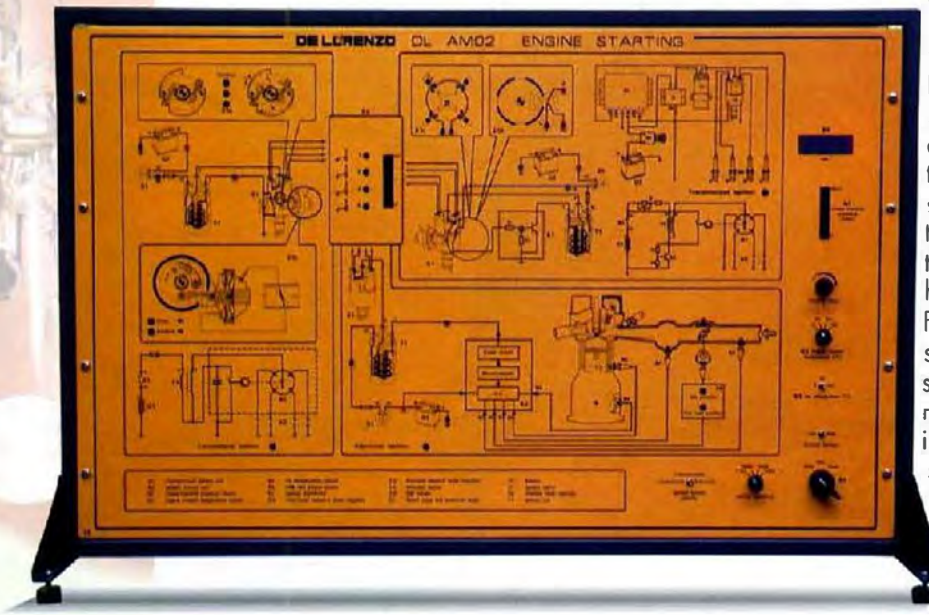
- Relations between temperature and pressure in the refrigerant
- Operation of the compressor
- Operation of the condenser
- Pressure switches
- Temperature regulation

DL AM02 ENGINE STARTING

This simulation panel deals with the study of the starting techniques used in the Otto cycle motors. The main types of starting are here analyzed: conventional with coil, with transistors and electronic starting.

As a first starting system, the simulator analyzes the conventional starting with coil in which the system is controlled by contacts. This means that the current which flows through the starting coil is inserted or de-inserted mechanically through a contact in the starting distributor.

Then, the simulator analyzes the starting system with transistors, where the starting contact-breaker does not have to control any more the current of the primary, but only the control current of a transistor which takes care of the switching of the current of the primary.



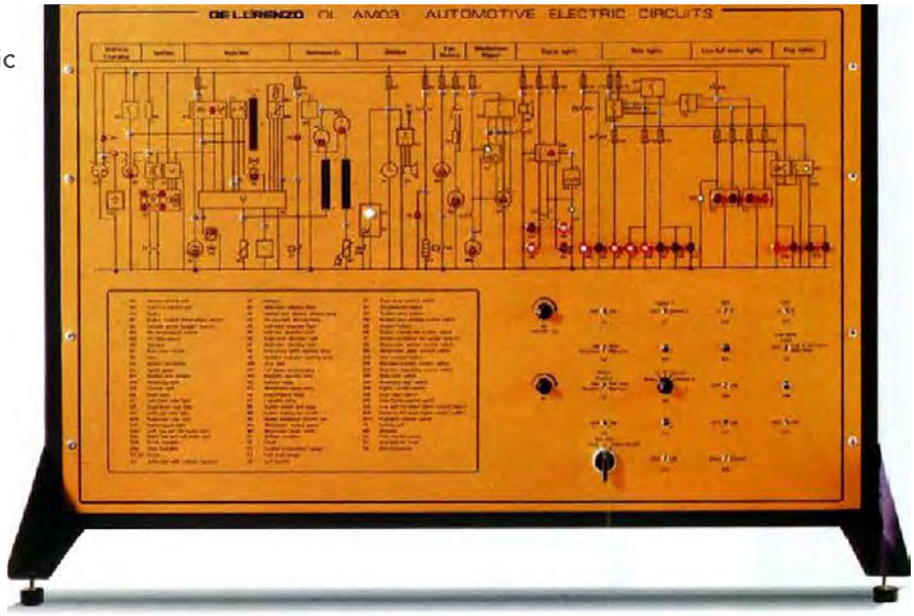
In addition to the starting system with transistors and control through contacts also the versions of transistor starting system with priming system through Hall transducer or through inductive transducer are here analyzed in detail.

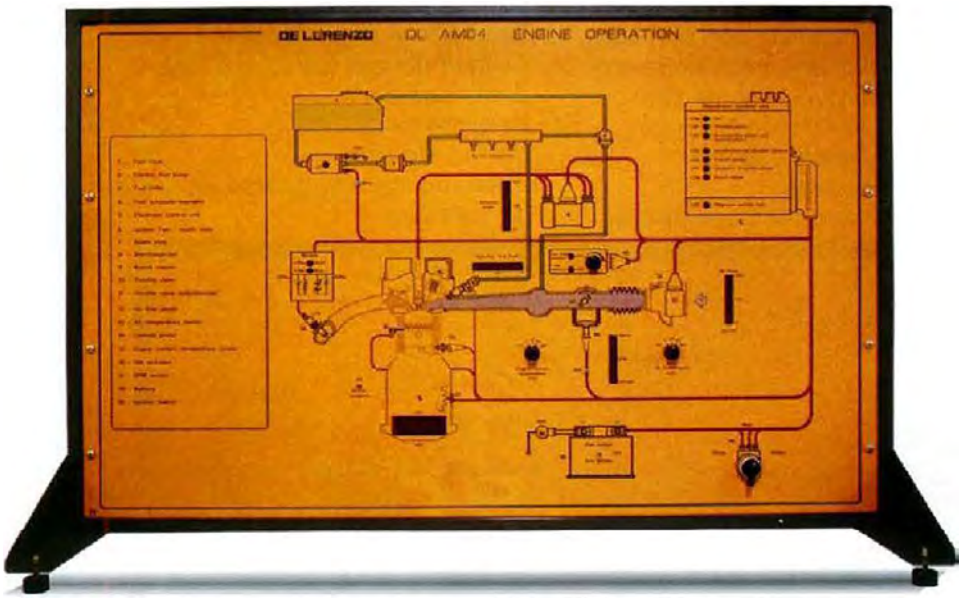
Finally, the simulation panel studies also the electronic starting in which the mechanical regulator of the spark advance is eliminated and the same spark advance is calculated by the electronic control panel.

DL AM03
ELECTRIC CIRCUITS

The following sections of the electric plant of the car are reproduced on the panel:
- Electrical supply
- Starting
- Ignition
- Fuel injection
- Various end users (radio, defrosting, etc.)
- Indicators
- Cooling and aeration
- Windshield wipers
- Signalling system
- Lighting system
- Head lights
- Anti-fog lights

The scheme utilizes the symbology specified by the DIN regulations.

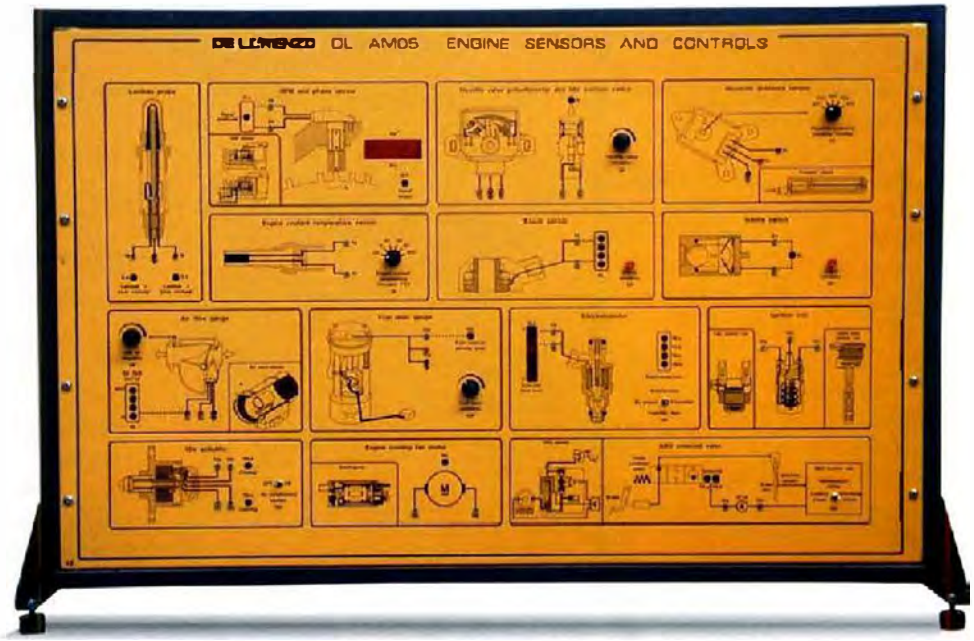




DL AM04
ENGINE OPERATION

From just one electronic control panel all the regulations on the Otto cycle based engines are performed.

The measurement sensors at the engine detect the operating data and adapt them for the use of a microprocessor, which elaborates them, recognizes the operating status of the engine and calculates accordingly the regulation signals for the control of the suitable actuators. In this way it is possible to obtain the best interconnection among injection, fuel preparation and ignition point as a function of the various operating situations of the engine. The simulator takes into consideration all these aspects by performing the following functions:
- Ignition phase
- Heating phase
- Lambda regulation
- Quick acceleration/deceleration phases
- Cut-off phase
- Regulation of the injection time
- Regulation of the advance angle
- Regulation of the minimum rpm
- Regulation of the knock
- Limitation of the rpm



DL AM05
ENGINE SENSORS AND CONTROLS

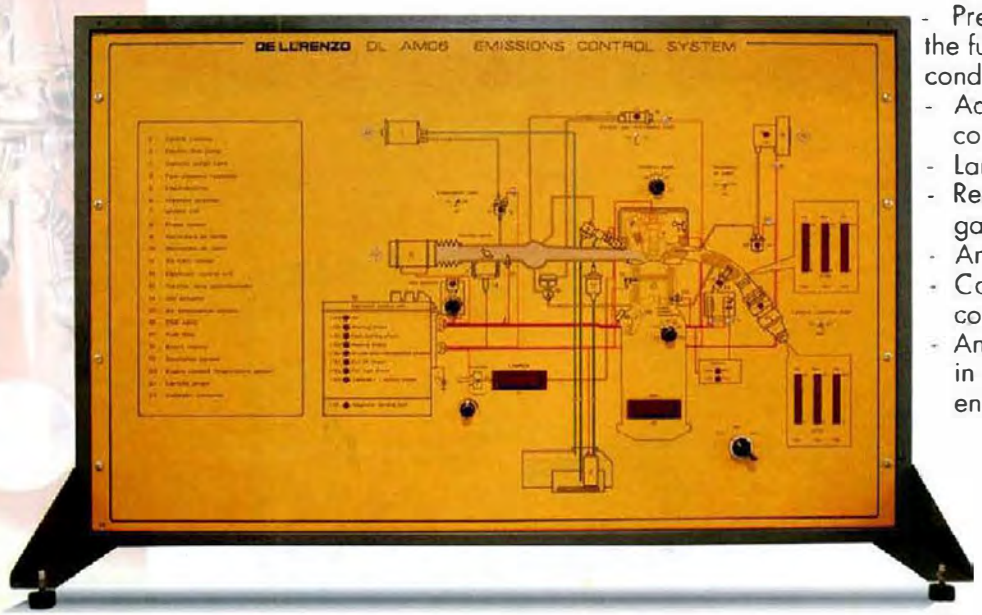
The extensive use of sensors and actuators comes from the need of the electronic control panels to know in real time the actual values of the physical parameters to be controlled or which influence the behaviour of the car.
The simulator takes into consideration all these components, by analyzing their behaviour and their structure.
In particular, the following components are analyzed:

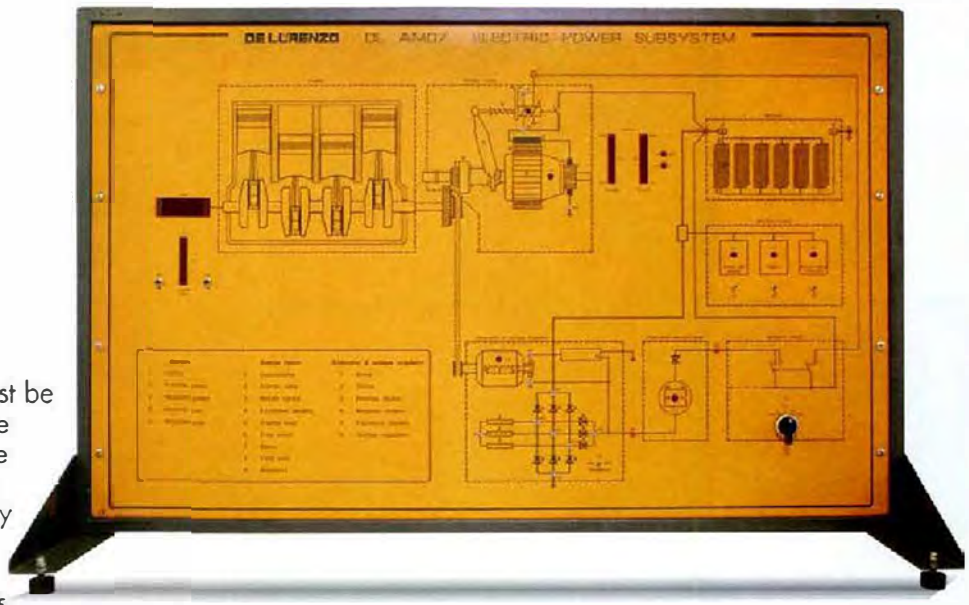
- Temperature sensors
- Pressure sensors
- Air flow rate sensors
- Position sensors
- Rpm/reference point sensors
- Oxigen sensors (Lambda probe)
- Knock sensors
- Level sensors
- Inertial sensors
- Electropumps and geared motors
- Servomotors
- Electrovalves
- Electroinjectors
- Coils

DL AM06
EMISSIONS CONTROL

The combustion of the fuel inside the cylinders of an engine is, usually, incomplete. The more it is incomplete, the bigger is the emission of noxious components which can be found in the exhaust gases from the engine.
To reduce environmental pollution it is necessary to improve the efficiency of the engine for what concerns the exhaust gases.
This simulator takes into consideration all the relevant subjects and in particular:

- Composition and control of the exhaust gases in the Otto cycle based engines
- Combustion products
- Preparation and control of the fuel and operating conditions
- Adaptation to the operating conditions
- Lambda regulation
- Recirculation of the exhaust gases
- Anti-evaporation of the fuel
- Catalytic thermal post-combustion
- Analysis of the exhaust gases in the Otto cycle based engines: test cycles

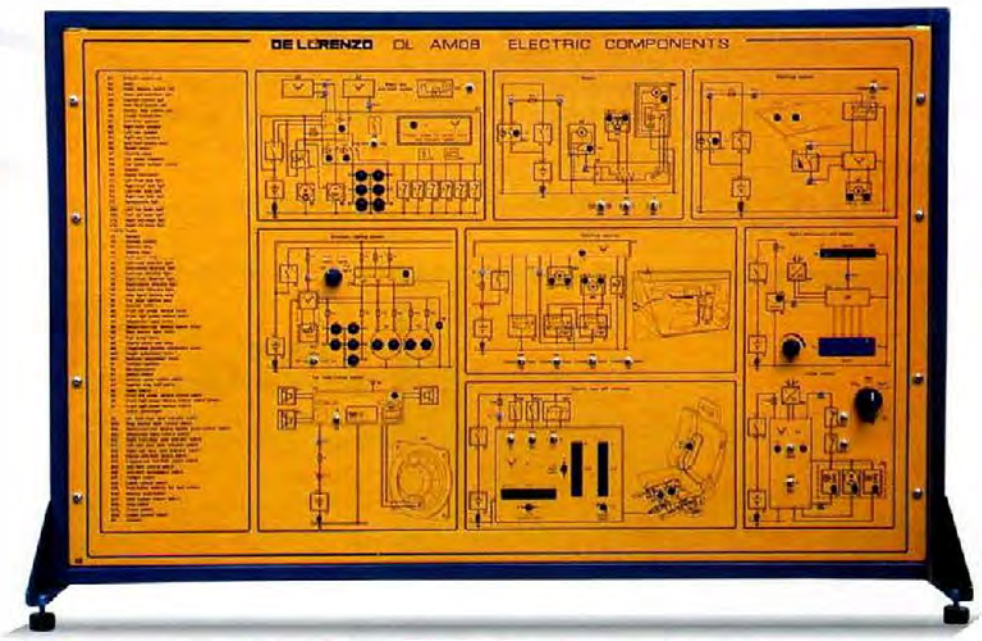




DL AM07
ELECTRIC POWER

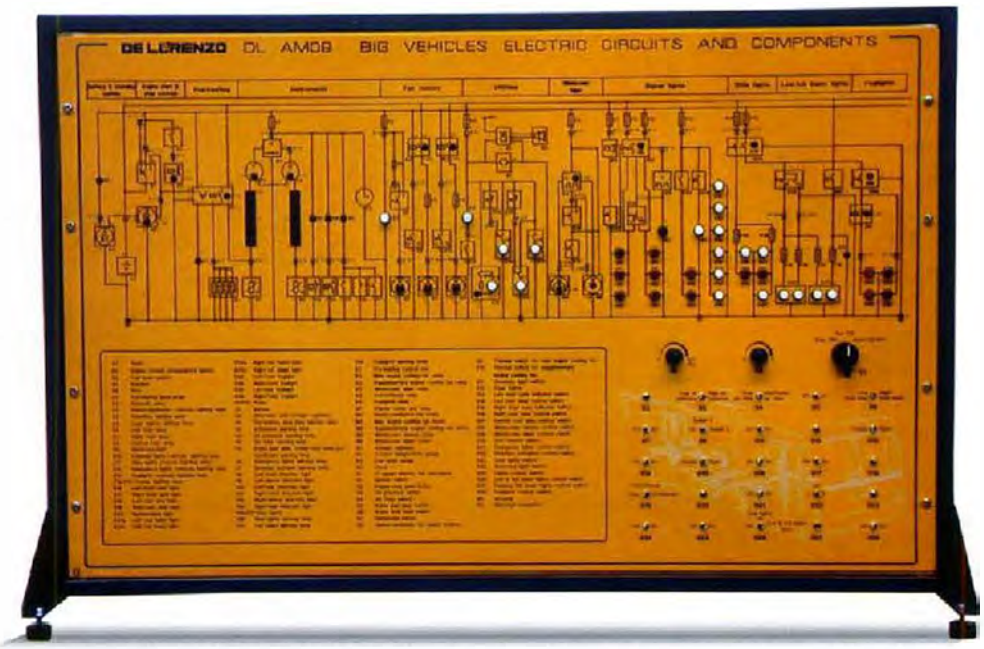
The combustion engines must be started with a special device because, differently from the electric motors or the steam engines, they cannot start by themselves.
The simulator takes into consideration all the devices, circuits and systems for the starting and the recharging.
In particular the following components are analyzed:
- Battery
- Starter
- Alternator
- Connecting circuits

The simulator analyzes in detail all the different phases relevant to the starting transistors, the conditions of standard operation, the recharging and the situations of variation of the electric loads.



