Advanced Electrical Laboratories (AEL-LABS):
Electromechanical Constructions Lab

AEL-4

Engineering and Technical Teaching Equipment

www.edibon.com
↳PRODUCTS
↳40.- ELECTRICITY

AEL-1. ELECTRICAL INSTALLATIONS LAB
AEL-2. HOME AUTOMATION SYSTEMS LAB
AEL-3. ELECTRICAL MACHINES LAB
AEL-4. ELECTROMECHANICAL CONSTRUCTIONS LAB
AEL-5. POWER SYSTEMS AND SMART GRID TECHNOLOGY LAB

Key features:

- **SCADA Control System.**
- **Specialized EDIBON Softwares, based on Labview, for:**
  - **SCADA Control Software.**
  - **Data Acquisition Software.**
  - **Computer Aided Instruction Software.**
  - **... and others.**
- **Touch Screens and computers for a real interaction.**
- **Functional and self contained Electrical Workbench with instrumentation panel with all the required elements to supply power and control in the workbench.**
- **Intuitive, quick and accurate interaction of the user with the Electrical Workbench.**
- **Complete and functional training solution for electricity learning purposes.**
- **Covering all areas of electricity field.**

... and others possibilities.

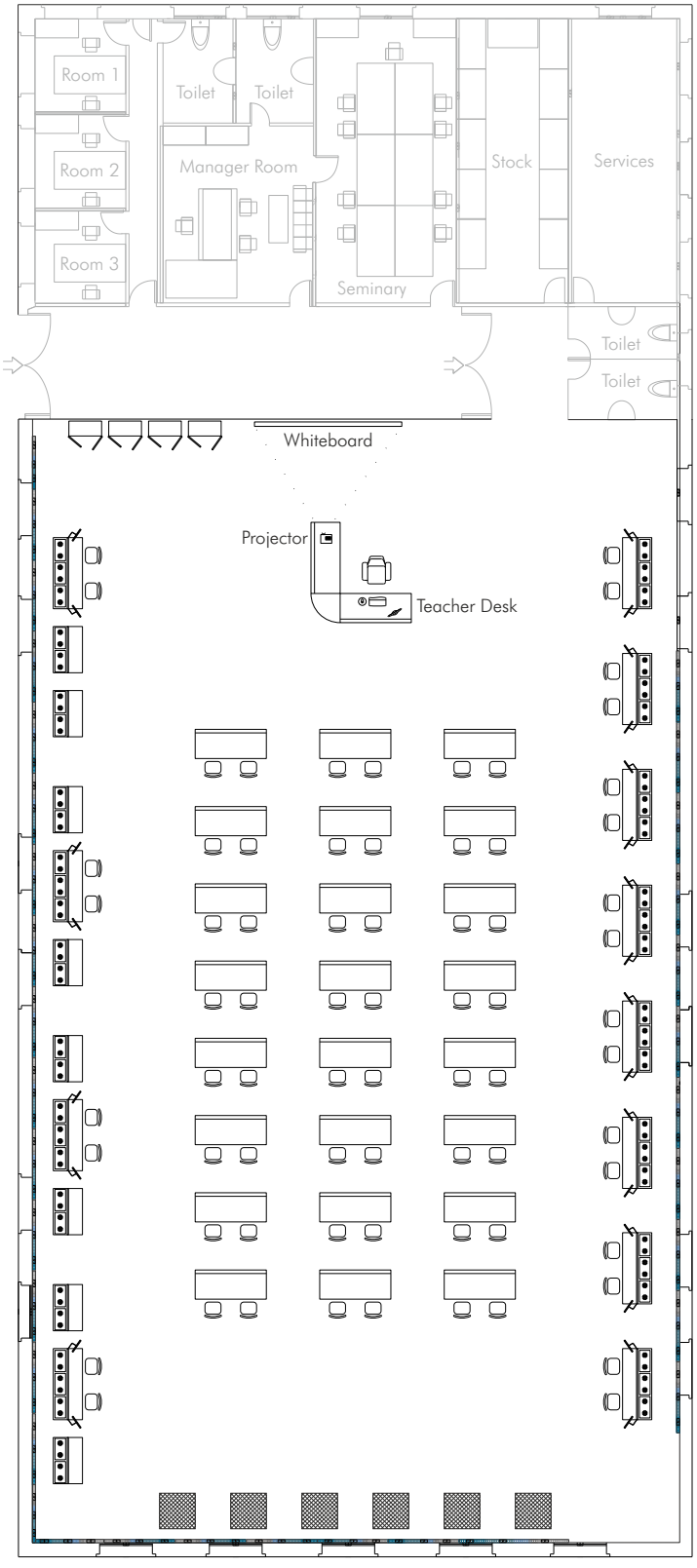
ISO 9001: Quality Management
(for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate
(total safety)

Certificates ISO 14001 and
ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter Certificate and
Worlddidac Member

Classroom and Laboratory Lay Out



AEL-WTS. Laboratory Workplace Table

AEL-WBC. Electrical Workbench (Rail) + 2 x AEL-PC. Two Touchscreen and computers

AEL-WBM. Electrical Workbench (Mobile)

AEL-MC. Multipurpose Cabinet

AEL-WIC. Electrical Installations Cabinet

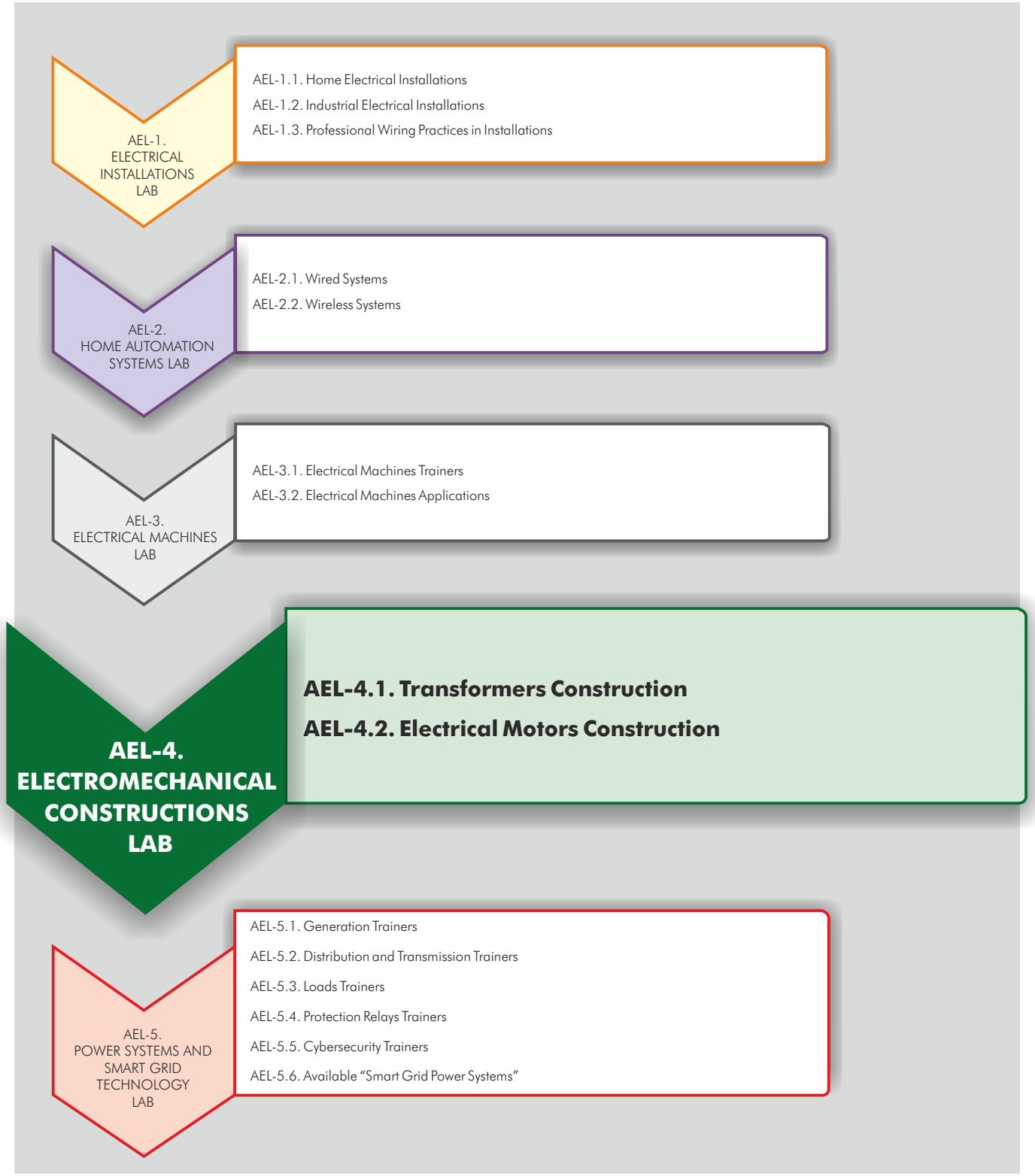
EDIBON, a company with more than 35 years of experience designing and implementing training systems, has a wide variety of applications adapted to 21st century new technologies.

Apart from providing a solid theoretical basis, EDIBON units and trainers are aimed at technical professional training, vocational training, for higher education and even applied research, as well as at the improvement in all fields through advanced systems.

The electricity area includes five great groups that cover Electrical Installations, Home Automation Systems, Electrical Machines, **Electromechanical Constructions**, Power Systems and Smart Grid Technology.

All the units have a modular and intuitive design, with real elements used in the industry and technological market.