DL AM08
ELECTRIC COMPONENTS

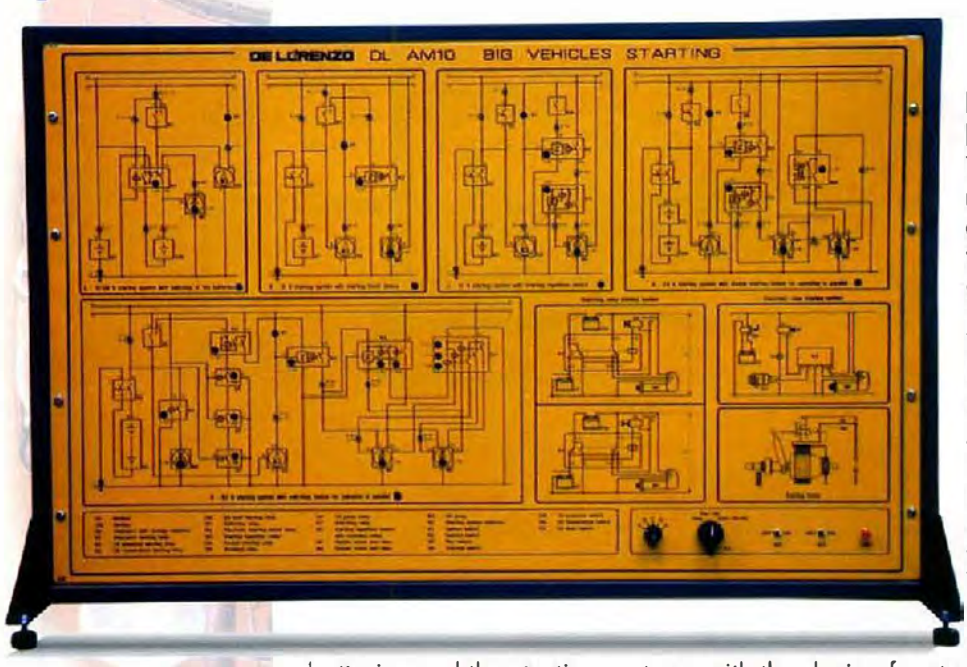
This simulator deals with the electrical auxiliary plants used in modern automobiles, such as:
- Alarm and anti-theft system
- Electrical windows
- Electrical regulation of the car seats
- Automatic regulation of the lighting
- Car radio/stereo system
- Cruise control
- Electrical sunroof
- The scheme utilizes the symbology specified by the DIN/IEC regulations.



DL AM09
BIG VEHICLES ELECTRIC CIRCUITS AND COMPONENTS

This simulation panel deals with the circuits and the electric components used in the industrial vehicles (buses, lorries, etc.)
The following sections of the electric plant are reproduced and analyzed:
- Electrical supply
- Starting
- Ignition
- Fuel injection
- Auxiliary plants (doors opening/closing, defrosting, anti-theft system, etc.)
- Indicators
- Cooling and aeration
- Windshield wipers
- Signalling system
- Lighting system
- Head lights
- Anti-fog lights

The scheme utilizes the symbology specified by the DIN regulations.



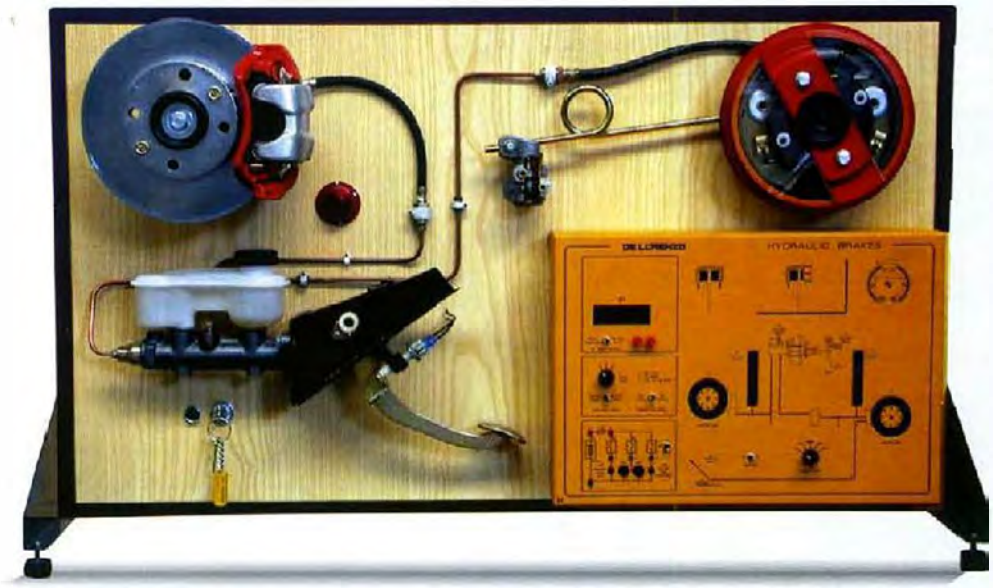
DL AM10
BIG VEHICLES STARTING

The term "industrial vehicle" is normally used for the vehicles which are made for the transport of more than 9 people, for the transport of goods and/or for the haulage of trailers.
This category basically includes: buses, lorries of various dimensions, special lorries, haulers.
According to the great variety of industrial vehicles also the starting systems are always adapted to the structure and type of motor of the vehicle on which they must be put.
This simulator mainly takes into consideration the 12 V and the 24 V starting systems with switching of the batteries and the starting systems with the device for starting block.
The simulator analyzes also the starting systems with the device for starting repetition, those with the relay for double starting for operation in parallel and those with the switching relay for the operation in parallel.

DL AM11
HYDRAULIC BRAKES

This demonstration panel comprises a disk brake in the front wheel and a drum brake in the driving wheel.
Both wheels can be rotated slowly. When the brake is activated both wheels will stop.
The cylinder can be moved hydraulically.
The system covers the following subjects:

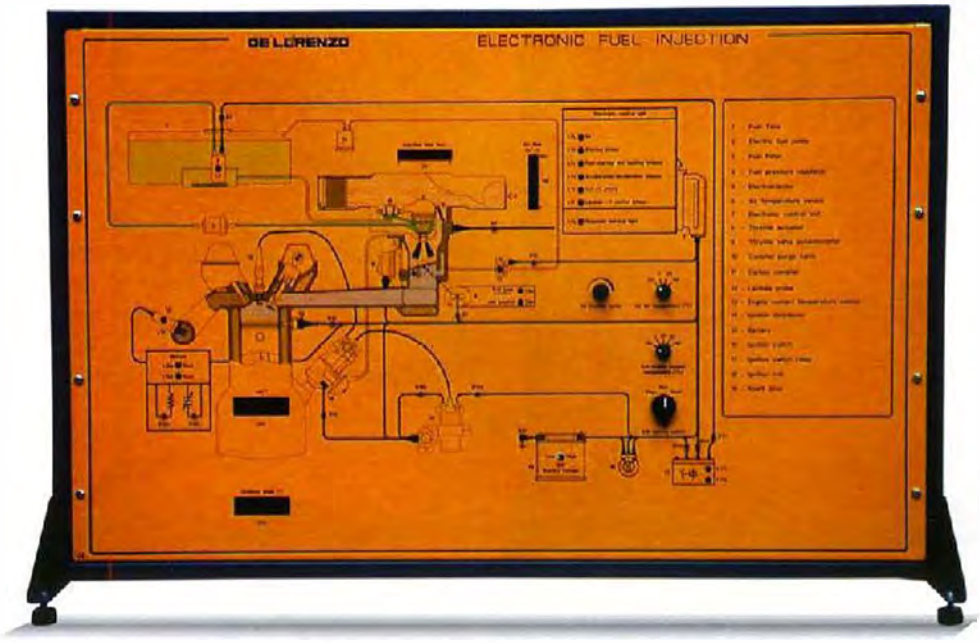
- Back wheel bind (lock), pressure does not drop after releasing pedal
- Vacuum loss
- Back brakes failure
- Front brakes failure
- Hand brakes
- Brake light failure

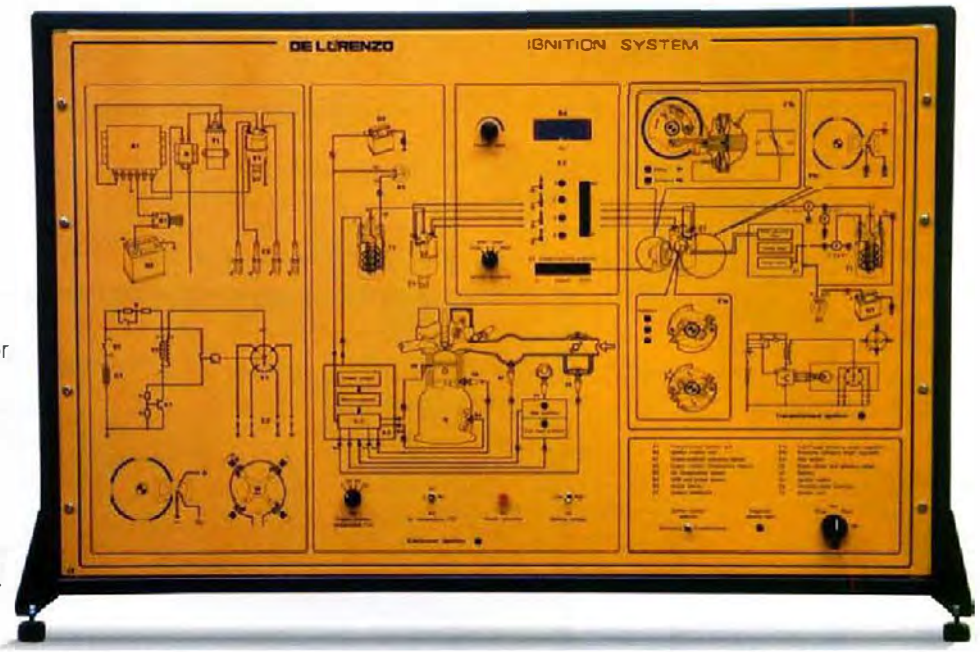


DL AM12
ELECTRONIC FUEL INJECTION

This simulator shows how modern cars injection systems operate. The experiments covered by the panel are:

- Relationship between the duration of injector opening to the quantity of injected fuel
- Air temperature effect on the quantity of injected fuel
- Signal analysis with oscilloscope
- Injection time calculation with oscilloscope
- Injection time calculation with tachometer and dwell meter
- MAF sensor operation
- Valve position switch output signals
- Valve position sensor output signals
- Study of injector activation signal at various conditions
- Injection duration at various speeds, temperatures and engine loads
- Oxygen sensor operation





DL AM13
IGNITION SYSTEM

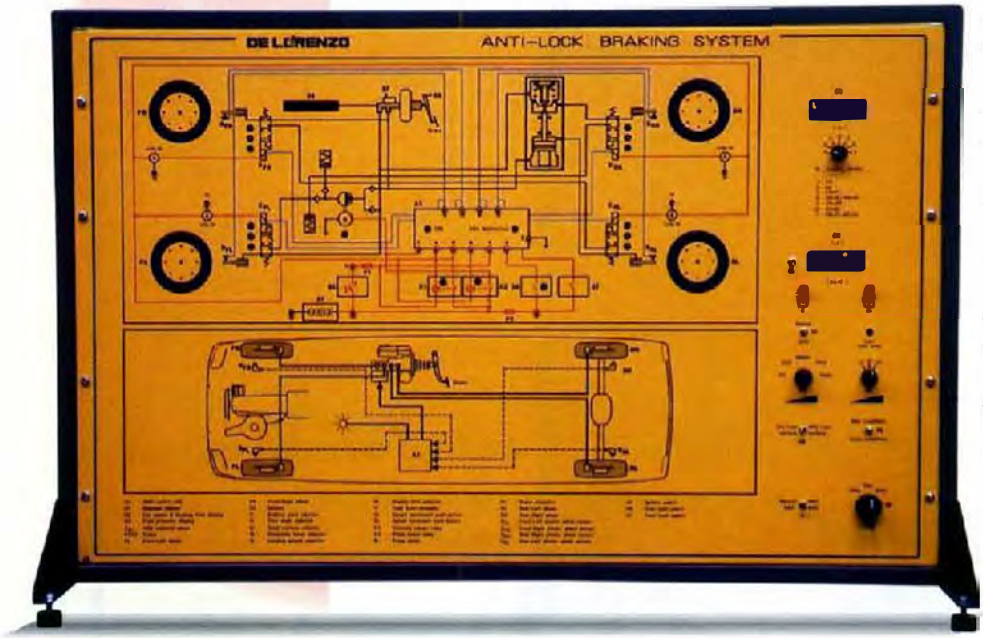
This simulator shows how modern cars ignition systems operate.
All relative signals, such as the output of Hall sensor, knock sensor output, engine speed, the refrigerator temperature, MAP output, A/D input, voltage and current of initial and secondary ignition, stroboscope trigger, end to test points. The experiments covered by the system are:

- Direct ignition activation system
- Different spark types analysis
- Dwell timing and control
- MAP sensor characteristics
- Cooling sensor operation
- Knock sensor characteristics
- Constant current for various engine speeds
- Ignition system operation at various conditions of speed, load and engine temperature
- Ignition time and dwell measurements
- Operation of the ignition system with fuel electronic injection

DL AM14
ANTI-LOCK BRAKING SYSTEM

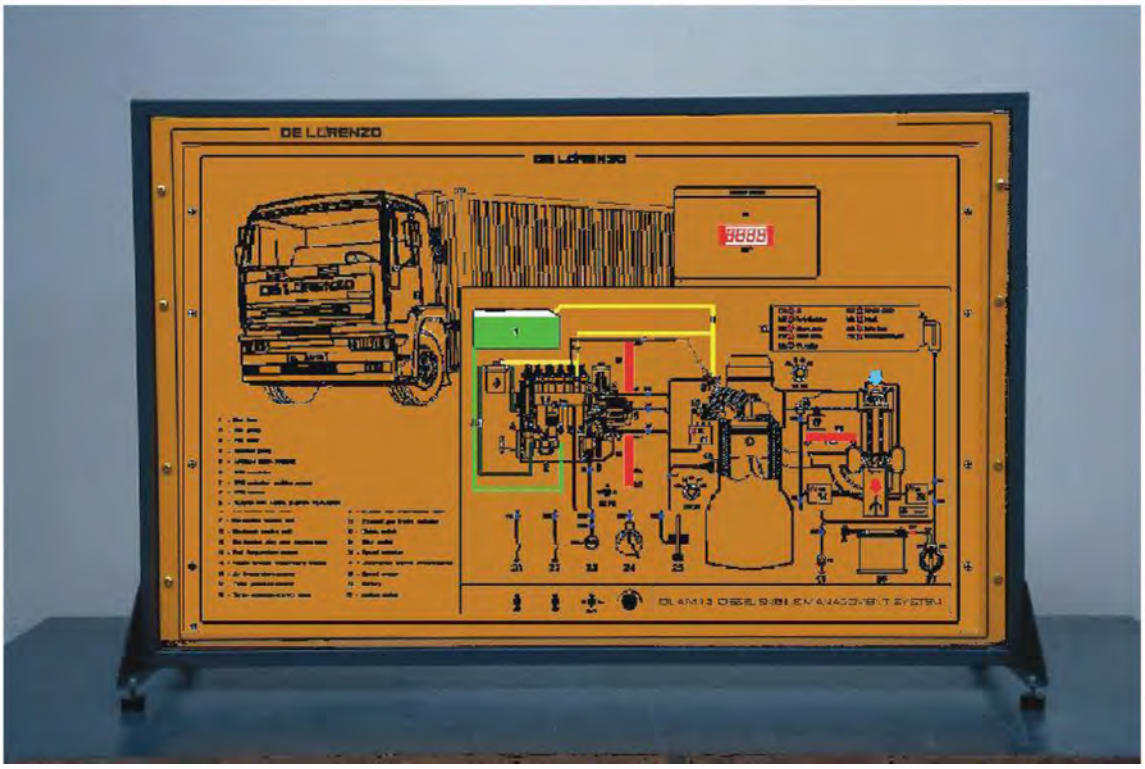
Designed to show how modern car ABS systems are designed to operate. The experiments covered by the system are:

- ABS operation when wheels are rotated at different speeds
- ABS operation when wheels are rotated at same speed
- Pressure measurement during operation
- Hydraulic ABS valve operation



- Self diagnostic control
- Fault diagnosis procedure
- Various control signals measurements in ABS system
- Low fluid level detection
- ABS operation with one wheel speed sensor disconnected
- ABS operation with destroyed hydraulic valve
- Brake system operation when the electronic brake unit is disconnected
- Brakes operation when there is leakage
- System operation with different relative rotation speed of wheels
- ABS operation with hydraulic valve stuck

DL AM15 – DIESEL ENGINE MANAGEMENT SYSTEM



It includes a panel trainer and a software and it enables the study of the following topics:

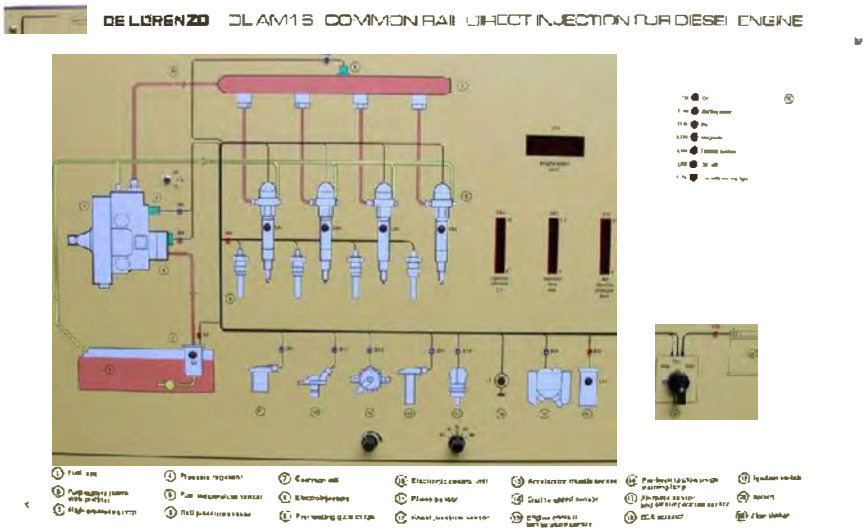
- Heavy vehicle wiring diagrams
- Heavy vehicle Electronics Control Module (ECM)
- Heavy vehicle electronic fuel injection systems
- Heavy vehicle sensors
- Heavy vehicle exhaust gas analysis and emission control
- Heavy vehicle turbo chargers and blowers
- Heavy vehicle cold start systems
- 12 V circuits
- Electronic control of vehicle performance and speed
- Engine protection
- Tamper resistance
- Fault finding

This panel trainer provides realistic fault finding facilities using heavy vehicle schematic diagrams. An easily understood schematic system represents the starting and fuel injection systems of a typical heavy vehicle. The student is able to see the exact operation of the various circuits as used in trucks and buses and is able to gain a hands-on introduction to each of the components and devices found in typical heavy vehicle systems. All practical activities are carried out using the electrical/electronic circuits and devices mounted on the panel trainer.

Appropriate heavy vehicle components and circuit mimics are screen printed into the trainer to aid students understanding of the system under investigation.

It provides facility to insert faults into the various circuit elements under the control of a computerized workstation linked to the management system.

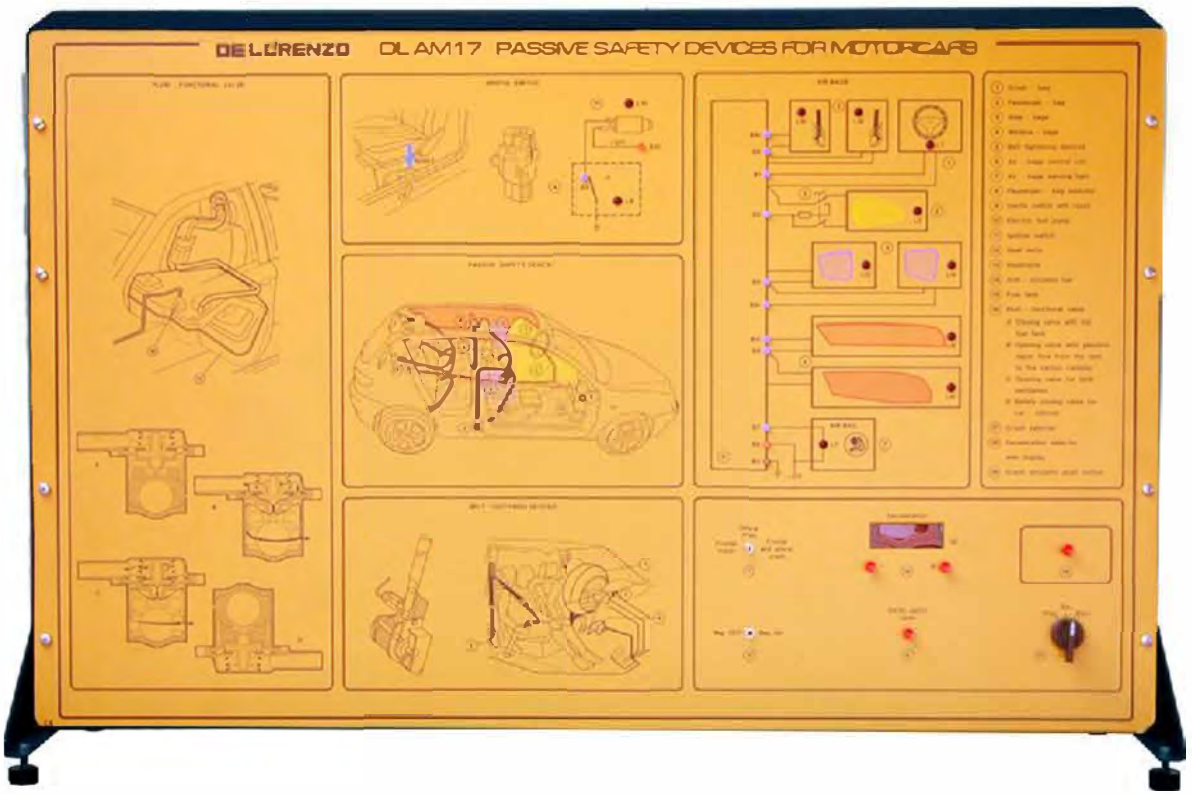
DL AM16
COMMON RAIL DIRECT INJECTION FOR DIESEL ENGINE



This simulator allows the study, the testing and the troubleshooting on HDI (CDI – CR) injection systems for diesel engines that, similarly to what happens for the traditional injection petrol engines where, however, the pressure of the fuel is only few bars, use a high pressure (up to 1500 bar) electric pump and a single manifold (common rail) to connect the pump to the electro-injectors, which are electronically and individually controlled for what concerns the start and the duration of the injection.
In the conventional diesel engine the rotation speed of the engine controls the pressure to the injectors and, furthermore, pressure and injection are strictly correlated, because only when the pressure exceeds a given threshold there is the mechanical opening of the injector.
Therefore, the advantages of the common rail are rather evident:
High pressure also at low regimes;
Excellent atomization and dispersion of the fuel;
Increase of the torque;
Reduction of the noise;
Reduction of the consumptions and of the emissions.
The results that have been obtained with the common rail direct injection diesel engines are such that it is foreseeable that within ten years the pre-chamber diesel engines will disappear.
The whole plant, for a common rail direct injection diesel engine, is reproduced on the panel through a synoptical diagram that allows a complete analysis of the circuit of the fuel, of the electrical/electronic control circuit and of all the relevant components.

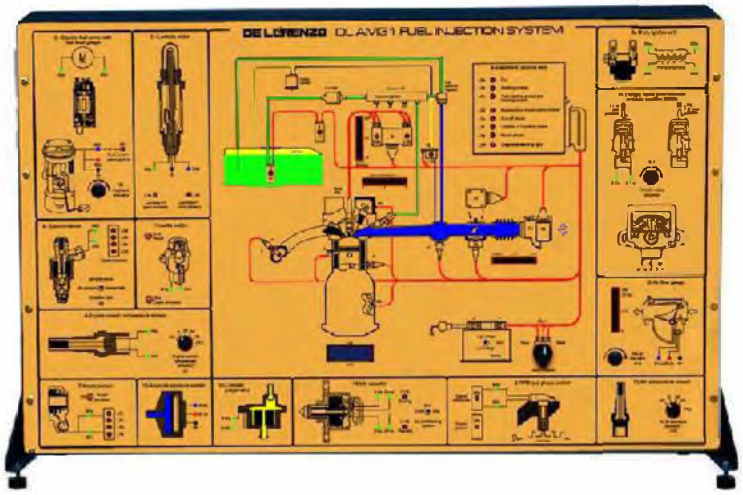
It is possible to simulate the behaviour of components and circuits, on the basis of operating conditions that students and teachers can control directly on the panel or through the personal computer.
The latter keeps constantly under control the simulation, by visualizing its behaviour by means of signals and analog and digital meters; in this way the student, through suitable measurements and tests, can proceed to the fault finding activity.
The software is organized in lessons suitably balanced among theory, practical experiences, troubleshooting and tests.
The main components that characterize a common rail direct injection diesel engine are the following:
fuel tank with pre-filter;
high pressure electro-pump;
flow limiter:
common rail with electro-injectors, fuel pressure limiting valve and relevant pressure sensor;
electronic control board for the management of the whole plant;
engine rpm sensor;
accelerator pedal position sensor;
over-supply pressure sensor;
air temperature sensor;
engine temperature sensor;
air mass sensor;
pneumatic actuator for the variable geometry turbine.
computerized workstation linked to the management system.

DL AM17
PASSIVE SAFETY DEVICES FOR MOTORCARS



This simulator allows the study, the testing and the troubleshooting on the devices which have been developed for the purpose of increasing the safety of driver and passengers inside motorcars.
The simulator considers all those systems that allow to reduce the consequences of accidents; in particular, the following devices are analyzed:
air-bag (driver-bag, passenger-bag, side-bag, window-bag)
safety belts tension relay
fuel shut-off inertial switch
multi-function valve in the fuel tank
The different not-acting safety devices are reproduced on the panel through a synoptic diagram that allows a complete analysis of the components and, in case, of the relevant electrical/electronic control circuit.
It is possible to simulate the behaviour of components and circuits, on the basis of operating conditions that students and teachers can control directly on the panel or through the personal computer.
The latter keeps constantly under control the simulation, by visualizing its behaviour by means of signals and analog and digital meters; in this way the student, through suitable measurements and tests, can proceed to the fault finding activity.

DL AM31
FUEL INJECTION SYSTEM



This simulator is an educational system designed in vertical frame, bench-top, so the students have the capability to watch the theoretical and practical study of the automotive systems.
It includes color mimic diagram that clearly shows the structure of the system and allows the location of components on it.
The simulator consists of a panel operating by PC with mimic diagram for the clear positioning of the components. The various zones of the mimic diagram are presented with different colors and shades to emphasize the peculiar characteristics of the system. The mimic diagram is fitted with light indicators so as to enable the observation of the control.
The display of the information available at the PC monitor allows the continuous monitoring of the educational system.
The operational conditions are entered by the students. The insertion of faults is carried out by the PC.
The simulator is accompanied by relevant software to enable the student to follow step-by-step the theory and the exercise. The whole exercise procedure is carried out on the simulator.
The system is accompanied by technical manuals for theory and exercises.
With the simulator it is possible to study engine operation, engine sensors and controls and electronic fuel injection.

The simulator covers the following topics:

- Oxygen sensor, temperature sensor, MAP sensor, MAF sensor, knock sensor, operation.
- Pressure, flow, position sensors.
- Injection time - calculation.
- Ignition pulses effect on main switch, ignition timings.
- Engine efficiencies, horsepower and engine torque, valve position switch output signals and valve position sensor output signals.
- Signal analysis, injector activation signal at various conditions, air injection control, injection duration at various speeds, temperatures and engine loads.
- Air temperature effect on the quantity of injected fuel.
- Fuel cut-off, relationship between the duration of injector opening to the quantity of injected fuel.
- Solenoids, open and close loop controls and exhaust gas circuit.

The simulator takes into consideration all these aspects by performing the following functions:

- Ignition phase
- Heating phase
- Lambda regulation
- Quick acceleration/deceleration phases
- Cut-off phase
- Regulation of the injection time
- Regulation of the advance angle
- Regulation of the minimum rpm
- Regulation of the knock
- Limitation of the rpm

In particular, also the following components are analyzed:

- Rpm/reference point sensors
- Level sensor
- Inertial sensor
- Electro-pump
- Idle actuator
- Electro-injectors and coils.

Software

The simulator is provided complete with Training Software and Control Software.
The Training Software guides the student through the following phases: learning, simulation and experiments performance, tests and troubleshooting.

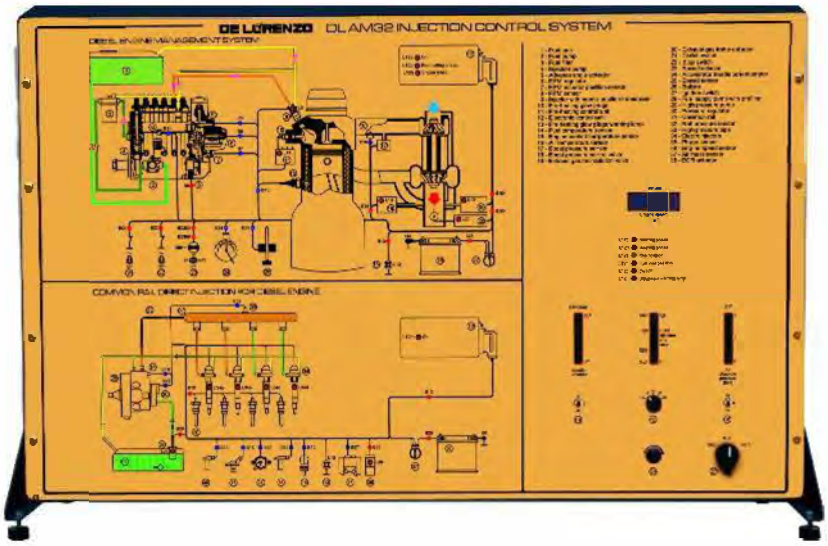
It represents the state of the art of the applications of Computer Aided Instruction, thanks to the use of the World Wide Web Internet technologies that are the most powerful and simple environment to be used for the distribution and utilization of multimedia and hyper textual components.
With this software learning becomes as simple as surfing on the Internet.

The Control Software controls all the devices of the simulator and allows visualizing on suitable time based diagrams all the quantities of the system. It also provides a Car Panel that makes even more realistic the use of the simulator.

Required PC configuration
The simulator can be used with any Personal Computer having:

- Windows 98/Me/2000/XP Operating System
- USB interface

DL AM32
INJECTION CONTROL SYSTEM



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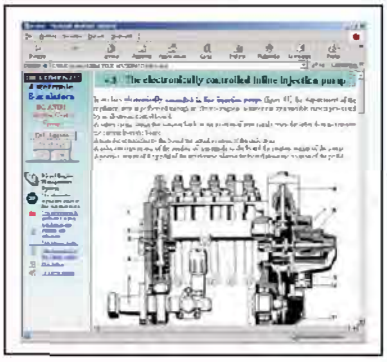
The operational conditions are entered by the students. The insertion of faults is carried out by the PC.
The simulator is accompanied by relevant software to enable the student to follow step-by-step the theory and the exercise. The whole exercise procedure is carried out on the simulator.
The system is accompanied by technical manuals for theory and exercises..