In this catalogue we will cover "**AEL-4. Electromechanical Constructions Lab.**"



AEL-4. **Electromechanical Constructions Lab**

The AEL-4. Electromechanical Constructions Lab is formed by:

AEL-WBC. **Electrical Workbench (Rail)**

AEL-WBR. **Electrical Workbench (Rack)**

+

Applications
(to be mounted on rail)

AEL-AD33

AEL-AD3A

• • •

+

Applications + Rack

AEL-AD33 + N-RACK-A

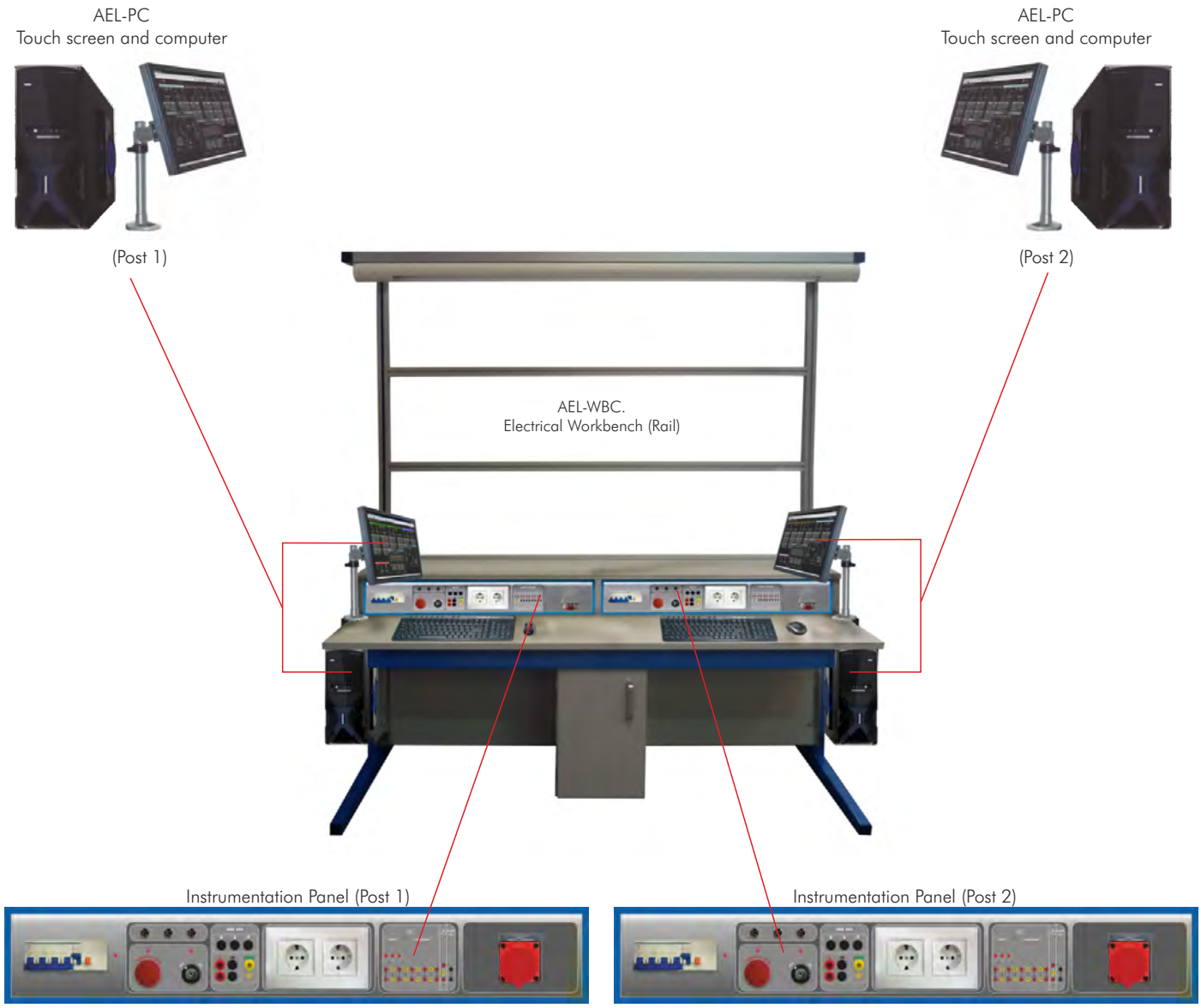
AEL-AD3A + N-RACK-A

• • •

+

Learning Software Packages

GENERAL DESCRIPTION



The Electrical Workbench has been designed to offer the students and teachers the necessary tools to learn and teach about the XXI century technologies.

The Electrical Workbench consists of:

Furniture, itself:

Consists of the frame that allows to locate the applications, lighting fitting, table, supports, etc.

Instrumentation Panel:

The workbench has been designed to be used by one or two students. Each student has access to its own instrumentation panel.

There are two Electrical Workbench versions:

AEL-WBC. Electrical Workbench (Rail).

The AEL-WBC is a workbench designed with rails in order to put and remove all electrical modules free.

AEL-WBR. Electrical Workbench (Rack).

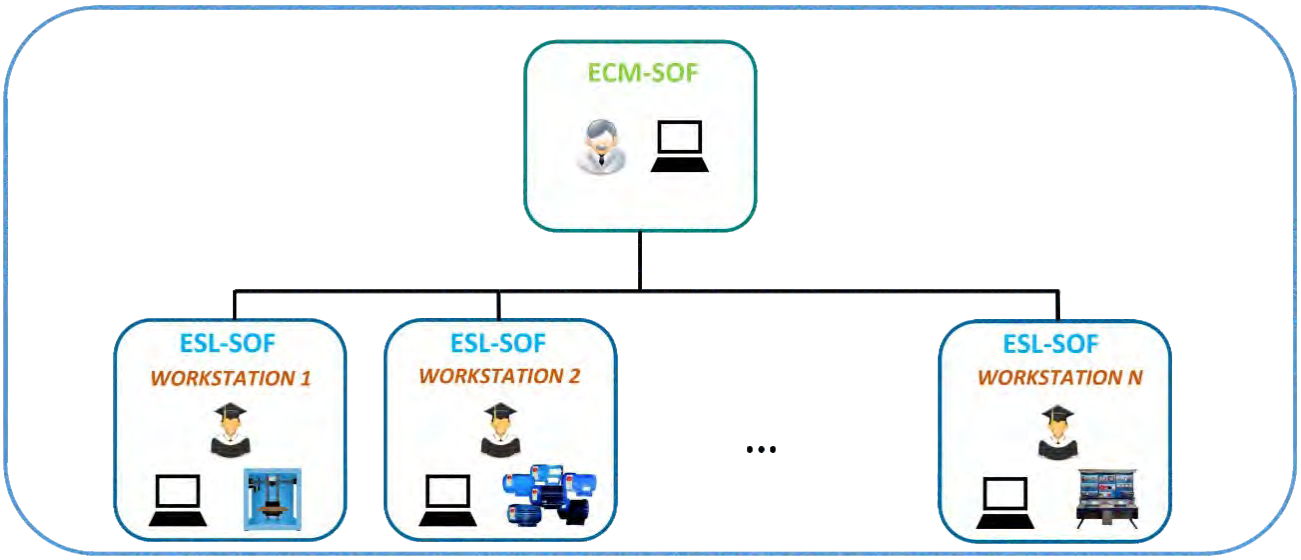
The AEL-WBR is a workbench designed with strong rack in order to fix all electrical modules.

Optional:

Touch screen and computer (AEL-PC):

The workbench can be supplied with one or two touch screens and computers. Thus, both students and teachers gain quick access to the applications to control them better, obtaining the maximum man-machine interaction.

In summary, technology, quality and aesthetics are combined in this piece of furniture in order to offer the best features for both research and teaching fields.



* Contents included for all ECM-SOF and ESL-SOF Workstations.

EDIBON has different software packages to provide students the maximum level in training systems.

Interactive Computer Aided Instruction Software System

- **ECM-SOF. EDIBON Classroom Manager (Instructor Software):**

ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

- **ESL-SOF. EDIBON Student Labsoft (Student Software)**:

ESL is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session.

Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

NOTE: Will be necessary acquire a license per student.

Example of some Software Screens:

Instructor Software

Student Software

List of **Applications**

AEL-4. **ELECTROMECHANICAL CONSTRUCTIONS LAB**

AEL-4.1. **Electrical Machines Construction**

Applications

Dissectible and Configurable Electrical Motors Application

- AEL-EMT-KIT. Advanced Dissectible and Configurable Electrical Machines.

Wiring & Construction of Motors, Generators and Transformers

- AEL-MGTC. Motors, Generators and Transformers Construction Application.
- AEL-TPTC. Three-Phase Transformer Construction Kit.

Disassembly Motors

- AEL-DMG-KIT. Disassembly Motors-Generators Kit.
- AEL-DIM-KIT. 4 Disassembly Induction Motors Kit.

AEL-4.2. **Electrical Motors Construction**

Applications

Cut Away Electrical Motors

- EMT1-S. Cut away DC independent excitation motor-generator.
- EMT2-S. Cut away DC series excitation motor-generator.
- EMT3-S. Cut away DC shunt excitation motor-generator.
- EMT4-S. Cut away DC compound excitation motor-generator.
- EMT5-S. Cut away DC shunt-series compound excitation motor.
- EMT6-S. Cut away AC synchronous three-phase motor alternator.
- EMT7-S. Cut away asynchronous three-phase motor of squirrel cage.
- EMT8-S. Cut away asynchronous three-phase motor with wound rotor.
- EMT9-S. Cut away Dahlander three-phase motor.
- EMT10-S. Cut away asynchronous three-phase motor of two independent speeds.
- EMT11-S. Cut away asynchronous single-phase motor with starting capacitor.
- EMT12-S. Cut away universal motor.
- EMT14-S. Cut away repulsion motor, single-phase with short circuited brushes.
- EMT15-S. Cut away DC permanent magnet motor.
- EMT16-S. Cut away asynchronous single-phase motor with starting and running capacitor.
- EMT17-S. Cut away asynchronous three-phase motor of squirrel cage with "Y" connection.
- EMT18-S. Cut away DC Brushless motor.
- EMT19-S. Cut away stepper motor.
- EMT20-S. Cut away asynchronous single-phase motor with split phase.
- EMT21-S. Cut away three-phase reluctance motor.
- EMT22-S. Cut away single-phase shaded pole motor.

Transparent and Functional Electrical Motors

- AEL-FTM. Transparent and Functional Motors Application
- AEL-EMT1-T. Transparent and functional DC independent excitation motor-generator.
- AEL-EMT2-T. Transparent and functional DC series excitation motor-generator.
- AEL-EMT3-T. Transparent and functional DC shunt excitation motor-generator.
- AEL-EMT4-T. Transparent and functionalDC compound excitation motor-generator.
- AEL-EMT5-T. Transparent and functional DC shunt-series compound excitation motor-generator.
- AEL-EMT6-T. Transparent and functional AC synchronous three-phase motor alternator.
- AEL-EMT7-T. Transparent and functional asynchronous three-phase motor of squirrel cage.
- AEL-EMT8-T. Transparent and functional asynchronous three-phase motor with wound rotor.
- AEL-EMT9-T. Transparent and functional Dahlander three-phase motor.
- AEL-EMT10-T. Transparent and functional asynchronous three-phase motor of two independent speeds.
- AEL-EMT11-T. Transparent and functional asynchronous single-phase motor with starting capacitor.
- AEL-EMT12-T. Transparent and functional universal motor.
- AEL-EMT14-T. Transparent and functional repulsion motor, single-phase with short circuited brushes.
- AEL-EMT16-T.Transparent and functional asynchronous single-phase motor with starting and running capacitor.
- AEL-EMT17-T. Transparent and functional asynchronous three-phase motor of squirrel cage with "Y" connection.
- AEL-EMT20-T. Transparent and functional asynchronous single-phase motor with split phase.
- AEL-EMT21-T. Transparent and functional three-phase reluctance motor.
- AEL-EMT22-T. Transparent and functional single-phase shaded pole motor.

SPECIFICATIONS

The Electromechanical Constructions Lab (AEL-4) is focused on the practical study of transformers and electric motors construction. This covers all the issues concerning detachable electric machines and transformers, electric motors construction and professional practices in wiring electrical machines.

The complete Electromechanical Constructions Lab (AEL-4) includes:

- Electrical Workbench.
- Software packages.
- Applications.

Electrical Workbench:

There are two Electrical Workbench versions:

AEL-WBC. **Electrical Workbench (Rail).**

The AEL-WBC is a workbench designed with rails in order to put and remove all electrical modules free. The frame consists of three levels to get a maximum space for the modules and applications. Besides, the user can put and remove manually all electrical modules and make free configurations to construct different applications.

The advantage of this workbench is that all modules can be put and removed free and quick, so the student can change quickly to other practical exercises.

AEL-WBR. **Electrical Workbench (Rack).**

The AEL-WBR is a workbench designed with strong rack in order to fix all electrical modules. Each module will be fixed with screws. The frame consists of three racks to support different applications.

The advantage of this workbench is that all applications are perfectly covered to get a homogeny and strong unit.

The Electrical Workbench is ready to use Specialized EDIBON Softwares, based on Labview, for:

SCADA Control Software.

Data Acquisition Software.

Computer Aided Instruction Software.

...others.

It is a complete and functional training solution for electricity learning purposes, with intuitive, quick and accurate interaction of the user with the Electrical Workbench.

It is a functional and self contained Electrical Workbench, with wide working area for several applications, with instrumentation panel including all the required elements to supply power and control in the workbench.

The Electrical Workbench is mainly formed by:

Furniture, itself:

Formed by the frame that allows to allocate the applications, lighting fitting, table, supports, etc.

Dimensions: 2000 x 1000 x 1900 mm approx.

Instrumentation Panel:

2 x Control and supply panels.

Three-phase and single-phase power systems.

Independent Residual Circuit Breaker (RCB).

Two single-phase sockets.

Different level control voltages for signals applications.

Integrated lighting system.

Technical data:

1 x Differential Protection, 1 x Emergency Stop Button and 1 x Safety Key.

Power Terminal Connections: 1 x Three-phase terminals: 380 Vac + N+ GND and 1 x Single-phase terminals: 230 Vac + GND and 2 x Single-phase plugs + 2 x Three-phase plugs.

Control terminals: 2 x 24 Vac., 2 x (+24) Vdc., 2 x (+12) Vdc., 2 x (-12) Vdc. and 2 x (+5) Vdc.

Power Supply required: 380 Vac 3PH + N + GND.

Optional:

Touch screen and computer (AEL-PC).

The workbench can be supplied with one or two touch screens and computers.

Software packages:

ICAI. Interactive Computer Aided Instruction Software System:

ECM-SOF. **EDIBON Classroom Manager (Instructor Software).**

ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

User Data Base Management.

Administration and assignment of Workgroups, Tasks and Training sessions.

Creation and Integration of Practical Exercises and Multimedia Resources.

Custom Design of Evaluation Methods.

Creation and assignment of Formulas & Equations.

Equation System Solver Engine.

Updatable Contents.

Report generation, User Progression Monitoring and Statistics.

ESL-SOF. **EDIBON Student Labsoft (Student Software).**

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session.

Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

Student Log-In & Self-Registration.

Existing Tasks checking & Monitoring.

Default contents & scheduled tasks available to be used from the first session.

Practical Exercises accomplishment by following the Manual provided by EDIBON.

Evaluation Methods to prove your knowledge and progression.

Test self-correction.

Calculations computing and plotting.

Equation System Solver Engine.

User Monitoring Learning & Printable Reports.

Multimedia-Supported auxiliary resources.

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

www.edibon.com/en/files/equipment/ICAI-ELEC/catalog

Instructor Software

ECM-SOF. EDIBON Classroom Manager Software Application main screen

ECAL. EDIBON Calculations Program Package - Formula Editor Screen

ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

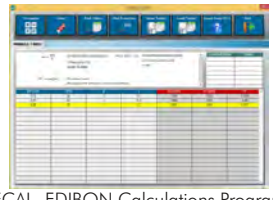
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

Student Software

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

EPE. EDIBON Practical Exercise Program Package Main Screen

ERS. EDIBON Results & Staticstics Program Package-Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

Applications:

AEL-4.1
Electrical Machines Construction

Dissectible and Configurable Electrical Motors System

AEL-EMT-KIT. **Advanced Dissectable and Configurable Electrical Machines**

The "AEL-EMT-KIT. Advanced Dissectable and Configurable Electrical Machines " is a set of configurable and dissectable electrical machines designed to study the basic principles of electrical machines.

It consists of mechanical pieces and electrical wirings.

The student will be able to make and test innumerable types of electrical machines.

Using this application the student will clearly observe the components of the machines and how they must be interconnected, both electrically and mechanically.

The different machines have protected rotating parts and use low voltages.

AEL-EMT-KIT consists of:

a) AEL-EMT-KIT/B. Base Unit and common modules.

Kits:

b) AEL-EMT-KIT/AS. AC Asynchronous Induction Motors.

c) AEL-EMT-KIT/DC. DC Motors/Generators.

d) AEL-EMT-KIT/SMG. AC Synchronous Motors/ Generators.

e) AEL-EMT-KIT/MPP. Stepper Motor.

a) AEL-EMT-KIT/B. Base Unit and common modules.

It includes:

- EMT-KIT/B. Base Unit.
  It is formed by:
  -Frame.
  -Support ring.
  -Bearings.
  -Shaft.
  -Axle bearings.
  -Other parts.
- EME/B. Electrical Machines Unit (Basic option).
- N-ALI01. Industrial Main Power Supply.
- BRLA. Compass to observe the rotating magnetic field.
- TECNEL/TM. Optical Speed Meter.

Recommended accessory:

- MUAD. Electric Power Data Acquisition System.

b) AEL-EMT-KIT/AS. AC Asynchronous Induction Motors.

The AEL-EMT-KIT/AS is designed to study AC asynchronous motors.

Required the AEL-EMT-KIT/B.

This kit consists of a set of mechanical pieces assembled among them in order to mount and operate different models of asynchronous induction machines. The objective of this kit is to study the operation of asynchronous induction machines, their parts, how the stator windings are distributed to configure the inductive poles and how, by means of a simple compass, the rotating magnetic field of these machines can be tested.

The user can construct and simulate the actual behavior of the following models of electrical machines with the AEL-EMT-KIT/AS:

- Three-phase AC induction motor of squirrel cage (2 pole).
- Three-phase AC induction motor of squirrel cage (4 pole).It includes:
  - Squirrel cage rotor.
  - Crosspiece.
  - Stator.
  - Induction coils.

Required modules:

- N-VVCA/M. AC Motors Speed Controller (Intermediate option).

Recommended modules:

- N-MED22. AC Voltmeter (0-400 Vac).
- N-MED10. AC Ammeter (0-5 A).
- N-MED26. Frequency Meter.

Recommended accessory:

- EAL. Network Analyzer Unit

c) AEL-EMT-KIT/DC. DC Motors/Generators.

The AEL-EMT-KIT/DC has been designed to study DC motors/generators.

This kit consists of a set of mechanical pieces assembled among them in order to mount and operate different models of DC machines. The objective of this kit is to study the operation and different parts of a DC generator/motor and how independent, series, shunt and compound connections are done.

This kit will be able to work in two different modes: as a generator and as a motor.

With the AEL-EMT-KIT/DC, the user can construct and simulate the actual behavior of the following models of electrical machines:

- DC shunt motor (with and without interpoles).
- DC series motor (with and without interpoles).
- DC compound motor (with and without interpoles).
- DC shunt generator (with and without interpoles).
- DC series generator (with and without interpoles).
- DC compound generator (with and without interpoles).
- DC separately excited generator (with and without interpoles).