With the simulator it is possible to study the control (diesel engine management) and the diesel engines direct injection (common rail direct injections).

The simulator covers the following topics:

- Heavy vehicle wiring diagram.
- Heavy vehicle Electronics Control Module (ECM).
- Heavy vehicle electronic fuel injection systems.
- Heavy vehicle sensors.
- Heavy vehicle exhaust gas analysis and emission control.
- Heavy vehicle turbo chargers and blowers.
- Heavy vehicle cold start systems.
- 12 V circuits.
- Electronic control of vehicle performance and speed.
- Engine protection.
- Tamper resistance.
- Fault finding.
- Fuel tank with pre-filter.
- High pressure electro-pump.
- Flow limiter.
- Electronic control board for the management of the whole plant.
- Engine rpm sensor.
- Accelerator pedal position sensor.
- Over-supply pressure sensor.
- Air temperature sensor, engine temperature sensor, air mass sensor.

Software



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The **Training Software** guides the student through the following phases: learning, simulation and experiments performance, tests and troubleshooting.

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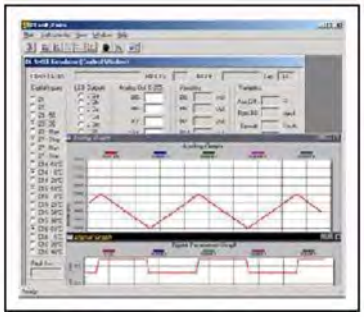


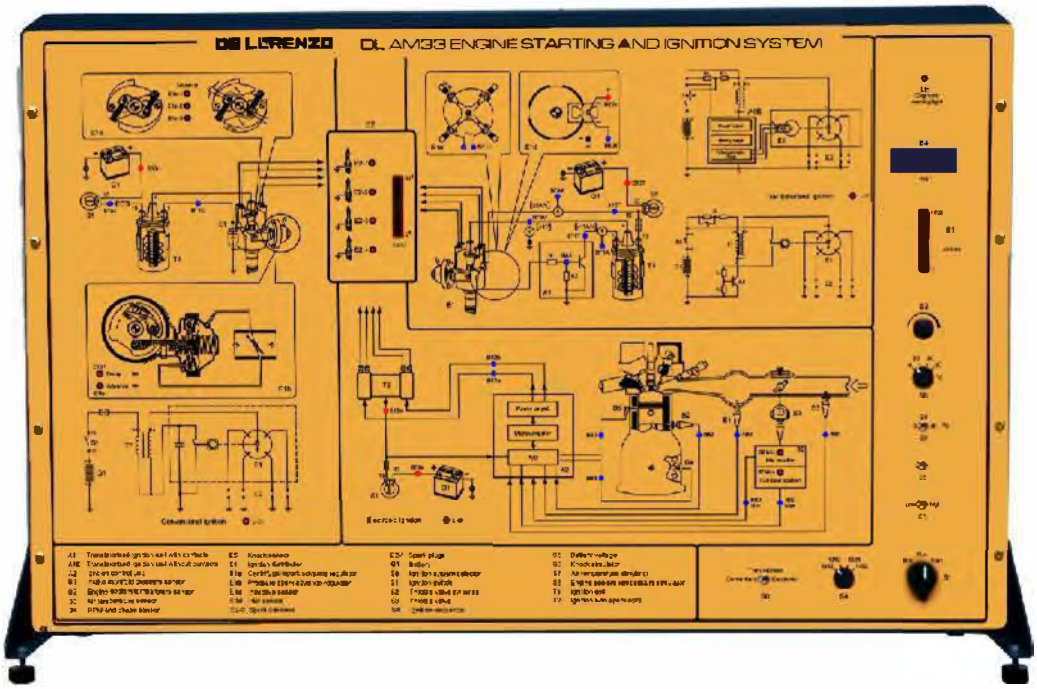
The **Control Software** controls all the devices of the simulator and allows visualizing on suitable time based diagrams all the quantities of the system. It also provides a Car Panel that makes even more realistic the use of the simulator.

Required PC configuration

The simulator can be used with any Personal Computer having:

- Windows 98/Me/2000/XP Operating System
- USB interface

AM 33
ENGINE STARTING AND IGNITION SYSTEM

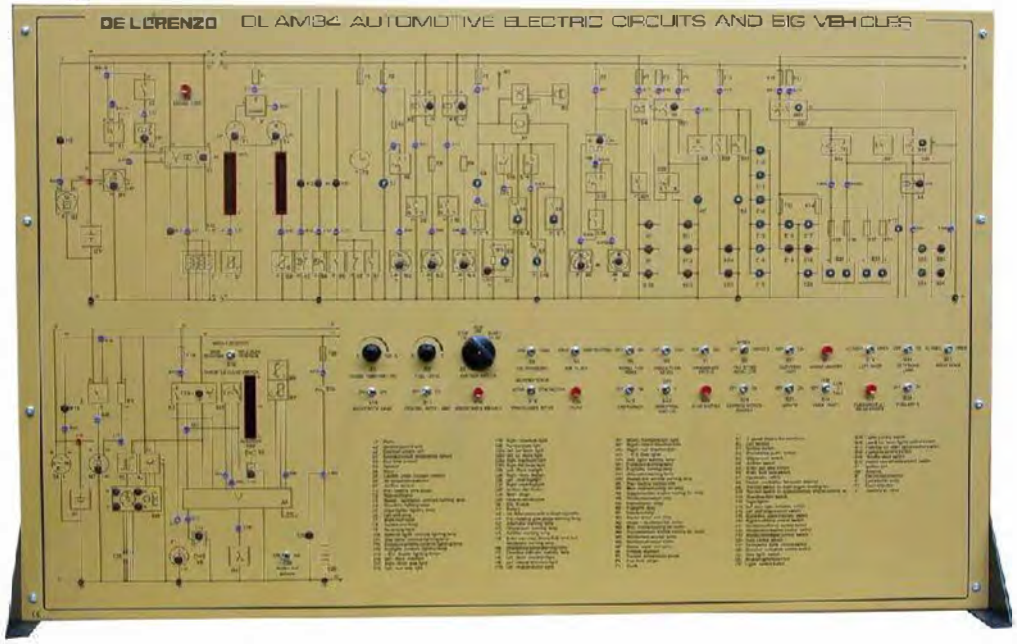


The simulator covers the following topics :

- Instruments (meter) operation,
- Voltage/resistance measurement,
- Starter operation,
- Ignition system,
- Operation and control of electronic circuits,
- Fuel system/operation,
- Electronic ignition,
- Direct ignition activation system,
- Different spark types analysis,
- Dwell timing and control,
- MAP sensor characteristics,
- Cooling sensor operation,
- Knock sensor characteristics,
- Constant current conservation for various engine speeds,
- Ignition system operation at various conditions of speed, load and engine temperature,
- Ignition time and dwell measurements,
- Operation of ignition system with fuel electronic injection.

By this simulator the main types of ignition systems are analyzed: conventional with coil, transistorized with Hall or inductive sensor, and electronic ignition.

DL AM34
AUTOMOTIVE ELECTRIC CIRCUITS AND BIG VEHICLES (LORRIES, BUSSES)



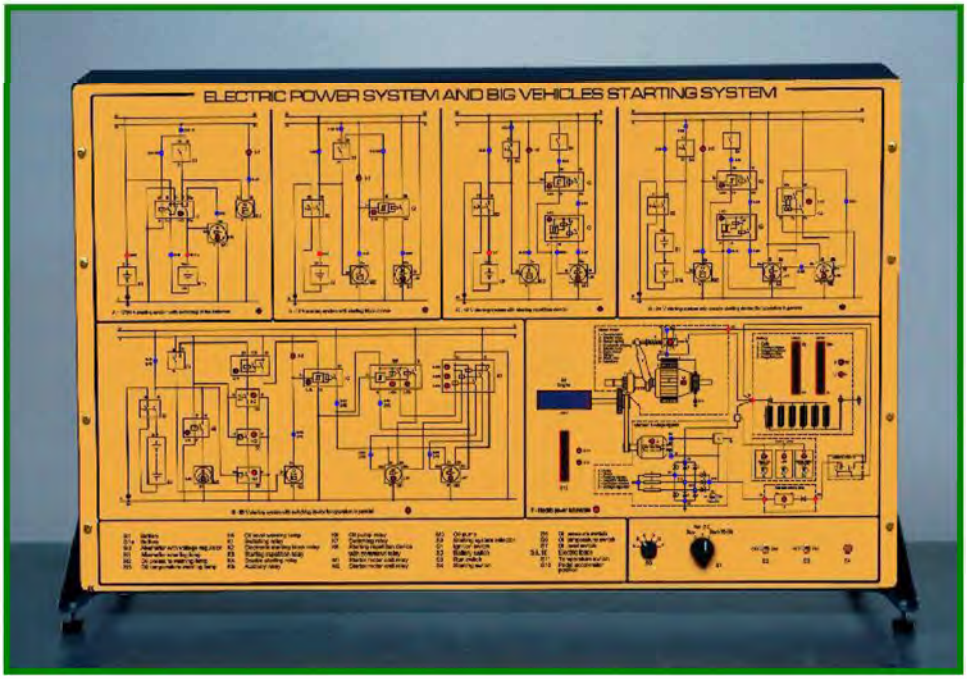
The simulator covers the following topics :

- Electrical components in cars,
- Electrical circuits in cars,
- Electrical circuits faults, short-circuits, open circuits, bad components in cars,
- Electrical components and their symbols in cars,
- Automotive electrical wiring diagrams,
- 12V circuits,
- Electrical components in big vehicles,
- Electrical circuits in big vehicles,
- Electrical systems in big vehicles,
- Electrical components and their symbols in big vehicles,
- Lorries electrical wiring diagrams

Practical exercise on fault recognition and malfunction repair (troubleshooting).

- The following sections of the electric plant are reproduced and analyzed:
- electrical supply
- starting
- ignition
- fuel injection
- auxiliary plants (doors opening/closing, defrosting, anti-theft system, radio, etc.)
- indicators
- cooling and aeration
- windshield wipers
- signalling system
- lighting system
- head lights
- anti-fog lights
- The scheme utilizes the symbology specified by the DIN regulations.

DL AM35 -
ELECTRIC POWER SYSTEM AND BIG VEHICLES STARTING SYSTEM



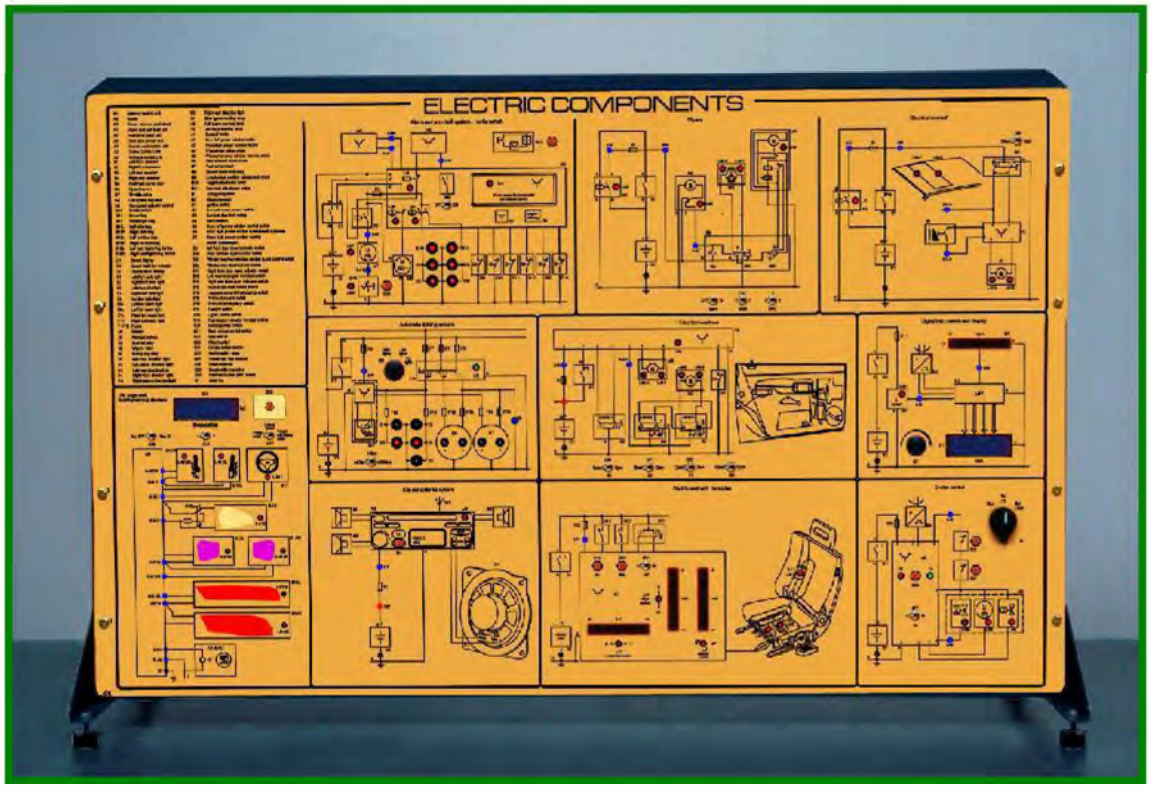
The simulator covers the following subjects that are relevant to both cars and big vehicles :

- Battery and power cables,
- Converter (alternator),
- Voltage regulator,
- Starting system,
- Fuses and connections (fusible links),
- Multiplier,
- Digital meter operation,
- Ammeter operation,
- Battery voltage in terms of load and temperature,
- Battery charging and testing procedure,
- Cranking system,

Loading procedure control system,
Methods of recognizing faults,
Repair practical techniques.

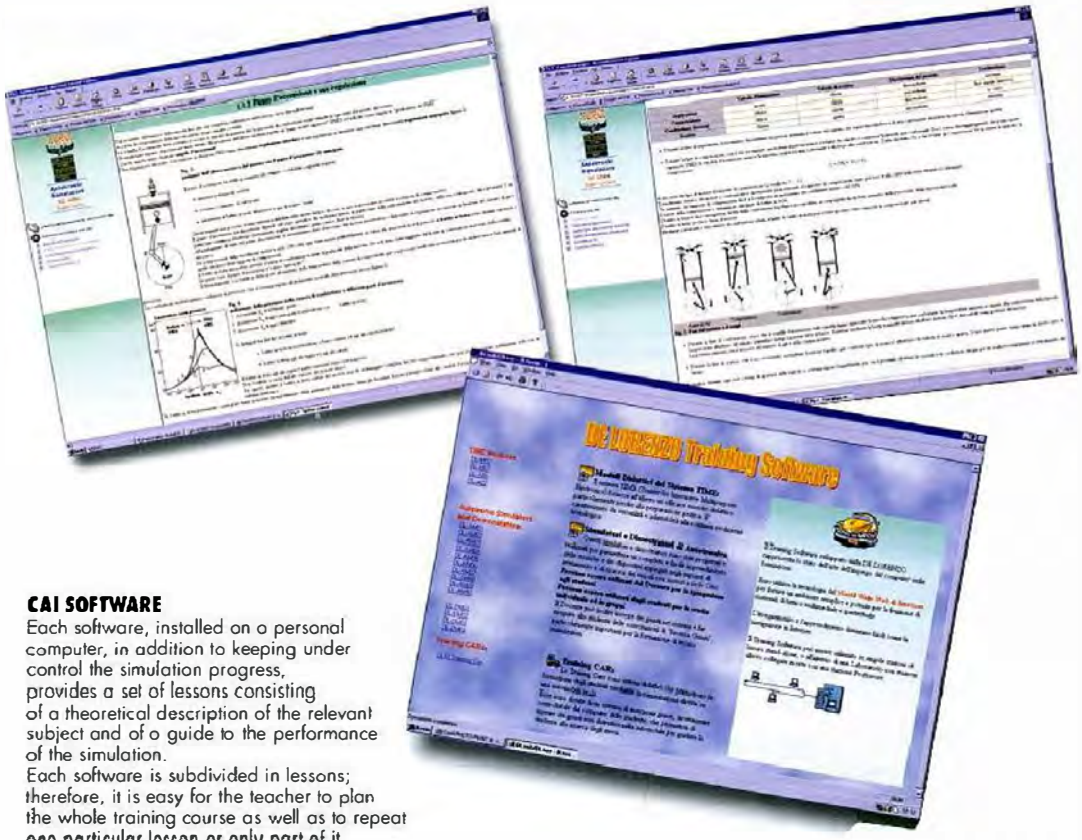
This simulator mainly takes into consideration the 12 V and the 24 V starting systems with switching of the batteries and the starting systems with the device for starting block.
The simulator analyzes also the starting systems with the device for starting repetition, those with the relay for double starting for operation in parallel and those with the switching relay for the operation in parallel.

DL AM36 - ELECTRIC COMPONENTS



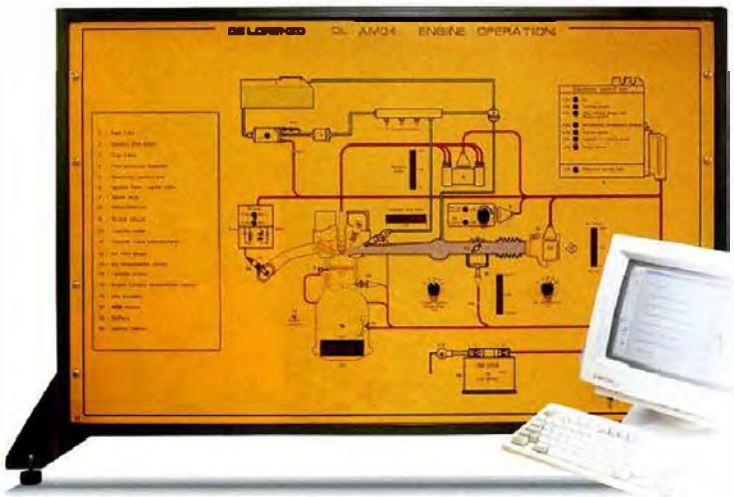
The simulator covers the following topics :

- Digital instruments and display,
- Electrical sunroof,
- Cruise control,
- Safety belts tension relay,
- Radio/stereo system,
- Automatic lighting system,
- Electric seats regulation,
- Fuel shut-off inertial switch,
- Electric (power) windows,
- Alarm system,
- Multi-function valve in the fuel tank,
- Air-bag (driver-bag, passenger-bag, side-bag, window-bag),
- Wipers.



CAI SOFTWARE

Each software, installed on o personal computer, in addition to keeping under control the simulation progress, provides a set of lessons consisting of a theoretical description of the relevant subject and of o guide to the performance of the simulation.
Each software is subdivided in lessons; therefore, it is easy for the teacher to plan the whole training course as well as to repeat one particular lesson or only part of it (theory, experiments, fault finding).
The hypertexts help in analyzing the proposed subjects in o personal way as a function of the knowledge of each student.
Through a set of questions with multiple choice answer it is possible to verify the learning progress of the student.
A panel supervision software focility, where in real time all the system variables are displayed, makes easier the control of the operation of the simulator and the prompt understanding of the current stote of the simulation.

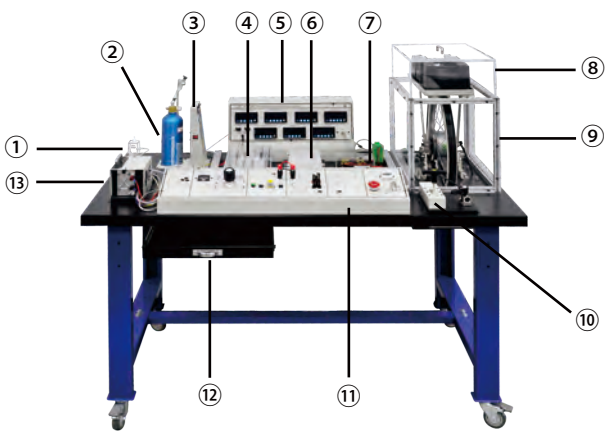


GFC-6100
Fuel Cell Electric Vehicle Training System

A Fuel Cell Electric Vehicle (FCEV) is a hydrogen vehicle which produces electricity to power. Its on-board electric motor uses hydrogen fuel cell. It provides an effective solution saving natural resource and alleviating environmental pollution. In the progress of fuel cell technology, the importance of the topics such as how to use fuel cell in an electric vehicle system and how to integrate fuel cell control with other subsystems has been enhanced. GFC-6100 Fuel Cell Electric Vehicle Training System is designed to demonstrate the application of fuel cells onto electric vehicles, including the FCEV mechanism, fuel cell system, hydrogen supply system, and motor controller.

● Features

1. The Training System can be emulated as:
   A. Direct Hydrogen Fuel Cell Vehicle
   B. Battery Electric Vehicle
   C. Hybrid FCEV
2. The Lithium-ion Battery can also be charged by external electric supply.
3. Connectable to PC via USB, Software for Data Acquisition from Meters embedded in the system
4. High energy efficiency and long driving range :
   With complementary discharging characteristics of hydrogen fuel cell and lithium-ion battery, the efficiency of entire system is enhanced.
5. Real-time vehicle information display :
   While the FCEV is running, the information of voltage, current, speed and temperature can be displayed on the instrument panel.
6. Offering fundamental knowledge of hydrogen fuel cells, hydrogen supply, hydrogen storage and system safety.



① Water storage
② Metal hydride canister (optional)
③ Temperature feedback fans (optional)
④ DC to DC Converter
⑤ Meter display
⑥ Battery (24V/10Ah)
⑦ Motor controller
⑧ Load unit
⑨ Wheel motor
⑩ Acceleration and resistance device
⑪ System control panel
⑫ Drawer
⑬ Fuel Cell stack (consumable) and controller

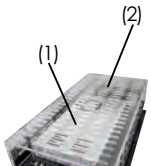
● Specifications

1. Water Storage
   Capacity : 50ml

2. Metal Hydride Canister (Optional)(Consumable)
   (1) Hydrogen capacity : 500 L ± 5%
   (2) Raw hydrogen purity : ⩾ 99.99%
   (3) Charging pressure : <1MPa
   (4) Hydrogen purity during discharging :
   ⩾ 99.999%

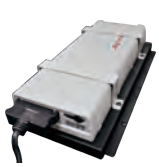
3. Temperature Feedback Fans (optional)
   (1) Thermocouples : J type (-210°C~760°C)
   (2) Fan (can set up the activation conditions from software) ×2
   Input voltage : 24V DC

4. DC to DC Converter
   (1) A DC-DC onverter for fuel cell (DC to DC converter 1)
      Input voltage : 19V~72V DC
      (with wide voltage input)
      Output voltage: 24V (adjustable 23V~30V)
   (2) Peripheral BOT system voltage
      Input voltage : 19V~36V DC
      Output voltage: 12V (adjustable 11V~16V)



5. Meter Display
   (1) Fuel cell voltage meter
      a. Range : 0~50V DC
      b. Communication : RS-485
   (2) Fuel cell current meter
      a. Range : 0~10A DC
      b. Communication : RS-485
   (3) Battery voltage meter
      a. Range : 0~50V DC
      b. Communication : RS-485
   (4) Battery current meter
      a. Range: -15A ~15A DC
      b. Communication : RS-485
   (5) Hydrogen storage temperature meter
      a. Range : -210°C~760°C
      b. Setting : Hi-Lo
      c. Communication : RS-485
   (6) Fuel cell temperature meter
      a. Range : -210°C~760°C
      b. Communication : RS-485
   (7) Speedometer meter
      a. Range : 0~19999 km/h
      b. Communication : RS-485
   (8) FC. temp. socket
   (9) H_2 temp. socket
   (10) Fan power socket
   (11) USB port

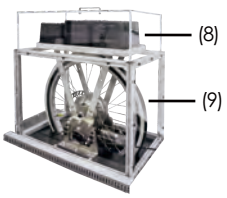
6. Battery
   (1) Battery type : lithium-ion
   (2) Battery configuration : 7S1P
   (3) Nominal voltage : 25.9V
   (4) Typical capacity : 10Ah
   (5) Max. charging voltage : 29.4V
   (6) Discharge cut-off voltage : 19.6V
   (7) Max. discharging current : 20A
   (8) Standard charge : 2A
   (9) Max. charging current : 5A
   (10) Operating temperature :
      0~45°C (charging)
      -10°C~50°C (discharging)



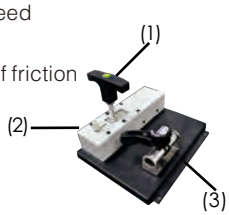
7. Motor Controller
   (1) Input voltage : 24V DC
   (2) Motor hall sensor
   (3) Speed adjustable

8. Load Unit
   Weight : 10kg x 3

9. Wheel Motor :
   (1) Brushless DC motor
   (2) Rated power : 200W
   (3) Wheel : 20"
   (4) Brake : disc brake



10. Acceleration and Resistance Device
   (1) Constant speed controller : 3 types of speed
   (2) Accelerator
   (3) Friction controller : can emulate 6 types of friction



11. System Control Panel
   (1) Divided into 5 functional blocks
      a. Hydrogen storage
      b. Hydrogen regulator
         • Inlet pressure gauge : 0~400 psi
         • Outlet pressure gauge : 0~30 psi
      c. Hydrogen fuel cell
         • Short circuit unit
         • Fan tachometer control
      d. DC to DC converter & li battery
      e. Motor controller
   (2) Protection block
      a. Emergency switch
      b. Key switch
      c. Battery breaker

12. Drawer
   (40.5(L) x 42(W))cm

13. Fuel Cell Stack (Consumable) and Controller
   Fuel Cell:
   (1) Performance
      a. Rated power : 200W
      b. Rated voltage : 28V
      c. Rated current : 7.2A
      d. Voltage range : 24V~46V

   (2) Fuel
      a. Pure hydrogen : > 99.95%
      b. Pressure : 0.45bar~0.55bar
      c. Hydrogen consumption: 2.8 L/min
      d. Oxidant / coolant : Air
   (3) Operating environment
      a. Ambient temperature : -5°C~40°C
      b. Ambient humidity : 20%~95%
      c. Fuel cell stack operating temperature: -10°C~60°C
   Controller:
   (1) Overheat protection
   (2) Low voltage protection
   (3) Overcurrent protection
   (4) Fan tachometer control
   (5) Short Control Unit(SCU) switch
   (6) Purging valve
   (7) Start switch

List of Experiments

1. Introduction of fuel cell electric vehicle
2. GFC-6100 Introduction
3. Electric vehicle battery
4. Electric vehicle drive device
5. Battery electric vehicles
6. Fuel cell electric vehicles
7. Momentum of pure electric vehicles
8. The fuel cell activation
9. The voltage-current characteristic curve of the fuel cell with/without SCU
10. The impact of the fuel cell operating pressure
11. Direct fuel cell vehicles
12. Series hybrid fuel cell electric vehicles

Accessories (GFC-69001)

1. Experiment Manual
2. Connection Leads and Plugs : 1set
3. CD : software
4. USB Cable
5. H_2 Regulator

There is a pressure regulator between high-pressure hydrogen cylinder and GFC-6100.

(1) Inlet connector : the cylinder connections has 4 types for selection. Confirmation for required type is needed before purchasing.

Gas Connection Assignment Table				
	CGA DISS	CGA	JIS	DIN
Hydrogen	724	350	22-L	DIN1

(2) Inlet pressure gauge : 0~400 bar
(3) Outlet pressure gauge : 0~16 bar

Optional

1. Hydrogen Storage (GFC-69101)
   (1) Metal hydride canister
   (2) Temperature feedback fans
   (3) Split Type 3-way ball valve
   (4) Teflon flexible tube

(1)
(2)
(3)
(4)

2. DC Electronic Load (GFC-69102)
   (1) Voltage control range : 0~60V
   (2) Current control range : 0~60A
   (3) Output power : 300W
   (4) 5 digital V/A/W meter
   (5) 150 store/recall memory for status value when powered on
   (6) High-speed measurement and communication transmission
   (7) Flexible CC, CR, CV, CP, dynamic and short operation modes
   (8) V/A/W values displayed simultaneously
   (9) SHORT time setting and SHORT_VH, SHORT_VL setting function
   (10) LCD display
   (11) Protections against V, I, W, and ˚C
   (12) Setting values adjusted by rotary knob or push button
   (13) Selectable positive ("+") or negative polarity ("-") displayed by voltage meter
   (14) OCP, OPP test function
   (15) Flexible load module configuration
   (16) External recall key

Consumables

1. Proton Exchange Membrane Fuel Cell (48 cells)
2. Metal Hydride Canister
3. Silicone Tube

Requirements

1. Hydrogen Purity : 99.99% (It is necessory to prepare locally)
2. Personal Computer

System Requirement

1. PC : 1GHz or faster 32-bit (x86) or 64-bit (x64) processor, 2GB RAM, 2GB more free disk space
2. OS : Windows XP / Vista / 7 / 8 / 10

AMTEC – HYBRID TRAINING EQUIPMENT

BASICS

Automotive Lockout-Tagout Trainer – 112045000

General description

Safety when handling high-voltage vehicles. With this flexible system you are training safely different manufacturers methods. Virtually every car manufacturer has a high-voltage vehicle in the program today. Knowing the different manufacturer's instructions and methods is therefore essential.

- The model shall be made of genuine car parts.
- The parts shall be cut to show clearly their functioning.
- Moving parts shall remain movable.
- The model shall be mounted on a frame or stand for easy handling.

Learning content

The following learning content shall be included:

- Recognize dangers on high-voltage components
- Establish accident prevention regulations
- Get to know the different manufacturer's instructions and methods
- Security rules:
  - disconnect, secure against reconnection, ensure that there is no voltage
  - Criteria for the use of test equipment
  - Log steps
  - Detailed accompanying documentation with exercise sheets

Demonstration possibilities

The following functions shall be demonstrated:

- Original service plug
- Combine any:
- 4 different manufacturers ways
- 4 different time intervals
- 4 indicators for battery voltages
- 3 digital voltage displays
- Training of safety precautions during maintenance work
- No voltages above the low voltage range of 40V
- Use as a desktop unit or in A4 frame

AMTEC – HYBRID TRAINING EQUIPMENT

Automotive Inverter Trainer – 112020310

Features

Large didactically designed engine and color printed, clear presentation of the transistor circuit Manual mode:

Individual on and off switching of the transistors in the inverter

Automatic mode: precise control of the drive to a standstill

LED's in each of the three phases indicate the direction of current to and from the engine - and thus the magnetization of the coil

LED's in each transistor indicate the status

Voltage measurement points in the three phases including additional current-measuring points with an integrated shunt, measuring socket in starpoint

Low voltage for safe handling

Learning Objectives

acquire knowledge about the interaction of the electronic components in the inverter and electric motor

pressing the switches in the correct order will move the motor gradually to work out the basic function

deepen your expertise to optimally adjust oscilloscopes and evaluate the presentations

represent pulse width modulated signals and sinusoidal waveforms in detail with the oscilloscope, also between individual phases

Equipment

Laboratory trainer in console housing for use on the table or in A4 supporting frame

1 x signal generator with precision regulator

1 x key switch for selecting the mode

6 x pushbutton for IGBT transistors, 6 x two-color LED for status indication

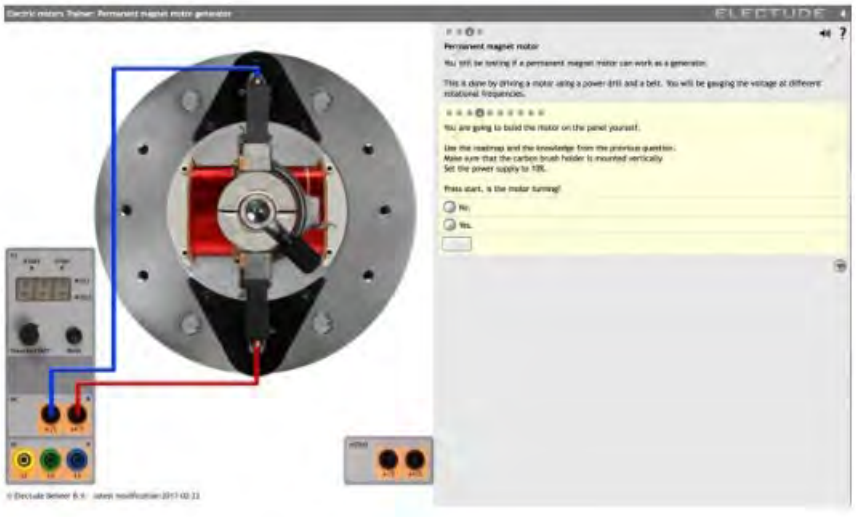
9 x test sockets, 4 x sockets for power supply with 12V

detailed documentation and extensive worksheets for teachers and students

AMTEC – HYBRID TRAINING EQUIPMENT

BASICS

Automotive Electric Motors Trainer – 112022100



General description

This training system consists of the table model and the corresponding e-learning companion course. The practice course modules deepen and complement the theory modules in a unique way.

Learning content

The following learning content shall be included:

- basic knowledge of electrical machines
- electric motors and generators that are relevant in automotive technology
- All operating parameters can be measured
- safe voltage range of <24 V.