It includes:

- Rotor.
- Commutator with segments.
- Poles and interpoles.
- Field winding.
- Drive motor.

Required modules:

- N-VVCA/M. AC Motors Speed Controller (Intermediate option).
- N-VVCC/M. DC Motor Speed Controller. (2 units)
- N-REV. Variable Resistor. (2 units)

Recommended modules:

Measurement modules:

- N-MED17. DC Voltmeter (0-200 V). (2 units)
- N-MED05. DC Ammeter (0-1.5 A). (2 units)

Load module:

- N-REF. Resistor Load with commutator.

Applications:

AEL-4.1
Electrical Machines Construction

Dissectible and Configurable Electrical Motors System

AEL-EMT-KIT. Advanced Dissectable and Configurable Electrical Machines. (continuation)

d) AEL-EMT-KIT/SMG. AC Synchronous Motors / Generators.

The AEL-EMT-KIT/SMG has been designed to study synchronous machines.

This Kit consists of a set of mechanical pieces assembled among them in order to mount and operate different models of synchronous machines.

The aim of this kit is to demonstrate the operation of synchronous machines existing in the market, their parts, how the stator windings are distributed to configure the inductive poles, how the velocity control of these machines is performed and how, by means of a simple compass, the rotating magnetic field of these machines can be tested.

The user can construct and simulate the actual behavior of the following models of electrical machines with the AEL-EMT-KIT/SMG:

- Three-phase AC synchronous motor (2 pole).
- Three-phase AC synchronous generator (2 pole).
- Three-phase AC synchronous motor (4 pole).
- Three-phase AC synchronous generator (4 pole).

It includes:

- Rotor.
- Slip ring.
- Stator.
- Stator coils.
- Induction coils.
- Drive motor.

Required modules:

- N-WCA/M. AC Motor Speed Controller.
- N-WCC/M. DC Motor Speed Controller. (2 units)

Recommended modules:

Measurement modules:

- N-MED22. AC Voltmeter (0-400 Vac).
- N-MED10. AC Ammeter (0-5 A).
- N-MED26. Frequency Meter.
- N-MED17. DC Voltmeter (0-200 V).
- N-MED05. DC Ammeter (0-1.5 A).

Load modules:

- N-REFT300. 300 Ohms Three-phase Fixed Resistor Module.
- N-CONT. Three-phase Variable Capacitor Load with commutator.

e) AEL-EMT-KIT/MPP. Stepper Motor.

The AEL-EMT-KIT/MPP has been designed to study stepper motors.

This Kit consists of a set of removable pieces assembled among them to make and operate a stepper motor.

The objective of this kit is to study the operation and different parts of a stepper motor. It includes a crosspiece rotor to make the shaft of the motor rotate through a rotating magnetic field controlled by a driver. It includes:

- Crosspiece.
- Poles.

Required modules:

- N-WCC/M. DC Motor Speed Controller.
- N-WPP. Stepper Motor Controller (manual and automatic control).

f) Recommended Accessories.

Optionally the AEL-EMT-KIT can be acquired with one of the following workbenches:

- AEL-WBR. Electrical Workbench (Rack).
- AEL-WBMG. Electrical Workbench (Mobile Big).
- AEL-WBMP. Electrical Workbench (Mobile Small).

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT-KIT/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EESD can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks:

- N-RACK-A.
- N-RACK-B. (3 units if optional modules are acquired)

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Applications:

AEL-4.1
Electrical Machines Construction

Dissectible and Configurable Electrical Motors System

AEL-EMT-KIT. Advanced Dissectable and Configurable Electrical Machines. (continuation)

Some practical exercises possibilities:

AEL-EMT-KIT/AS. AC Asynchronous Induction Motors:

1.- Recognition of the mechanical parts of a three-phase induction motor of squirrel cage.

2.- Construction of a three-phase induction motor of squirrel cage (2 pole), step by step.

3.- Construction of a three-phase induction motor of squirrel cage (4 pole), step by step.

4.- Measurement of the starting and running currents.

5.- Complete wiring of the stator wounds according to the electrical machines theory.

AEL-EMT-KIT/DC. DC Motors/Generators:

6.- Recognition of the mechanical parts of DC motors/generators .

7.- Construction of a DC shunt motor (with and without interpoles).

8.- Construction of a DC series motor (with and without interpoles).

9.- Construction of a DC compound motor (with and without interpoles).

10.- Construction of a DC shunt generator (with and without interpoles).

11.- Construction of a DC series generator (with and without interpoles).

12.- Construction of a DC compound generator (with and without interpoles).

13.- Construction of a DC separately excited generator (with and without interpoles).

14.- Complete wiring of all DC motors / generators according to theory.

AEL-EMT-KIT/SMG. AC Synchronous Motors / Generators:

15.- Recognition of the mechanical parts of synchronous motors/generators.

16.- Construction of a three-phase AC synchronous motor (2 pole).

17.- Construction of a three-phase AC synchronous generator (4 pole).

18.- Measurement of the current excitation.

19.- Measurement of the voltage generation in function of the speed of the generator.

20.- Measurement of the voltage generation in function of the current excitation.

AEL-EMT-KIT/MPP. Stepper Motor:

21.- Construction of a stepper motor.

22.- Speed control of the stepper motor.

For more information see **AEL-EMT-KIT** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT-KIT/catalog

Applications:

AEL-4.1
Electrical Machines Construction

Wiring & Construction of Motors, Generators and Transformers

AEL-MGTC. **Motor-Generator and Transformer Construction Trainer.**

The Motor-Generator and Transformers Construction Trainer, "AEL-MGTC", has been designed by EDIBON for the formation at theoretical-practical level in the field of the electromechanical construction of electric machines such as DC Motor-Generator, Three-Phase Asynchronous Motor of Squirrel Cage, Three-Phase Reluctance Motor, Three-Phase Transformer and Single-Phase Transformer.

This application offers several levels of formation that provide the user the knowledge and the essential skills about the fundamental principles of the electromechanical construction of electric machines. For this purpose, this application includes a specific manual in which is explained, at theoretical level, the relative aspects to the design, the fabrication, the construction and the winding of electric motors, generators and transformers. The trainer AEL-MGTC offers a manual winding machine for the realization of winding practices in the optional motors and transformers that can be acquired. The Manual Winding for Motors and Transformers, MWMT, provides several templates for the construction of the windings with different sizes. Once the windings are constructed, the user will proceed to its placing in the corresponding electric machines and the verification of the functioning of the same.

The electric motors, as well as the transformers, are provided disassembled by parts: a solid rotor supported in a bracket and a stator completely accessible allows the realization of the winding practices. In the case of the transformers, iron pieces in the shape of U are supplied for the arrangement of the windings.

One of the advantages of this trainer is that this covers from the construction of the electric machines to the operation of the same. This application has a variable power supply, a multimeter for the verification of the electrical parameters of the machines, a coil of copper wire and a toolbox for the montage and construction of the same. Besides, a compass is offered for the verification of the rotation magnetic field after assembly of the windings.

The trainer AEL-MGTC has the following optional electric machines:

- DC Motor-Generator.
- Three-Phase Asynchronous Motor of Squirrel Cage.
- Three-Phase Reluctance Motor.
- Three-Phase Transformer.
- Single-Phase Transformer.

The basic equipment of the trainer AEL-MGTC is formed by the following elements and modules:

- N-VPS01. AC 3PH Variable Power Supply.
- MWMT. Manual Winding for Motors and Transformers.
- N-MED65. Digital Multimeter.
- BRLA. Compass.
- CHER. Toolbox.

Option 1: Construction of a DC Motor-Generator Kit.

- DCMG-KIT. DC Motor-Generator Kit.
- N-REV. Single-Phase Variable Resistor.

Option 2: Construction of a Three-Phase Asynchronous Motor of Squirrel Cage Kit.

- ACIMS-KIT. Three-Phase Asynchronous Motor of Squirrel Cage Kit.

Option 3: Construcción de un Three-Phase Reluctance Motor Kit.

- ACRM-KIT. Motor de Reluctancia Trifásico Kit.

Option 4: Construction of a Three-Phase Transformer Kit.

- PTSIM-KIT. Three-Phase Transformer Kit.
- N-REFT. Three-Phase Resistor Load with Commutator.
- N-INDT. Three-Phase Inductance with Commutator.
- N-CONT. Three-Phase Capacitor with Commutator.

Option 5: Construction of a Single-Phase Transformer Kit.

- PSPIM-KIT. Single-Phase Transformer Kit.
- N-REF. Fixed resistor module.
- N-IND. Variable Inductance.
- N-CON. Variable Capacitor.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-MGTC-KIT/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-MGTC can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks:

- N-RACK-A.
- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

AEL-MGTC

Applications:

AEL-4.1
Electrical Machines Construction

Wiring & Construction of Motors, Generators and Transformers

AEL-MGTC. **Motor-Generator and Transformer Construction Trainer.** (continuation)

Some practical possibilities with Option 1: DC Motor-Generator Kit.

1.- Windings construction using a manual winding machine.

2.- Place the winding in the stator.

3.- Put into operation the DC Motor-Generator.

4.- Wiring of DC motor.

6.- DC Motor Speed Control.

7.- DC Motor turning direction control.

8.- Excitation current control.

Some practical possibilities with Option 2: Three-Phase Asynchronous Motor of Squirrel Cage Kit.

9.- Windings construction using a manual winding machine.

10.- Place the winding in the AC motor stator.

11.- Put into operation the AC induction motor.

12.- Wiring of Three-Phase Asynchronous Motor of Squirrel Cage.

Some practical possibilities with Option 3: Three-Phase Reluctance Motor Kit.

13.-Windings construction using a manual winding machine.

14.-Place the winding in the AC reluctance motor stator.

15.- Put into operation the AC induction motor.