Demonstration possibilities

The following courses shall be available separately:

- e-learning module "Electric motors - permanent magnet - Introduction" (EU Stage 2)
- e-learning module "Electric motors - series-wound motor - Introduction" (EU Stage 2)
- e-learning module "Electric motors - three-phase asynchronous motor - Introduction" (EU Stage 2)
- e-learning module "Electric motors - synchronous AC motor - Introduction" (EU Stage 2)
- 4 e-learning modules "generators" of different types (EU Stage 3)

Specifications

The following specifications shall be met:

- 1x three-phase control with speed
- 3x coil (250 turns) with pole shoe
- 2x permanent magnet with pole shoe
- 1x rotor with permanent magnet
- 1x rotor electromagnet
- 1x short circuit anchor
- 1x centering ring
- 1x carbon brush holder
- 1x drive belt
- 1x power supply
- 1x drive unit

Dimensions:	width:	270 mm
	height:	100 mm
	depth:	300 mm
	weight:	2 kg

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AMTEC – HYBRID TRAINING EQUIPMENT

BASICS

Starter Alternator (Micro-Hybrid) – 810001340

General description

- The model shall be made of genuine car parts.
- The parts shall be cut to show clearly their functioning.
- Moving parts shall remain movable.
- The model shall be mounted on a frame or stand for easy handling.

Demonstration possibilities

The following functions shall be demonstrated:

- Rotor with windings and slip ring
- Stator with stator winding
- Ventilation through two interior blower wheels
- The controller is cast in
- The shaft can be turned easily

The STARS system is able to switch the engine off at a red light or in a traffic jam and to restart the engine almost imperceptibly as soon as the brake is released.

Dimensions:	width:	200 mm
	height:	190 mm
	depth:	200 mm
	weight:	7.5 kg

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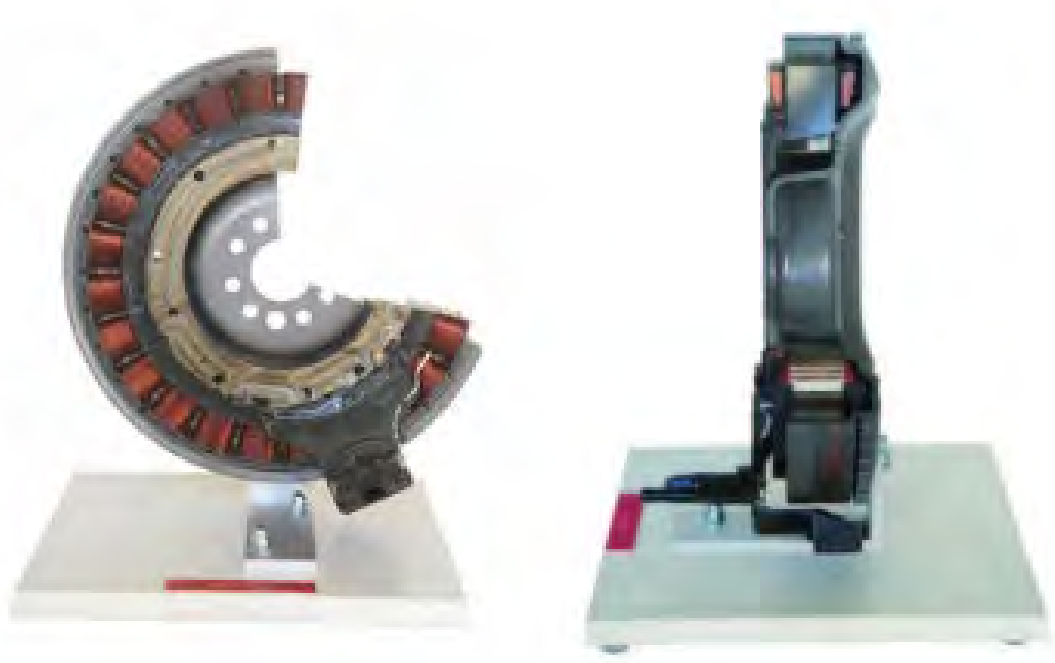
AMTEC – HYBRID TRAINING EQUIPMENT

Intermediate Level

Mercedes Benz Hybrid Electric Motor S400 – 810001355



General description

- The model shall be made of genuine car parts.
- The parts shall be cut to show clearly their functioning.
- Moving parts shall remain movable.
- The model shall be mounted on a frame or stand for easy handling.

Demonstration possibilities

Under this system the electric engine works together with the combustion engine. The electrical machine provides motor torque when boosting or operates as a generator in the regenerative braking phase. It also works as the starter.

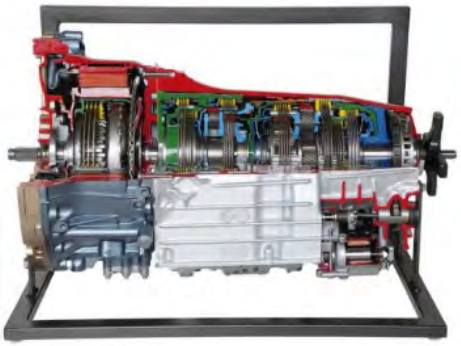
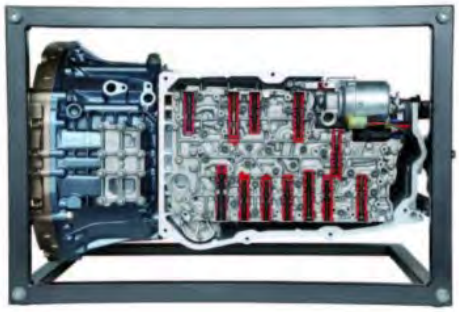
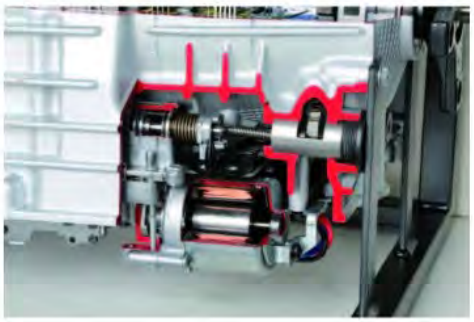
The following functions shall be demonstrated:

- stator carrier
- rotor with increment ring and position sensor track
- stator with coil
- electric screw connection and temperature sensor coupling

AMTEC – HYBRID TRAINING EQUIPMENT

Intermediate Level

Mercedes Benz 7-Speed Automatic Transmission (Hybrid) – 810001351

General description

- The model shall be made of genuine car parts.
- The parts shall be cut to show clearly their functioning.
- Moving parts shall remain movable.
- The model shall be mounted on a frame or stand for easy handling.

Demonstration possibilities

With the 6th generation of Mercedes-Benz automatic transmissions, the following is achieved: High shifting comfort, lightweight construction, fuel savings and increased driving enjoyment. The transmission can be turned easily both from the drive and also from the output side.

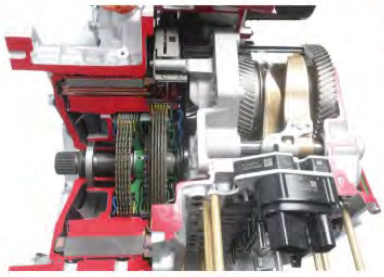
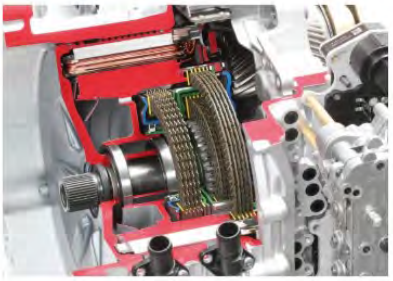
The following functions shall be demonstrated:

- All 7 hydraulic couplings
- E-motor
- Planetary wheel set
- Ravigneaux planetary gear train and two simple planetary gear trains
- Disk springs
- Parking lock (can be activated and released)
- Hydraulic control
- Oil pumps
- Sport clutch
- Solenoid valves
- Many small construction parts

AMTEC – HYBRID TRAINING EQUIPMENT

Intermediate Level

DQ 400e VW (hybrid transmission) – 810001362

General description

- The model shall be made of genuine car parts.
- The parts shall be cut to show clearly their functioning.
- Moving parts shall remain movable.
- The model shall be mounted on a frame or stand for easy handling.

Demonstration possibilities

The following functions shall be demonstrated:

- Mechatronics
- gear wheels
- Synchronization
- duplex clutch
- parking lock
- oil cooler
- pressure reservoir
- differential
- oil pump
- electric motor

Dimensions:	width:	650 mm
	height:	590 mm
	depth:	590 mm
	weight:	90 kg

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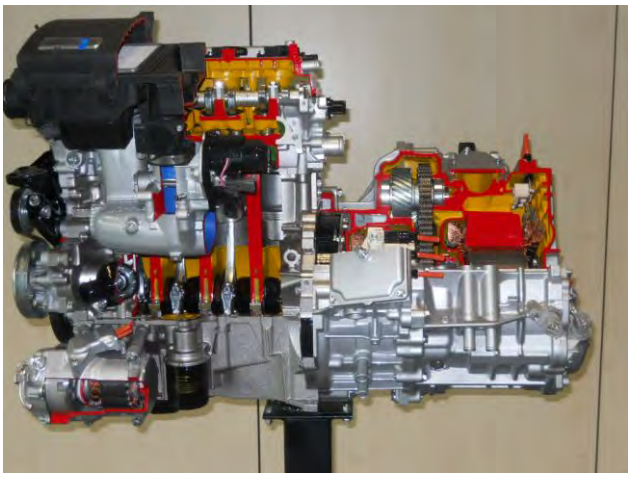
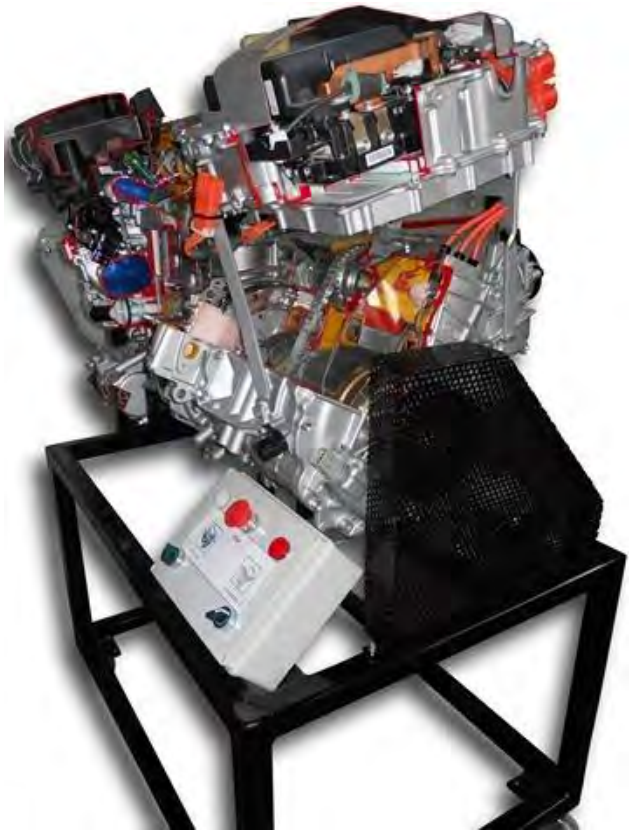
AMTEC HYBRID ENGINES

HYBRID SYNERGY DRIVE - GASOLINE AND ELECTRIC
Sectioned model with Hand-crank Operation





TOYOTA Hybrid System (THS)

The Toyota hybrid system has two sources of power, the petrol engine and electric motor.
The traction system select the best combination of the different characteristics of the two depending driving conditions. In addition, this engine is able to achieve maximum energy conservation by adopting a regenerative braking system, which retrieves energy during deceleration, and the "stop idling", that stops the engine during stops to a minimum.

GASOLINE ENGINE + ELECTRIC MOTOR = HYBRID SYSTEM
Improvement in consumption and emission levels

HYBRID SYSTEM CONFIGURATION

♦ P111 or P112 HYBRID TRANSMISSION
Transmission are assembled with the THS MG1 (electric motor generator No. 1) and MG2 (electric motor generator No. 2), device power distribution and reduction gears for the hybrid system. Their function is to switch the operation of the combustion engine to assist MG2, charging the HV battery and generate power to drive MG2.
♦ INVERTER
Check the current between MG1, MG2 and the HV battery and acts as a voltage converter DC / AC.
♦ BATTERY HV
It provides power to the engine at full load or in moments of stopping the engine and stores the power recovered from the regenerative braking system or power generation of MG1. 228 nickel-hydride batteries to be connected in series obtain a voltage of 273.6 V (DC).
♦ DEVICE FOR POWER DISTRIBUTION HV

ENGINE 1NZ-FXE

DESCRIPTION
The Prius uses the petrol engine 1NZ-FXE, recently developed for application to the hybrid system.
It is a 4-cylinder engine, 1.5-liter 16-valve DOHC. This engine has adopted the system VVT-i (variable valve timing electronically controlled intake valves) and the Atkinson cycle with a high expansion ratio, and was developed to realize high performance, low noise, fuel economy and reduced emission levels

AMTEC – HYBRID TRAINING EQUIPMENT

Full Hybrid Level

Cutaway Model Hybrid Car TOYOTA Prius – 519201103

Specifications

This is a cut-away model of an automobile chassis called "Hybrid System Car". The model is sectioned to show its components, parts and the operation mechanism. Students can easily understand and observe the automotive mechanism, such as:

- engine generator
- motor
- reduction gear
- drive shaft
- 2 different types of power sources
- gasoline engine and 3-phase AC electric motor are operable and the operation is displayed on the rear panel

General description

- The model shall be made of genuine car parts.
- The parts shall be cut to show clearly their functioning.
- Moving parts shall remain movable.
- The model shall be mounted on a frame or stand for easy handling.

Demonstration possibilities

The following functions shall be demonstrated:

- starting
- normal running
- high load
- reducing speed
- charging conditions

Model E-HC11034

Dimensions: (W x L x H)

- 125 cm x 125 cm x 150 cm

Weight:

- 230 Kg

AMTEC – HYBRID TRAINING EQUIPMENT

Full Hybrid Level

Training Car Hybrid Technology with E-Learning – 179405200

Description

The training system is based on a used Toyota Prius 2 which is specially adapted and modified into a training vehicle. Operation in public road traffic is no longer possible. Cut-outs with secured cutting edges at various points in the body and inside the vehicle allow access to important fault and diagnostic points. Various panels, passenger seat and rear seat are also removed for quick service access.

Design and vehicle options

- - Complete full length vehicle with low mileage
- - Fault package for power control module PCM, 10 switches, 10 errors
- - Inverter with cut-out for insight view covered with transparent shield
- - 6 x measuring sockets at the Inverter with output voltage reduced 10:1
- - Emergency stop close to the inverter
- - The high voltage battery is opend for insight view and covered with complete transparent shield in- stead of the factory case
- - Pin-outs on the sensors / actuators for fault circuit PCM (at least 50 pieces)
- - Breakout Box for Battery Management System BMS, 62 Pin. High voltage outputs are reduced 10:1
- - Breakout Box for power control module PCM, 124 Pin
- - Diagnostic interface with software suitable for Toyota vehicles

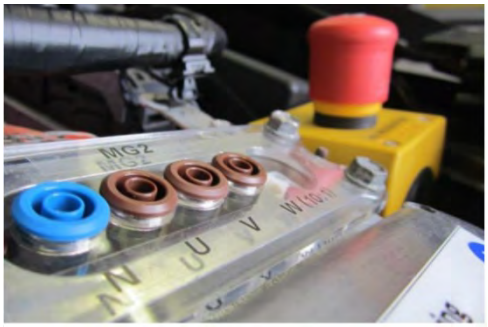
Teaching materials

Operating instructions, schematics, worksheets / work orders E-Learning course modules for Electude platform optional available.

Hybrid Training Car Toyota Prius 2

Dimensions (W x L x H)
Length 4480 mm, Width 1775 mm, Height 1490 mm

Weight
Weight: 1'400 kg



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Car Wiring System and Electrical Parts

The photos in the catalog are "INDICATIVE". The articles may differ visually but not technically depending on the retrievable spare parts.

Art. 704

CAR WIRING SYSTEM

CAR LIGHTING
XENON HEADLIGHT

ON BASE

This unit consists of a single Xenon headlight assembly fully operating and mounted on a wooden table support. Composed by the control unit for headlight-range adjustment and a 4 buttons keyboard to test and practice the different lights modalities.

Dimensions and Weight:
cms40x35x45 h
Kgs 8

Electric Motor Operation:
Main supply: 230V
Electrical System Complying with CE Standard

Art. 705

CAR WIRING SYSTEM

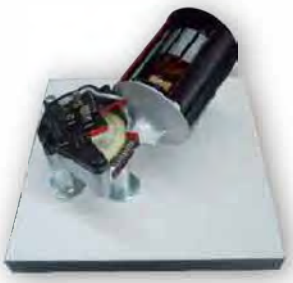
DASHBOARD

ON BASE

Dimensions and Weight:
cms32x30x35 h
Kgs 5

Electric Motor Operation:
Main supply: 230V
Electrical System Complying with CE Standard

This unit consists of a real dashboard mounted on a wooden table support. Composed by a complete keyboard with ON/OFF switches of vehicle symbols to test and practice the reading and understanding of indications/warnings on the dashboard.



Art. 706

CAR WIRING SYSTEM

FRONT WIPER MOTOR SECTIONED

Dimensions and Weight:
cms 22x22x20 h
Kgs 4

ON BASE

Art. 707

CAR WIRING SYSTEM

STARTER MOTOR

Dimensions and Weight:
cms 30x20x20 h
Kgs 6

Art. 708

CAR WIRING SYSTEM

GENERATOR

Dimensions and Weight:
cms 30x20x20 h
Kgs 6

Art. 709

CAR WIRING SYSTEM

ALTERNATOR

Dimensions and Weight:
cms 22x22x20 h
Kgs 5

The articles are strategically sectioned to provide a wide view of all the main parts without affecting their original movement. For didactic purpose all our sectioned articles are painted following a specific color-coding that allows an easy identification of the different components and the concerning functions.

Car Wiring System and Electrical Parts

The photos in the catalog are "INDICATIVE". The articles may differ visually but not technically depending on the retrievable spare parts.

Art. 710

CAR WIRING SYSTEM

IGNITION SYSTEM

ON BASE

Composed by:

- Distributor
- Coil
- Spark plug

Dimensions and Weight:
cms32x22x30 h
Kgs 4

Art. 710C

CAR WIRING SYSTEM

COIL

ON BASE

Art. 710D

CAR WIRING SYSTEM

DISTRIBUTOR

ON BASE

Dimensions and Weight:
cms20x20x25 h
Kgs 2.5

Art. 710SP

CAR WIRING SYSTEM

SPARK PLUG

Composed by:

- Spark plug body
- Ceramic insulator
- Earth electrode

Dimensions and Weight:
cms12x11x13 h
Kgs 0,5

Art. 710B

CAR WIRING SYSTEM

BATTERY

Composed by:

- Battery terminals
- Battery case cover
- Plastic casing
- Lead plates

Dimensions and Weight:
cms 20x18x20 h
Kgs 2

The articles are strategically sectioned to provide a wide view of all the main parts without affecting their original movement. For didactic purpose all our sectioned articles are painted following a specific color-coding that allows an easy identification of the different components and the concerning functions.

Car Wiring System and Electrical Parts

The photos in the catalog are "INDICATIVE". The articles may differ visually but not technically depending on the retrievable spare parts.

Art. 711

COIL IGNITION UNIT

DEMONSTRATION MODEL

Composed by:

- 4 spark plugs
- distributor with contact brakers unit
- rotor arm
- coil - battery (cover)
- handwheel

Dimensions and Weight:
cms 70x18x50 h
Kgs 10

Electrical appliances:
Main supply: 230V
Electrical System Complying with CE Standard

Art. 712

ELECTRONIC IGNITION

DEMONSTRATION MODEL

Composed by:

- 4 spark plugs
- distributor with pulse generator
- coil - battery (cover)
- handwheel

Dimensions and Weight:
cms 70x18x50 h
Kgs 11

Art. 713

PRE-HEATING GLOW PLUG

DEMONSTRATION MODEL

Composed by:

- 4 pre-heating glow plugs
- battery (cover)
- on/off switch

Dimensions and Weight:
cms 70x18x50 h
Kgs 11

Art. 713R

PRE-HEATING SYSTEM UNIT

REAL OPERATING

This unit reproduces the real operation circuit of the Preheating glow plugs by means of 12V battery.
Provided with battery charger 230/12V

Dimensions and Weight:
cms 70x18x50 h
Kgs 9/12

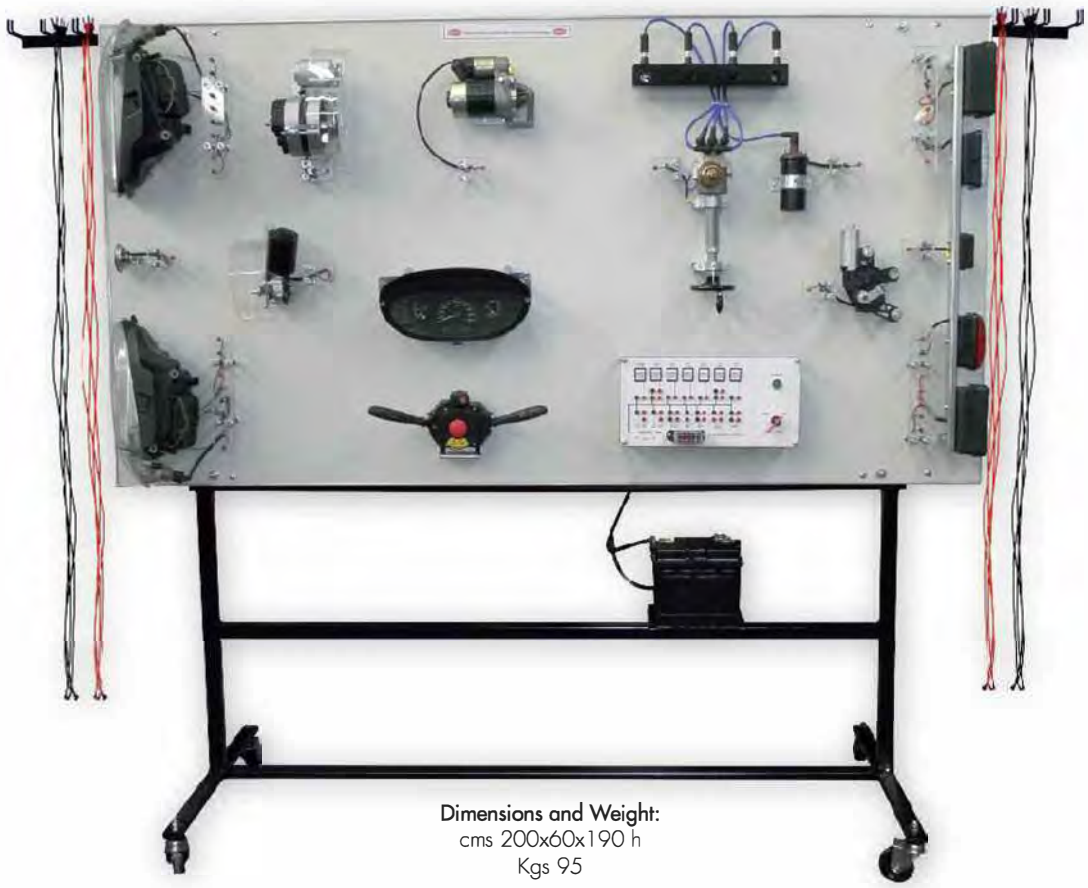
Electric Motor Operation:
Main supply: 230/12V
Electrical System Complying with CE Standard

The articles are strategically sectioned to provide a wide view of all the main parts without affecting their original movement. For didactic purpose all our sectioned articles are painted following a specific color-coding that allows an easy identification of the different components and the concerning functions.

Car Wiring System
Trainer with trouble-shooting

The photos in the catalog are "INDICATIVE". The articles may differ visually but not technically depending on the retrievable spare parts.

Art. 703	Art. 703I	Art. 703P
CAR WIRING SYSTEM TRAINER	CAR WIRING SYSTEM TRAINER	CAR WIRING SYSTEM TRAINER
WITH TROUBLE SHOOTING FOR PETROL VEHICLES COIL IGNITION	WITH TROUBLE SHOOTING FOR PETROL VEHICLES ELECTRONIC IGNITION UNIT	WITH TROUBLE SHOOTING FOR DIESEL VEHICLES PREHEATING GLOW PLUGS UNIT
ON STAND WITH WHEELS	ON STAND WITH WHEELS	ON STAND WITH WHEELS



Dimensions and Weight:
cms 200x60x190 h
Kgs 95

Real System - Battery operated:
Main supply: 12V battery
Provided with battery charger 230V/12V
Electrical System Complying with CE Standard

Technical Features

- IGNITION SYSTEM (Coil ignition or Electronic ignition) or PREHEATING GLOW PLUGS
- Relays
- Distributor (Petrol versions)
- Front Halogen headlights and rear lights
- Turn indicators
- Stop lights
- Emergency
- Licence plate light
- Rear fog light
- Reverse light
- Horn
- Front and Rear Windshield wiper motor
- Dashboard (with operating symbol lights) with Devio (operating)
- Battery
- Battery charger
- Spark plugs (petrol version) Glow plugs (Diesel version)
- Coil (petrol version)
- Fuse box
- Starter motor
- Alternator (operating)
- Control panel
- Jack cable female/male red (positive)
- Jack cable female/male red (negative)
- Rotating hangers for Jack cables

The articles are strategically sectioned to provide a wide view of all the main parts without affecting their original movement. For didactic purpose all our sectioned articles are painted following a specific color-coding that allows an easy identification of the different components and the concerning functions.

KL-800

Autotronic Training System

Interactive Computerized Automotive System

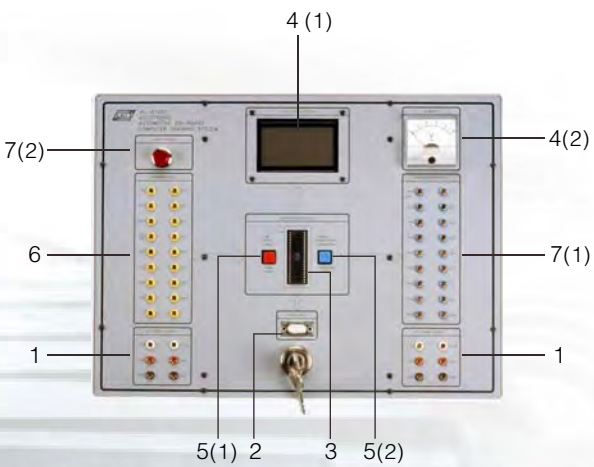
The whole system has been modularized to provide electronic and automotive courses with step-by-step experiments on educational technology training.

All theoretical, experimental and practical learning procedures are supported by personal computer assisted supervision and dedicated software.

The KL-800 can simulate the operation of fuel injection system, ignition system, and the control of exhaust gas, etc. Experiments include the characteristics, and operation of various sensors and actuators, monitored by microprocessor on the main unit.

Features

1. 89S51 computer interface monitor control
2. Data of fuel injection, ignition and exhaust gas can be acquired and monitored by computer.
3. Can be assembled as the injection system
4. With trouble-shooting simulation function
5. Switch-off input / output function when trouble-shooting is made



KL-81001

Specifications

Main Unit (KL-81001)

1. Power Supply Unit
   Fixed DC power supply
   (1) Output voltage : +5V, ±12V
   (2) Max. output current : +5V/2A, +12V/2A
   (3) With output overload protection
2. Computer Interface
   RS-232C port : 9pin D-sub connector
3. CPU
   Single-chip processor : 89S51
4. Display
   (1) LCD graphic display : 64 x 128
      a. With back-light
      b. Synchronously display following values :
         NE / PHO/HALL, MAF, MAT, MAP, TPS, CTS, VSS, IPW
   (2) Analog meter : oxygen meter

LCD graphic display

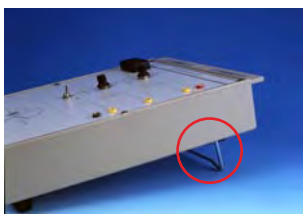
5. Selectors
   (1) Select : NE, PHO, HALL
   (2) Mode : select fuel injector
   a. Sync. b. Non-sync. c. Sequence.

6. Input Signals
   NE, PHO, HALL, VAF, MAT, F/C, MAF, MAP, TPS, CTS, O2, P/N, A/C, PSPS, VSS, 3GR

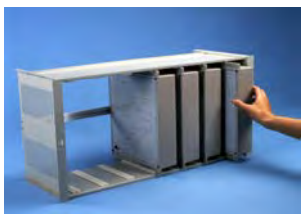
7. Output Signals
   (1) INJ1, INJ2, INJ3, INJ4, SPK1, SPK2, SPK3, SPK4, FANC, F/C, ACC, IAC1, IAC2, IAC3, IAC4, TCC, CCP, EGRV
   (2) Check engine lamp

Experiment Modules

1. Adopt test leads with 4mm plugs and sockets
2. Circuit symbols, blocks and components printed on the surface of each module
3. Modules secured in plastic housing, dimension : 297x226x60mm
4. With cabinet for all modules, it facilities easy storage
5. Comprehensive experiment manuals
6. All modules equipped with 4/8 bit DIP switch for fault simulation


Stand-up feet for easy operating on the workbench

All modules equipped with 4/8 bit DIP switch for fault simulation


Storage cabinet for easy storing of all modules

List of Modules

1. Crankshaft Position Sensor (KL-83001)
   (1) Pick-up coil sensor
   (2) Photo interrupter sensor
   (3) Hall IC sensor

2. Air-Flow Sensor (Vane Type) (KL-83002)
   (1) VAF output : 0.25V~3.5V
   (2) MAT output : 68Ω~10KΩ
   (3) Fan control : F/C switch

3. Air-flow Sensor (Hot Wire) & Manifold Absolute Pressure Sensor (KL-83003)
   (1) Air-flow sensor (hot wire type)
   MAF output : 0.5V~4.5V
   (2) Manifold Absolute Pressure (MAP) sensor
   MAP output : 1.2V~3.6V(-80kpa~0kpa)

4. TPS, CTS & O_2 Sensor (KL-83004)
   (1) Throttle position sensor (TPS)
   TPS output : 0.5V ~ 4.5V
   (2) Coolant temperature sensor (CTS)
   Voltage level : 4.5V/-40°C, 2.3V/20°C, 0.5V/108°C
   (3) Oxygen sensor
   a. Normal : 0.1V ~ 1.0V swing
   b. Rich : 0.6V ~ 1.0V swing
   c. Lean : 0.1V ~ 0.3V swing

5. P/N, A/C, PSPS Switch & Vehicle Speed Sensor (KL-83005)
   (1) P/N switch : park neutral switch
   (2) A/C switch : air-condition switch
   (3) PSPS switch : power steering pressure switch
   (4) Vehicle speed sensor (VSS) :
   speed adjustable & 3GR switch

6. Fuel Injectors/Spark Plugs (KL-83006)
   (1) Fuel injectors
   a. Static load : 18Ω
   b. Normal rotation speed 800 rpm, Max. rotation speed 3600 rpm
   c. Sequence changeable
   d. Fuel injectors LED display
   (2) Spark plugs
   LED display

7. Ignition System (KL-83007)
   (1) Single-output of ignition coil
   a. Static load : 2Ω
   b. LED display
   (2) Double-output of ignition coil
   a. Static load : 1Ω
   b. LED display

8. Cooling Fan & Fuel Pump & AC Compressor Relays (KL-83008)
   (1) Cooling fan
   a. Control signal : FANC
   b. DC 12V motor
   c. Operational conditions :
   A/C switch ON or coolant temperature sensor (CTS) signal higher than 108°C
   (2) Fuel pump
   a. Control signal : F/C
   b. DC 12V motor
   c. Operational conditions :
   Air-Flow F/C signal ON and with rotation speed
   (3) AC compressor
   a. Control signal : ACC
   b. DC 12V motor
   c. Operational conditions :
   A/C signal ON

9. Idle Air Control Valve (KL-83009)
   (1) Control signal: IAC1, IAC2, IAC3, IAC4
   (2) Step motor
   (3) Operational conditions :
   P/N, A/C, PSPS signal ON

10. TCC & CCP&EGRV Solenoid (KL-83010)
   (1) Torque converter clutch
      a. Control signal : TCC
      b. DC 12V solenoid
      c. Operational conditions :
      VSS signal is over 40km/hr and 3GR switch ON
   (2) Carbon canister purge valve
      a. Control signal : CCP
      b. DC 12V solenoid
      c. Operational conditions :
      • RPM is over 1200
      • CTS is over 65°C
      • TPS is 1.0V ~ 2.5V
   (3) Exhaust gas recirculation valve
      a. Control signal : EGRV
      b. DC 12V solenoid
      c. Operational conditions :
      • RPM is over 1200
      • CTS is over 65°C
      • TPS at 1.0V ~ 2.5V
      • MAP at 1.5V ~ 2V
   (4) When above four conditions simultaneously exist, EGRV will be turned ON.