16.- Wiring of Three-Phase Reluctance Motor.

Some practical possibilities with Option 4: Three-Phase Transformer Kit.

17.- Windings construction using a manual winding machine.

18.- Place the winding in the transformer core.

19.- Put into operation the transformer.

20.-Wiring of Three-Phase Transformer according to different configurations.

21.-Calculation of the transformer ratio according to different configurations.

22.- Drop voltage calculation with resistive load.

23.- Drop voltage calculation with inductive load.

24.- Drop voltage calculation with capacitive load.

Some practical possibilities with Option 5: Single-Phase Transformer Kit.

25.- Windings construction using a manual winding machine.

26.- Place the winding in the transformer core.

27.- Put into operation the transformer.

28.- Wiring of Single-Phase Transformer according to different configurations.

29.- Calculation of the transformer ratio according to different configurations.

30.- Drop voltage calculation with resistive load.

31.- Drop voltage calculation with inductive load.

32.- Drop voltage calculation with capacitive load.

For more information see **AEL-MGTC** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-MGTC/catalog

AEL-MGTC

Applications:

AEL-4.1
Electrical Machines Construction

Wiring & Construction of Motors, Generators and Transformers

AEL-TPTC. **Three-Phase Transformer Construction Kit.**

The Three-Phase Transformer Construction Kit "AEL-TPTC" has been designed to show the students how a three-phase transformer is constructed step by step. This application is provided with different parts of a three-phase transformer and the students will learn the manufacture processes.

Additionally it is recommended to acquire the power supply, winding machine and multimeter. On this way the students can manufacture themselves new coils and test the power transformer.

The AEL-TPTC includes the following elements:

- TPT01. Three-Phase Transformer 01.
- CHER. Tool box.

Additional and recommended modules and elements:

- N-VPS01. AC 3PH Vaiable Power Supply.
- MWMT. Manual Winding Machine for Motors and Transformers (to design coils).
- MED65. Digital Multimeter.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-TPCT/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-TPTC can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks:

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Step by step construction of a three-phase transformer.

2.- Study of different parts of a three-phase transformer.

Additional practical possibilities (with the additional and recommended modules and elements):

3.- Measurement of the transformer coils.

4.- Testing of the three-phase transformer after the construction.

5.- Measurement of the different voltages in the primary and secondary wounds.

6.- Designing different types of coils using a winding machine.

For more information see **AEL-TPTC** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-TPTC/catalog

AEL-TPTC

Applications:

AEL-4.1
Electrical Machines Construction

Disassembly Motors

AEL-DMG-KIT. **Disassembly Motors-Generators Kit.**

The Disassembly Motors-Generators Kit "AEL-DMG-KIT" has been designed by EDIBON for the training at theoretical-practical level about the assembly of the following electric motors: DC Compound with Shunt-Series Motor-Generator, Asynchronous Three-Phase Motor-Alternator, Asynchronous Three-Phase Motor of Squirrel Cage, Asynchronous Three-Phase Motor of Wound Rotor, Dahlander Three-Phase Motor, Asynchronous Three-Phase Motor of Two Independent Speeds, Asynchronous Single-Phase Motor with Starting Capacitor, Universal Motor, DC Permanent Magnet Motor, Asynchronous Single-Phase Motor with Starting and Running Capacitor, Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection, DC Brushless Motor, Asynchronous Single-Phase Motor with Split Phase, Three-Phase Reluctance Motor, Three-Phase Shaded Pole Motor.

This Disassembly Motors-Generators Kit offers several levels of training, which will provide the user of the knowledge and the essential skills about the assembly of electric motors and generators. For this purpose, the application includes a specific manual explaining, at theoretical level, the relative aspects to the electric machines. The theme covers from the construction process of each motor to the functional principles of the same. Furthermore, a set of included and optional modules are provided in order to put into practice all the theoretical concepts previously studied in the manual, as the construction from scratch of an electric machine, step by step, until its whole assembly.

One of the advantages of AEL-DMG-KIT is the large variety of electric machines available to be assembled. This allows to obtain a wide and practical formation about assembly procedures of the electric motors most used in the industry. In addition, once the electric motor is assembled, it can be put into operation with the optional modules offered in each option.

The basic equipment of AEL-DMG-KIT is formed by the following modules:

- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter. (2 units)
- CHER. Toolbox.

Optional motors to be acquired:

Option 1: Disassembly of DC Independent Shunt-Series-Compound Excitation Motor-Generator.

- EMT5. DC Independent Shunt-Series-Compound Excitation Motor-Generator.
- N-VVCC/M.DC Motor Speed Controller. (Intermediate option) (Recommended additional).
- N-REV. Variable Resistor. (optional)

Option 2: Disassembly of AC Synchronous Three-Phase Motor Alternator.

- EMT6. AC Synchronous Three-Phase Motor Alternator.
- N-VVCA/M.AC Motors Speed Controller (Intermediate option) (Recommended additional).
- N-VVCC/M.DC Motor Speed Controller. (Intermediate option) (Recommended additional).
- EMT7. Asynchronous Three-Phase Motor of Squirrel Cage (optional)

Option 3: Disassembly of Asynchronous Three-Phase Motor of Squirrel Cage.

- EMT7. Asynchronous Three-Phase Motor of Squirrel Cage.

Option 4: Disassembly of Asynchronous Three-Phase Motor with Wound Rotor.

- EMT8. Asynchronous Three-Phase Motor with Wound Rotor.

Option 5: Disassembly of Dahlander Three-Phase Motor.

- EMT9. Dahlander Three-Phase Motor.

Option 6: Disassembly of Asynchronous Three-Phase Motor of Two Independent Speeds.

- EMT10. Asynchronous Three-Phase Motor of Two Independent Speeds.

Option 7: Disassembly of Asynchronous Single-Phase Motor with Starting Capacitor.

- EMT11. Asynchronous Single-Phase Motor with Starting Capacitor.

Option 8: Disassembly of Universal Motor.

- EMT12. Universal Motor.

Option 9: Disassembly of DC Permanent magnet motor.

- EMT15. DC Permanent Magnet Motor.
- N-VVCC/M.DC Motor Speed Controller. (Intermediate option) (Recommended additional).

Option 10: Disassembly of Asynchronous Single-Phase Motor with Starting and Running Capacitor.

- EMT16. Asynchronous Single-Phase Motor with Starting and Running Capacitor.

Option 11: Disassembly of Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.

- EMT17. Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.

Option 12: Disassembly of DC Brushless Motor.

- EMT18. DC Brushless Motor.
- N-ALI03. AC Auxiliary Power Supply.

Option 13: Disassembly of Asynchronous Single-Phase Motor with Split Phase.

- EMT20. Asynchronous Single-Phase Motor with Split Phase.

Option 14: Disassembly of Three-Phase Reluctance Motor.

- EMT21. Three-Phase Reluctance Motor.

Option 15: Disassembly of Single-Phase Shaded Pole Motor.

- EMT22. Single-Phase Shaded Pole Motor.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-DMG-KIT/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-DMG-KITcan be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks:

- N-RACK-M.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

AEL-DMG-KIT

Applications:

AEL-4.1
Electrical Machines Construction

Disassembly Motors

AEL-DMG-KIT. **Disassembly Motors-Generators Kit.** (continuation)

Some practical exercises possibilities:

1.- Complete step by step assembly of DC Independent Shunt-Series Compound Excitation Motor-Generator.

2.- Put into operation the DC Independent Shunt-Series Compound Excitation Motor-Generator.

3.- Complete step by step assembly of AC Synchronous Three-Phase Motor Alternator.

4.- Put into operation the AC Synchronous Three-Phase Motor Alternator.

5.- Complete step by step assembly of Asynchronous Three-Phase Motor of Squirrel Cage.

6.- Put into operation the Asynchronous Three-Phase Motor of Squirrel Cage.

7.- Complete step by step assembly of Asynchronous Three-Phase Motor with Wound Rotor.

8.- Put into operation the Asynchronous Three-Phase Motor with Wound Rotor.

9.- Complete step by step assembly of Dahlander Three-Phase Motor.

10.- Put into operation the Dahlander Three-Phase Motor.

11.- Complete step by step assembly of Asynchronous Three-Phase Motor of Two Independent Speeds.

12.- Put into operation the Asynchronous Three-Phase Motor of Two Independent Speeds.

13.- Complete step by step assembly of Asynchronous Single-Phase Motor with Starting Capacitor.

14.- Put into operation the Asynchronous Single-Phase Motor with Starting Capacitor.

15.-Complete step by step assembly of Universal Motor.

16.- Put into operation the Universal Motor.

17.-Complete step by step assembly of DC Permanent magnet motor.

18.-Put into operation the DC Permanent magnet motor.

19.- Complete step by step assembly of Asynchronous Single-Phase Motor with Starting and Running Capacitor.

20.-Put into operation the Asynchronous Single-Phase Motor with Starting and Running Capacitor.

21.- Complete step by step assembly of Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.

22.- Put into operation the Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.

23.-Complete step by step assembly of DC Brushless Motor.

24.- Put into operation the DC Brushless Motor.

25.- Complete step by step assembly of Asynchronous Single-Phase Motor with Split Phase.

26.- Put into operation the Asynchronous Single-Phase Motor with Split Phase.

27.-Complete step by step assembly of Three-Phase Reluctance Motor.

28.- Put into operation the Three-Phase Reluctance Motor.

29.- Complete step by step assembly of Single-Phase Shaded Pole Motor.

30.- Put into operation the Single-Phase Shaded Pole Motor.

For more information see **AEL-DMG-KIT** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-DMG-KIT/catalog

AEL-DMG-KIT

Applications:

AEL-4.1
Electrical Machines Construction

Disassembly Motors

AEL-DIM-KIT. **4 Disassembly Induction Motors Kit**

The 4 Disassembly Induction Motors Kit "AEL-DIM-KIT" allows the students to construct and operate several induction motor types. It has been designed to introduce students into the basic principles of electrical induction motors and provides them with a good understanding of induction motors operation.

Using this application, the students will see clearly the induction motors piece by piece and they learn how to construct the machine step by step.

This application includes the following machines and modules:

- EMT7-D. Disassembly asynchronous three-phase motor of squirrel cage.
- EMT8-D. Disassembly asynchronous three-phase motor with wound motor.
- EMT20-D. Disassembly asynchronous single-phase motor with split phase.
- EMT16-D. Disassembly asynchronous single-phase motor with starting and running capacitor.
- MED65. Digital Multimeter.

Additional and recommended module:

- EME/B. Electrical Machines Unit (Basic option).

  With this power supply, users can put into operation all electrical motors.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-DIM-KIT/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-MGTC can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks:

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Assembly, step by step, an asynchronous three-phase motor of squirrel cage.
2.- Assembly, step by step, an asynchronous three-phase motor with wound motor.
3.- Assembly, step by step, an asynchronous single-phase motor with split phase.
4.- Assembly, step by step, an asynchronous single-phase motor with starting and running capacitor.

Additional practical possibilities (with additional recommended modules):

5.- Put into operation the asynchronous three-phase motor of squirrel cage.
6.- Put into operation the asynchronous three-phase motor with wound motor.
7.- Put into operation the asynchronous single-phase motor with split phase.
8.- Put into operation the asynchronous single-phase motor with starting and running capacitor.

For more information see **AEL-DIM-KIT** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-DIM-KIT/catalog

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OPTIONAL

AEL-DIM-KIT

Applications:

AEL-4.2
Electrical Motors Construction

Cut Away Electrical Motors

images of some motors

EMT1-S. Cut Away DC Independent Excitation Motor-Generator

It includes a Cut away DC independent excitation motor-generator (EMT1-S) in order to study the different parts of this motor type.

EMT2-S. Cut Away DC Series Excitation Motor-Generator

It includes a Cut away DC series excitation motor-generator (EMT2-S) in order to study the different parts of this motor type.

EMT3-S. Cut Away DC Shunt Excitation Motor-Generator

It includes a Cut away DC shunt excitation motor-generator (EMT3-S) in order to study the different parts of this motor type.

EMT4-S. Cut Away DC Compound Excitation Motor-Generator

It includes a Cut away DC compound excitation motor-generator (EMT4-S) in order to study the different parts of this motor type.

EMT5-S. Cut Away DC Shunt-Series Compound Excitation Motor

It includes a Cut away DC shunt-series compound excitation motor (EMT5-S) in order to study the different parts of this motor type.

EMT6-S. Cut Away AC Synchronous Three-Phase Motor Alternator

It includes a Cut away AC synchronous three-phase motor alternator (EMT6-S) in order to study the different parts of this motor type.

EMT7-S. Cut Away Asynchronous Three-Phase Motor of Squirrel Cage

It includes a Cut away asynchronous three-phase motor of squirrel cage (EMT7-S) in order to study the different parts of this motor type.

EMT8-S. Cut Away Asynchronous Three-Phase Motor with Wound Rotor

It includes a Cut away asynchronous three-phase motor with wound rotor (EMT8-S) in order to study the different parts of this motor type.

EMT9-S. Cut Away Dahlander Three-Phase Motor

It includes a Cut away Dahlander three-phase motor (EMT9-S) in order to study the different parts of this motor type.

EMT10-S. Cut Away Asynchronous Three-Phase Motor of Two Independent Speeds

It includes a Cut away asynchronous three-phase motor of two independent speeds (EMT10-S) in order to study the different parts of this motor type.

EMT11-S. Cut Away Asynchronous Single-Phase Motor with Starting Capacitor

It includes a Cut away asynchronous single-phase motor with starting capacitor (EMT11-S) in order to study the different parts of this motor type.

Applications:

AEL-4.2
Electrical Motors Construction

Cut Away Electrical Motors

EMT12-S. **Cut Away Universal Motor**

It includes a Cut away universal motor (EMT12-S) in order to study the different parts of this motor type.

images of some motors

EMT14-S. **Cut Away Repulsion Motor, Single-Phase with Short Circuited Brushes**

It includes a Cut away repulsion motor, single phase with short circuited brushes (EMT14-S) in order to study the different parts of this motor type.

EMT15-S. **Cut Away DC Permanent Magnet Motor**

It includes a Cut away DC permanent magnet motor (EMT15-S) in order to study the different parts of this motor type.

EMT16-S. **Cut Away Asynchronous Single-Phase Motor with Starting and Running Capacitor**

It includes a Cut away asynchronous single-phase motor with starting and running capacitor (EMT16-S) in order to study the different parts of this motor type.

EMT17-S. **Cut Away Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection**

It includes a Cut away asynchronous three-phase motor of squirrel cage with «Y» connection (EMT17-S) in order to study the different parts of this motor type.

EMT18-S. **Cut Away DC Brushless Motor**

It includes a Cut away DC Brushless motor (EMT18-S) in order to study the different parts of this motor type.

EMT19-S. **Cut Away Stepper Motor**

It includes a Cut away stepper motor (EMT19-S) in order to study the different parts of this motor type.

EMT20-S. **Cut Away Asynchronous Single-Phase Motor with Split Phase**

It includes a Cut away asynchronous single-phase motor with split phase (EMT20-S) in order to study the different parts of this motor type.

EMT21-S. **Cut Away Three-Phase Reluctance Motor**

It includes a Cut away three-phase reluctance motor (EMT21-S) in order to study the different parts of this motor type.

EMT22-S. **Cut Away Single-Phase Shaded Pole Motor**

It includes a Cut away single-phase shaded pole motor (EMT22-S) in order to study the different parts of this motor type.

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-FTM.**Transparent and Functional Motors Application.**

The application of Transparent and Functional Motors "AEL-FTM" has been designed by Edibon for the formation at theoretical-practical and functional levels about the electric rotating machines.

This application offers several study options which will provide the user of the knowledge, at a functional level, of the electric motors. For this purpose, the application includes a specific manual explaining, at theoretical level, the relative aspects to the electric machines. The theme covers from the parts that form different types of electric machines to how their operations are. Furthermore, a set of both optional transparent motors and modules are provided for the study of the same from a practical point of view.

The AEL-FTM offers a series of optional electric transparent motors: DC Machine with Independent Excitation, DC Series Excitation Motor-Generator, DC Machine with Shunt Excitation, DC Compound Excitation Motor-Generator, DC Independent Shunt-Series-Compound Excitation Motor-Generator, AC Synchronous Three-Phase Motor Alternator, Asynchronous Three-Phase Motor of Squirrel Cage, Asynchronous Three-Phase Motor with Wound Rotor, Dahlander Three-Phase Motor, Asynchronous Three-Phase Motor of Two Independent Speeds, Asynchronous Single-Phase Motor with Starting Capacitor, Universal Motor, Permanent Magnet DC Motor, Asynchronous Single-Phase Motor with Starting and Running Capacitor, Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection, Brushless Motor, Stepper Motor, Asynchronous Single-Phase Motor with Split Phase, Three-Phase Reluctance Motor, Single-Phase Shaded Pole Motor.

In addition, a set of modules are recommended with each electric machine in order to put into operation each one. Besides, it is possible to visualize in dynamic regime the inside of each transparent motor through the stroboscope.

One of the advantages of this application is that is included a stroboscope to visualize the rotor in operation. This technique is employed frequently in the industry to calibrate or repair the equipment. Besides, with the modules which are offered in each option, can be done speed regulation tests and in some cases to study the drop voltage produced by the loads.

The basic equipment of AEL-FTM is formed by the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-MED65. Digital Multimeter. (2 units)
- STRO. Stroboscope.

Optional motors to be acquired:

Option 1: Study of DC Independent Excitation Motor-Generator.

- EMT1-T. Transparent and Functional DC Independent Excitation Motor-Generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option). (2 units).

Option 2: Study of DC Series Excitation Motor-Generator.

- EMT2-T. Transparent and Functional DC Series Excitation Motor-Generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).

Option 3: Study of DC Shunt Excitation Motor-Generator.

- EMT3-T. Transparent and functional DC Shunt Excitation Motor-Generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).

Option 4: Study of DC Compound Excitation Motor-Generator.

- EMT4-T. Transparent and Functional DC Compound Excitation Motor-Generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).

Option 5: Study of all connections of DC Machines.

- EMT5-T. Transparent and Functional DC Independent Shunt-Series Compound Excitation Motor-Generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option). (2 units)

Option 6: Study of AC Synchronous Three-Phase Motor Alternator.

- EMT6-T. Transparent and Functional AC Synchronous Three-Phase Motor Alternator.
- EMT7. Asynchronous Three-Phase Motor of Squirrel Cage
- N-VVCC/M. DC Motor Speed Controller (intermediate option).
- N-REFT. Three-Phase Resistor Load with Commutator.
- N-VVCA/M. AC Motors Speed Controller (Intermediate option).

Option 7: Study of Asynchronous Three-Phase Motor of Squirrel Cage.

- EMT7-T. Transparent and Functional Asynchronous Three-Phase Motor of Squirrel Cage.
- N-VVCA/M. AC Motor Speed Controller. (Intermediate option).

Option 8: Study of Asynchronous Three-Phase Motor with Wound Rotor.

- EMT8-T. Transparent and Functional Asynchronous Three-Phase Motor with Wound Rotor.
- N-REVT. Three-Phase Variable Resistor.
- N-VVCA/M. AC Motors Speed Controller (Intermediate option).

Option 9: Study of Dahlander Three-Phase Motor.

- EMT9-T. Transparent and Functional of Dahlander Three-Phase Motor.
- N-VVCA/M. AC Motors Speed Controller (Intermediate option).