KL-83001

KL-83002

KL-83003

KL-83004

KL-83005

KL-83006

KL-83007

KL-83008

KL-83009

KL-83010

List of Experiments

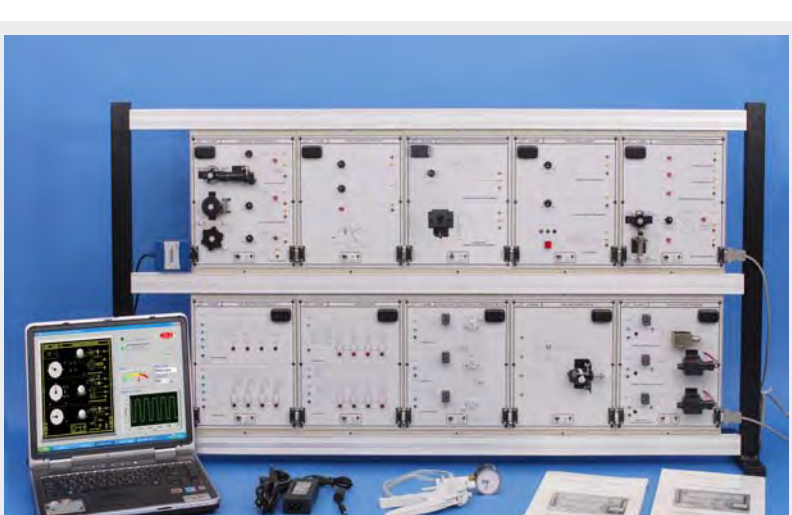
Experiment 1 Connections and of RPM Sensors
Experiment 2 Connections and Measurements of Air-Flow Sensor
Experiment 3 Throttle Position Sensor (TPS)
Experiment 4 Coolant Temperature Sensor (CTS)
Experiment 5 Oxygen Sensor
Experiment 6 Vehicle Speed Sensor
Experiment 7 3rd Gear Switch of Automatic Gearbox (3GR)
Experiment 8 Park/Neutral (P/N) Switch
Experiment 9 Air Condition (A/C) Switch
Experiment 10 Power Steering Pressure
Experiment 11 Injector Circuit
Experiment 12 Control Ignition System
Experiment 13 Cooling Fan Relay
Experiment 14 Fuel Pump Relay
Experiment 15 Circuit of A/C Compressor Relay
Experiment 16 Idle Air Control Valve (A/C)
Experiment 17 Torque Converter Clutch (TCC)
Experiment 18 Carbon Canister Purge Valve (CCPV)
Experiment 19 Exhaust Gas Recirculation Valve (EGRV)
Experiment 20 ECM Operators Simulator

● Accessories (KL-89001)

1. Connector leads 4mm-4mm x 1 set
2. Learning manual, experiment manual
3. Storage cabinet x 2 sets
4. Rack frame (KL-89003)

KL-800A

CAN BUS Autotronic Training System



The KL-800A CAN BUS Autotronic Training System is a distributed control system supported by advanced serial bus system CAN (Controller Area Network). CAN is a multi-master bus with an open, linear structure with one bus line and equal nodes. The number of nodes is not limited by the protocol.

Each module of KL-800A system is an ECU or the interoperable device (node) on CAN BUS. Data transfer between modules is achieved by the micro-controllers over CAN BUS. When signals and data are sent to a personal computer, the computer monitoring system displays the current status and data of module on PC screen and turns on the warning light if something is wrong.

The KL-800A system can simulate the operation of fuel injection system, ignition system and exhaust gas control. Experiments include the characteristics and operation of various sensors and actuators used in automobiles.

Features

1. CAN-compliant modules can be easily connected together using the 9-pin D-sub connectors and cables. These modules can interoperate with each other.
2. User-friendly GUI design allows the user to display and control modules on PC screen.
3. Each module is equipped with fault simulation switches for troubleshooting practice.

Specifications

1. Power Supply
   (1) DC voltage : +12V
   (2) Max. current : 5A
2. System Requirement
   (1) IBM PC or compatible (option)
   (2) NI CAN BUS USB interface card
3. Experimental Modules
   (1) Equipped with 2mm terminals for testing and checking
   (2) Circuit symbols and block diagrams printed on the surface of module
   (3) Module secured in plastic housing; module dimensions: 297x226x60mm ±10%
   (4) Modules put in the experimental frame for demonstration and experiment
   (5) Equipped with fault simulation switches

List of Modules

1. Crankshaft Position Sensor (KL-84001)
   (1) Pick-up coil sensor, sensor photo interrupter, sensor hall-effect IC
   (2) Output : NE, PHO, HALL
   (3) With CAN BUS control interface
2. Air-Flow Sensor (Vane Type) (KL-84002)
   (1) VAF output : 0.5V ~ 4.5V
   (2) MAT output : 0.3V ~ 4.5V (110°C ~ -5°C)
   (3) F/C switch : controlled by the rpm adjustable knob
   (4) With CAN BUS control interface
3. Air-Flow Sensor Hot Wire & Manifold Absolute Pressure Sensor (KL-84003)
   (1) Air flow sensor (hot wire type)
   MAF output voltage : 0.5V ~ 4.5V
   (2) Manifold absolute pressure sensor
   MAP output voltage : 1.2V ~ 3.6V (-80kpa ~ 0)
   (3) With CAN BUS control interface
4. TPS & CTS & O_2 Sensor (KL-84004)
   (1) Throttle position sensor (TPS)
   TPS output voltage : 0.5V ~ 4.5V
   (2) Coolant temperature sensor (CTS)
   a. CTS output voltage : 0.3V ~ 4.5V
   b. CTS voltage/temperature : 4.3V/-5°C, 3.7V/10°C, 3V/25°C, 2.2V/40°C, 1.2V/65°C, 0.3V/110°C
   (3) Oxygen sensor
   a. O_2 output voltage
   • Normal : 0.1V ~ 1.0V
   • Rich : 0.6V ~ 1.0V
   • Lean : 0.1V ~ 0.3V
   b. Selector switch for selecting normal, rich and lean
   (4) With CAN BUS control interface
5. P/N, A/C, PSPS, 3GR Switch & Vehicle Speed Sensor (KL-84005)
   (1) P/N switch : park/neutral switch
   (2) A/C switch : air conditioning switch
   (3) PSPS switch : power steering pressure switch
   (4) Vehicle speed sensor
   Speed adjustable : 0 ~ 120km/hr
   (5) 3GR switch
   (6) With CAN BUS control interface
6. Fuel Injectors/Spark Plugs (KL-84006)
   (1) Fuel injector control
   a. Coil resistance of injector : 18Ω
   b. Max. engine speed : 3600rpm
   c. Selectable injection modes : synchronous, non-synchronous, sequential
   d. Injection sequence displayed by LEDs
   (2) With CAN BUS control interface

7. Ignition system (KL-84007)
   (1) Single-output of ignition coil
      a. Coil resistance : 2Ω
      b. Computer-controlled ignition displayed by LEDs
   (2) Double-output of ignition coil
      a. Coil resistance : 1Ω
      b. Computer-controlled ignition displayed by LEDs
   (3) With CAN BUS control interface

8. Cooling Fan & Fuel Pump & A/C Compressor Relays(KL-84008)
   (1) Cooling fan
      a. Control signal : FANC
      b. 12V DC motor driven
      c. Actuating conditions : A/C switch ON or coolant temperature sensor (CTS) signal higher than 108°C
   (2) Fuel pump
      a. Control signal : F/C
      b. 12V DC motor driven
      c. Actuating conditions : F/C switch of vane air flow sensor ON and engine running (rpm signal)
   (3) A/C compressor
      a. Control signal : ACC
      b. 12V DC motor driven
      c. Actuating condition : A/C switch ON
   (4) With CAN BUS control interface

9. Idle Air Control Valve (KL-84009)
   (1) Step motor driven
   (2) Control signals : IAC1, IAC2, IAC3, IAC4
   (3) Actuating conditions : P/N or A/C or PSPS switch ON/OFF
   (4) With CAN BUS control interface

10. TCC & CCP & EGRV (KL-84010)
   (1) Torque converter clutch
      a. Control signal : TCC
      b. 12VDC solenoid valve
      c. Actuating conditions :
         vehicle speed sensor (VSS) signal higher than 40km/hr and 3GR switch ON
   (2) Carbon canister purge valve
      a. Control signal : CCP
      b. 12VDC carbon canister purge valve
      c. Actuating conditions
         • RPM signal : engine speed faster than 1200 rpm
         • CTS signal : coolant temperature greater than 65°C
         • TPS output voltage : 1.0V ~ 2.5V
   (3) Exhaust gas recirculation valve
      a. Control signal : EGRV
      b. 12VDC exhaust gas recirculation valve
      c. Actuating conditions :
         • RPM signal : engine speed faster than 1200 rpm
         • CTS signal : coolant temperature greater than 65°C
         • TPS output voltage : 1.0V ~ 2.5V
         • MAP output voltage : 1.6V ~ 1.8V
   (4) With CAN BUS control interface

KL-84001

KL-84002

KL-84003

KL-84004

KL-84005

KL-84006

KL-84007

KL-84008

KL-84009

KL-84010

List of Experiments

Experiment 1 Engine Speed Sensors
Experiment 2 Air-Flow Sensors
Experiment 3 Throttle Position Sensor
Experiment 4 Coolant Temperature Sensor
Experiment 5 Oxygen Sensor
Experiment 6 Vehicle Speed Sensor
Experiment 7 Third Gear Switch
Experiment 8 Park/Neutral Switch
Experiment 9 Air Conditioning Switch
Experiment 10 Power Steering Pressure Switch
Experiment 11 Injector Circuit
Experiment 12 Computer-Controlled Ignition System
Experiment 13 Cooling Fan Relay Circuit
Experiment 14 Fuel Pump Relay Circuit
Experiment 15 A/C Compressor Relay Circuit
Experiment 16 Idle Air Control Valve
Experiment 17 Torque Converter Clutch
Experiment 18 Carbon Canister Purge Valve
Experiment 19 Exhaust Gas Recirculation Valve
Experiment 20 Car Computer

● Accessories (KL-89002)

1. 9-pin D-sub RS-232 Cables :
   (1) 180cm male-to-female cable x 1 pce
   (2) 40cm female-to-female cable x 1 pce
2. NI CAN BUS USB Interface card
3. AC Adapter : 12VDC / 5A
4. Manual Vacuum Pump
5. Experiment Manual, Instructor Manual, CD for KL-800A
6. Power Cord
7. Rack Frame (KL-97002)
8. Connector Leads : 2mm-2mm x 1set
9. Storage Cabinet x 2 sets

AMTEC – RUNNING ENGINES ON STANDS

Amtec Techniquip PTY LTD makes use of various engines and produces high quality running petrol / diesel Engines, engines are used in diesel mechanics / automotive workshops for demonstrating principles of internal combustion engines, the unit can be used to complete numerous practical experiments within the various curriculum's.

Engines are used in vehicles locally to ensure spares and service part are available from your local automotive retailer.

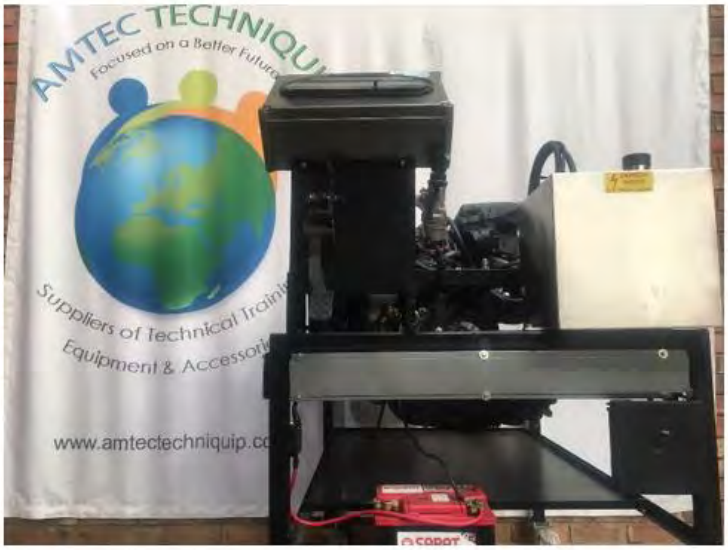
Diesel Running Engine

Diesel engine configurations available:

- Common rail Turbo charged
- Rotary pump
- In-line pump

AMTEC – RUNNING ENGINES ON STANDS

Petrol Running Engine



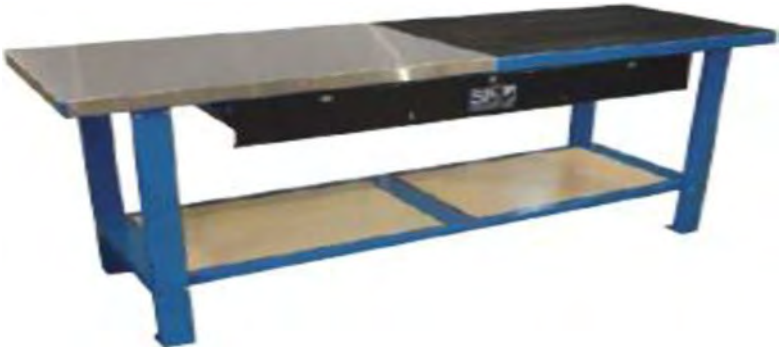
Petrol engine configurations available:

- Carburetor
- Fuel injected - Turbo charged
- Fuel injected - Naturally aspirated
- 2 Stroke

AMTEC TECHNIQUIP
Focused on a Better Future
Suppliers of Technical Training Equipment & Accessories

AMTEC WORKSHOP MACHINES AND EQUIPMENT

AMTEC can offer all Workshop equipment and tools required in the Automotive and Training facilities.
We can offer a comprehensive solution to fit-out your entire center.



AMTEC AUTOMOTIVE SPECIALITY TOOLS AND SERVICE KITS

AMTEC is able to supply all Specialty tools and Service kits for the Automotive workshops and Training centers

- Multimeters
- Compression testers
- Fuel injector testers
- Fuel pressure testers
- Vacuum and bleeder kits
- Oil testers
- Seal kits
- Bearing kits
- Aircon testers
- Coolant kits
- Brake calibrators
- Puller sets
- Battery testers and chargers

AMTEC TECHNIQUIP
Focused on a Better Future
Suppliers of Technical Training Equipment & Accessories

AMTEC DIAGNOSTIC AND OBD READERS

AMTEC are suppliers of various diagnostic readers and OBD scanners. From entry-level and handheld instruments to the top of the range multi-function diagnostic equipment from BOSCH, LAUNCH and AUTEL

AMTEC DVD LIST

Amtec Techniquip has training DVDs and manuals available for common processes in the various Engineering workshop teaching various principles from safety in the workplace to various machines.

We have the following DVD's available for the Engineering Workshop.

DVD Description	PART NO	COURSE
AC & DC MACHINES DVD + 2 MANUALS	AMTECDVD001	Electrical
AC INDUCTION MOTORS DVD + 2 MANUALS	AMTECDVD002	Electrical
AIR CONDITIONING & REFRIGERATION DVD + 2 MANUALS	AMTECDVD003	AC
ANALOGUE OSCILLOSCOPE DVD + 1 MANUAL	AMTECDVD004	Electronics
AUTO ELECTRICAL TESTING DVD + 1 MANUAL	AMTECDVD005	Auto Electrical
AUTOMATIC PROCESS CONTROL DVD + 2 MANUALS	AMTECDVD006	Instrumentation
AUTOMOTIVE ELECTRICAL MAINTENANCE DVD + 1 MANUAL	AMTECDVD007	Auto Electrical
BASIC BEARING MAINTENANCE DVD + 2 MANUALS	AMTECDVD008	Mechanical
BASIC CENTRIFUGAL PUMPS DVD + 2 MANUALS	AMTECDVD009	Mechanical
BASIC HAND TOOLS DVD + 2 MANUALS	AMTECDVD010	Various
BASIC HYDRAULIC MAINTENANCE DVD + 2 MANUALS	AMTECDVD011	Mechanical
BELT AND CHAIN DRIVES DVD + 1 MANUAL	AMTECDVD012	Mechanical
BRAZING AND BRAZE WELDING DVD + 2 MANUALS	AMTECDVD013	Mechanical
COMPOUND MITRE SAW DVD + 1 MANUAL	AMTECDVD014	Mechanical
COMPRESSED AIR SYSTEMS DVD + 2 MANUALS	AMTECDVD015	Mechanical
CONFINED SPACES DVD + 2 MANUALS	AMTECDVD016	Various
DRILLING TAPPING AND THREADING DVD + 2 MANUALS	AMTECDVD017	Mechanical
ELECTRICAL ANGLE GRINDER DVD + 2 MANUALS	AMTECDVD018	Mechanical
ELECTRICAL CONSTRUCTION OPERATOR DVD + 2 MANUALS	AMTECDVD019	Electrical
ELECTRICAL TEST EQUIPMENT DVD + 2 MANUALS	AMTECDVD020	Electrical
ELECTRICITY IN THE WORKPLACE DVD + 2 MANUALS	AMTECDVD021	Electrical
ESSENTIAL KNOWLEDGE FOR WELDERS DVD + 1 MANUAL	AMTECDVD022	Welding
FIRE SAFETY SERIES DVD + 1 MANUAL	AMTECDVD023	Various
FIRE SAFETY FOR OFFICES DVD - NO MANUALS	AMTECDVD024	Various
FORKLIFT OPERATOR TRAINING 2 DVDs + CD ROM	AMTECDVD025	Fork Lift
GAS HAZARD AWARENESS DVD + 1 MANUAL	AMTECDVD026	Welding
GAS METAL ARC WELDING DVD + 1 MANUAL	AMTECDVD027	Welding
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LUBRICATION DVD + 1 MANUAL	AMTECDVD036	Mechanical
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MECHANICAL COUPLING ALIGNMENT DVD + 2 MANUALS	AMTECDVD038	Mechanical
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PRECISION MEASURING INSTRUMENTS DVD + 2 MANUALS	AMTECDVD043	Welding
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