AEL-FTM RACK

images of some motors

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-FTM.Transparent and Functional Motors Application (continuation).

Option 10: Study of Asynchronous Three-Phase Motor of Two Independent Speeds.

- EMT10-T. Transparent and Functional of Asynchronous Three-Phase Motor of Two Independent Speeds.
- N-VVCA/M. AC Motor Speed Controller. (intermediate option).

Option 11: Study of Asynchronous Single Phase Motor with Starting Capacitor.

- EMT11-T. Transparent and Functional Asynchronous Single-Phase Motor with Starting Capacitor.

Option 12: Study of Universal Motor.

- EMT12-T. Transparent and Functional Universal Motor.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).
- N-REV. Variable Resistor.

Option 13: Study of Permanent Magnet DC Motor.

- EMT15-T. Transparent and Functional Permanent Magnet DC Motor.
- N-VVCC/M. DC Motor Speed Controller. (intermediate option).

Option 14: Study of Asynchronous Single-Phase Motor with Starting and Running Capacitor.

- EMT16-T. Transparent and Functional Asynchronous Single-Phase Motor with Starting and Running Capacitor.

Option 15: Study of Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.

- EMT17-T. Transparent and Functional Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.
- N-VVCA/M. AC Motor Speed Controller. (intermediate option).

Option 16: Study of Brushless Motor.

- EMT18-T. Transparent and Functional Brushless Motor.
- N-ALI03. AC Auxiliary Power Supply.

Option 17: Study of Stepper Motor.

- EMT19-T. Transparent and Functional Stepper Motor.
- N-ALI03. AC Auxiliary Power Supply.
- N-VVCC/M. DC Motor Speed Controller. (Intermediate option).

Option 18: Study of Asynchronous Single-Phase Motor with Split Phase.

- EMT20-T. Transparent and Functional Asynchronous Single-Phase Motor with Split Phase.
- N-VVCA/M. AC Motor Speed Controller (Intermediate option).

Option 19: Study of Three-Phase Reluctance Motor.

- EMT21-T. Transparent and Functional Three-Phase Reluctance Motor.
- N-VVCA/M. AC Motor Speed Controller (Intermediate option)

Option 20: Study of Single-Phase Shaded Pole Motor.

- EMT22-T. Transparent and Functional Single-Phase Shaded Pole Motor.

Additional and recommended brakes to be chosen to study these motors:

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake. This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.
- FREPR. Prony brake.

Additional and recommended measurement module:

- N-EAL. Network Analyzer Unit.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-FTM/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-FTM can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-M. (2 units).

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

AEL-FTM RACK

images of some motors

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-FTM.Transparent and Functional Motors Application (continuation).

Some practical possibilities with Option 1: Transparent and Functional DC Independent Excitation Motor-Generator.

1.- Wiring and starting of DC independent excitation motor.

2.- Study of the control parameters of DC current motors.

3.- Visualization of the rotor rotating.

4.- Visualization of the internal elements of the motor.

5.- Usage of the stroboscope for the static visualization of the rotor.

6.- DC machine turning direction control.

7.- Excitation current control.

Some practical possibilities with Option 2: Transparent and Functional DC Motor-Generator with Series Excitation.

8.- Wiring and starting of DC independent excitation motor.

9.- Study of the control parameters of DC current motors.

10.-Visualization of the rotor rotating.

11.-Visualization of the internal elements of the motor.

12.-Usage of the stroboscope for the static visualization of the rotor.

13.-DC machine turning direction control.

14.-Excitation current control.

Some practical possibilities with Option 3: Transparent and Functional DC Motor-Generator with Shunt Excitation.

15.-Wiring and starting of DC independent excitation motor.

16.-Study of the control parameters of DC current motors.

17.-Visualization of the rotor rotating.

18.-Visualization of the internal elements of the motor.

19.-Usage of the stroboscope for the static visualization of the rotor.

20.-DC machine turning direction control.

21.-Excitation current control.

Some practical possibilities with Option 4: Transparent and Functional DC Motor-Generator with Compound Excitation.

22.-Wiring and starting of DC independent excitation motor.

23.-Study of the control parameters of DC current motors.

24.-Visualization of the rotor rotating.

25.-Visualization of the internal elements of the motor.

26.-Usage of the stroboscope for the static visualization of the rotor.

27.-DC machine turning direction control.

28.-Excitation current control.

Some practical possibilities with Option 5: Transparent and Functional DC Motor-Generator with Series-Shunt-Compound Excitation.

29.-Wiring and starting of DC independent excitation motor.

30.-Study of the control parameters of DC current motors.

31.-Visualization of the rotor rotating.

32.-Visualization of the internal elements of the motor.

33.-Usage of the stroboscope for the static visualization of the rotor.

34.-DC machine turning direction control.

35.-Excitation current control.

Some practical possibilities with Option 6: Transparent and Functional AC Synchronous Three-Phase Motor-Alternator.

36.-Checking the main power supply.

37.-Wiring and starting the AC Synchronous Motor.

38.-Visualization of the rotor rotating.

39.-Visualization of the internal elements of the motor.

40.-Usage of the stroboscope for the static visualization of the rotor.

41.-Study of drop voltage of Synchronous Motor with load.

Some practical possibilities with Option 7: Transparent and Functional Three-Phase Asynchronous Motor of Squirrel Cage.

42.- Checking the main power supply.

43.-Wiring and starting the Three-Phase Asynchronous Motor of Squirrel Cage.

44.-Visualization of the rotor rotating.

45.-Visualization of the internal elements of the motor.

46.-Usage of the stroboscope for the static visualization of the rotor.

47.-Manual reversing operations of the Three-Phase Asynchronous Motor of Squirrel Cage.

AEL-FTM RACK

images of some motors

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-FTM.Transparent and Functional Motors Application (continuation).

Some practical possibilities with Option 8: Transparent and Functional Three-Phase Asynchronous Motor of Wound Rotor.

48.-Checking the main power supply.

49.-Wiring and starting the Three-Phase Asynchronous Motor of Wound Rotor.

50.-Visualization of the rotor rotating.

51.-Visualization of the internal elements of the motor.

52.-Usage of the stroboscope for the static visualization of the rotor.

53.-Manual reversing operations of the Three-Phase Asynchronous Motor of Wound Rotor.

Some practical possibilities with Option 9: Transparent and Functional Three-Phase Dahlander Motor.

54.- Checking the main power supply.

55.-Wiring and starting the Three-Phase Dahlander Motor tor.

56.-Visualization of the rotor rotating.

57.-Visualization of the internal elements of the motor.

58.-Usage of the stroboscope for the static visualization of the rotor.

59.-Manual reversing operations of the Three-Phase Dahlander Motor Rotor.

60.-Manual speed variation of a Dahlander motor.

Some practical possibilities with Option 10: Transparent and Functional Asynchronous Three-Phase Motor of Two Independent Speeds.

61.-Checking the main power supply.

62.-Wiring and starting the Asynchronous Three-Phase Motor of Two Independent Speeds.

63.-Visualization of the rotor rotating.

64.-Visualization of the internal elements of the motor.

65.-Usage of the stroboscope for the static visualization of the rotor.

66.-Manual reversing operations of the Asynchronous Three-Phase Motor of Two Independent Speeds.

67.-Manual speed variation of an Asynchronous Three-Phase Motor of Two Independent Speeds.

Some practical possibilities with Option 11: Transparent and Functional Asynchronous Single-Phase Motor with Starting Capacitor.

68.- Checking the main power supply.

69.-Wiring and starting the Asynchronous Single-Phase Motor with Starting Capacitor.

70.- Visualization of the rotor rotating.

71.-Visualization of the internal elements of the motor.

72.-Usage of the stroboscope for the static visualization of the rotor.

73.-Manual reversing operations of the Asynchronous Single-Phase Motor with Starting Capacitor.

Some practical possibilities with Option 12: Transparent and Functional Universal Motor.

74.- Checking the main power supply.

75.- Wiring and starting the Universal Motor.

76.- Visualization of the rotor rotating.

77.-Visualization of the internal elements of the motor.

78.-Usage of the stroboscope for the static visualization of the rotor.

79.-Manual reversing operations of the Universal Motor.

Some practical possibilities with Option 13: Transparent and Functional Permanent Magnet DC Motor.

80.-Wiring and starting of Permanent Magnet DC Motor.

81.-Study of the control parameters of Permanent Magnet DC Motor.

82.- Visualization of the rotor rotating.

83.-Visualization of the internal elements of the motor.

84.-Usage of the stroboscope for the static visualization of the rotor.

85.-Permanent Magnet DC Motor turning direction control.

86.- Excitation current control.

Some practical possibilities with Option 14: Transparent and Functional Asynchronous Single-Phase Motor with Starting and Running Capacitor.

87.- Checking the main power supply.

88.-Wiring and starting the Asynchronous Single-Phase Motor with Starting and Running Capacitor.

89.- Visualization of the rotor rotating.

90.-Visualization of the internal elements of the motor.

AEL-FTM RACK

images of some motors

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-FTM.Transparent and Functional Motors Application (continuation).

91.- Usage of the stroboscope for the static visualization of the rotor.

92.- Manual reversing operations of the Asynchronous Single-Phase Motor with Starting and Running Capacitor.

Some practical possibilities with Option 15: Transparent and Functional Asynchronous Three-Phase Motor of Squirrel Cage with "Y" Connection.

93.- Checking the main power supply.

94.- Wiring and starting the Asynchronous Three-Phase Motor of Squirrel Cage.

95.- Visualization of the rotor rotating.

96.- Visualization of the internal elements of the motor.

97.- Usage of the stroboscope for the static visualization of the rotor.

98.- Manual reversing operations of the Asynchronous Three-Phase Motor of Squirrel Cage.

Some practical possibilities with Option 16: Transparent and Functional Brushless Motor.

99.- Wiring and starting of Brushless Motor.

100.- Study of the control parameters of Brushless Motor.

101.- Visualization of the rotor rotating.

102.- Visualization of the internal elements of the motor.

103.- Usage of the stroboscope for the static visualization of the rotor.

104.- Brushless Motor turning direction control.

105.- Excitation current control.

Some practical possibilities with Option 17: Transparent and Functional Stepper Motor.

106.- Wiring and starting of Stepper Motor.

107.- Study of the control parameters of Stepper Motor.

108.- Visualization of the rotor rotating.

109.- Visualization of the internal elements of the motor.

110.- Usage of the stroboscope for the static visualization of the rotor.

111.- Stepper Motor turning direction control.

112.- Excitation current control.

Some practical possibilities with Option 18: Transparent and Functional Asynchronous Single-Phase Motor with Split Phase.

113.- Checking the main power supply.

114.- Wiring and starting the Asynchronous Single-Phase Motor with Split Phase.

115.- Visualization of the rotor rotating.

116.- Visualization of the internal elements of the motor.

117.- Usage of the stroboscope for the static visualization of the rotor.

118.- Manual reversing operations of the Asynchronous Single-Phase Motor with Split Phase.

Some practical possibilities with Option 19: Transparent and Functional Three-Phase Reluctance Motor.

119.- Checking the main power supply.

120.- Wiring and starting the Three-Phase Reluctance Motor.

121.- Visualization of the rotor rotating.

122.- Visualization of the internal elements of the motor.

123.- Usage of the stroboscope for the static visualization of the rotor.

124.- Manual reversing operations of the Three-Phase Reluctance Motor.

Some practical possibilities with Option 20: Transparent and Functional Single-Phase Shaded Pole Motor.

125.- Checking the main power supply.

126.- Wiring and starting the Single-Phase Shaded Pole Motor.

127.- Visualization of the rotor rotating.

128.- Visualization of the internal elements of the motor.

129.- Usage of the stroboscope for the static visualization of the rotor.

130.- Manual reversing operations of the Single-Phase Shaded Pole Motor.

For more information see **AEL-FTM** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-FTM/catalog

AEL-FTM RACK

images of some motors

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT1-T. **Transparent and Functional DC Independent Excitation Motor-Generator.**

The AEL-EMT1-T includes a transparent and functional motor.

With this application the student can see how work a DC independent excitation motor - generator and visualize how the rotor is moved.

It includes the following modules:

- EMT1-T. Transparent and functional DC independent excitation motor-generator.
- N-WCC/M. DC Motor Speed Controller (intermediate option). (2 units)
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter. (2 units).

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-WCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- STRO. Stroboscope.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT1-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT1-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-M.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Start-up of the EMT1-T motor.

2.- Speed control of the EMT1-T motor.

3.- Torque control of the EMT1-T motor.

4.- Study of different wirings of this type of motors.

5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of this type of motors with variable brake toque.

7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT1-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT1-T/catalog

AEL-EMT1-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT2-T. **Transparent and Functional DC Series Excitation Motor-Generator.**

The AEL-EMT2-T includes a transparent and functional motor.

With this application the student can see how work a DC series excitation motor-generator and visualize how the rotor is moved.

It includes the following modules:

- EMT2-T. Transparent and functional DC series excitation motor-generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter. (2 units)

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- STRO. Stroboscope.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT2-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT2-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Start-up of the EMT2-T motor.

2.- Speed control of the EMT2-T motor.

3.- Torque control of the EMT2-T motor.

4.- Study of different wirings of this type of motors.

5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of this type of motors with variable brake toque.

7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT2-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT2-T/catalog

AEL-EMT2-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT3-T. **Transparent and Functional DC Shunt Excitation Motor-Generator.**

The AEL-EMT3-T includes a transparent and functional motor.

With this application the student can see how work a DC shunt excitation motor-generator and visualize how the rotor is moved.

It includes the following modules:

- EMT3-T. Transparent and functional DC shunt excitation motor-generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter. (2 units)

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- STRO. Stroboscope.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT3-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT3-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules..

Some practical exercises possibilities:

1.- Start-up of the EMT3-T motor.

2.- Speed control of the EMT3-T motor.

3.- Torque control of the EMT3-T motor.

4.- Study of different wirings of this type of motors.

5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of this type of motors with variable brake toque.

7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT3-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT3-T/catalog

AEL-EMT3-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT4-T. **Transparent and Functional DC Compound Excitation Motor-Generator.**

The AEL-EMT4-T includes a transparent and functional motor.

With this application the student can see how work a DC compound excitation motor-generator and visualize how the rotor is moved.

It includes the following modules:

- EMT4-T. Transparent and functional DC compound excitation motor-generator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter. (2 units)

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- STRO. Stroboscope.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT4-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT4-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Start-up of the EMT4-T motor.

2.- Speed control of the EMT4-T motor.

3.- Torque control of the EMT4-T motor.

4.- Study of different wirings of this type of motors.

5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of this type of motors with variable brake toque.

7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT4-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT4-T/catalog

AEL-EMT4-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT5-T. **Transparent and Functional DC Shunt-series Compound Excitation Motor-Generator.**

The AEL-EMT5-T includes a transparent and functional motor.

With this application the student can see how work a DC shunt-series compound excitation motor and visualize how the rotor is moved.

It includes the following modules:

- EMT5-T. Transparent and functional DC shunt-series compound excitation motor.
- N-WCC/M. DC Motor Speed Controller (intermediate option). (2 units)
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter. (2 units)

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-WCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- STRO. Stroboscope.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT5-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT5-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Start-up of the EMT5-T motor.

2.- Speed control of the EMT5-T motor.

3.- Torque control of the EMT5-T motor.

4.- Study of different wirings of this type of motors.

5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of this type of motors with variable brake toque.

7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT5-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT5-T/catalog

AEL-EMT5-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT6-T. **Transparent and Functional AC Synchronous Three-phase Motor Alternator.**

The AEL-EMT6-T includes a transparent and functional motor.

With this application the student can see how work this type of motor and visualize how the rotor is moved.

It includes the following modules:

- EMT6-T. Transparent and functional AC synchronous three-phase motor alternator.
- N-VVCC/M. DC Motor Speed Controller (intermediate option).
- EMT7-T. Transparent and functional asynchronous three-phase motor of squirrel cage.
- N-VVCA/M. AC Motor Speed Controller (intermediate option).
- N-ALI02. Domestic Main Power Supply.
- N-REFT. Three-phase Resistor Load with commutator.
- N-MED65. Digital Multimeter. (2 units).

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.

  This unit may be necessary to measure voltage, current, power factor ,etc of the generator.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT6-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT6-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-M.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Start-up of the motor.
2.- Study of different applications of these types of generators.
3.- Study of output voltage in function of the current excitation.
4.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

5.- Study of output voltage in function of the frequency.
6.- Frequency control.
7.- Study of the synchronous generator without load.
8.- Study of the synchronous generator with load.

For more information see **AEL-EMT6-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT6-T/catalog

AEL-EMT6-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT7-T. **Transparent and Functional Asynchronous Three-phase Motor of Squirrel Cage.**

The AEL-EMT7-T includes a transparent and functional motor.

With this application the student can see how an asynchronous three-phase motor of squirrel cage and visualize how the rotor is moved.

It includes the following modules:

- EMT7-T. Transparent and functional asynchronous three-phase motor of squirrel cage.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.
- N-VVCA/M. AC Motor Speed Controller (intermediate option).

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT7-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT7-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the three-phase induction motor of squirrel cage.
2.- Start-up of the motor.
3.- Configuration in clockwise direction.
4.- Configuration in anti-clockwise direction.
5.- Study of frequency controller.
6.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

7.- Study of the response of the motor with variable brake torque.
8.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT7-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT7-T/catalog

AEL-EMT7-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT8-T. **Transparent and Functional Asynchronous Three-phase Motor with Wound Rotor.**

The AEL-EMT8-T includes a transparent and functional motor.

With this application the student can see how an and asynchronous three-phase motor with wound rotor and visualize how the rotor is moved.

It includes the following modules:

- EMT8-T. Transparent and functional asynchronous three-phase motor with wound rotor.
- N-ALI02. Domestic Main Power Supply.
- N-REVT. Three-phase Variable Resistor.
- N-MED65. Digital Multimeter.
- N-VVCA/M. AC Motor Speed Controller (intermediate option).

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT8-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT8-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-M.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the asynchronous three-phase motor with wound rotor in short circuit.
2.- Start-up of the motor.
3.- Study of this motor with the variable resistor in the rotor.
4.- Study of frequency controller.
5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of the response of the motor with variable brake torque.
7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT8-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT8-T/catalog

AEL-EMT8-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT9-T. **Transparent and Functional Dahlander Three-phase Motor.**

The AEL-EMT9-T includes a transparent and functional motor.

With this application the student can see how work a Dahlander three-phase motor and visualize how the rotor is moved.

It includes the following modules:

- EMT9-T. Transparent and functional Dahlander three-phase motor.
- N-ALI01. Industrial Main Power Supply.
- N-MED65. Digital Multimeter.
- N-ARR07. Manual Dahlander Commutator, 2 Speeds.

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT9-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT9-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the electrical connections of the Dahlander motor.
2.- Start-up of the motor.
3.- Study of two speed manual Dahlander commutation.
4.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

5.- Study of the response of the motor with variable brake torque.
6.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT9-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT9-T/catalog

AEL-EMT9-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT10-T. **Transparent and Functional Asynchronous Three-phase Motor of Two Independent Speeds.**

The AEL-EMT10-T includes a transparent and functional motor.

With this application the student can see how work an asynchronous three-phase motor of two independent speeds and visualize how the rotor is moved.

It includes the following modules:

- EMT10-T. Transparent and functional asynchronous three-phase motor of two independent speeds.
- N-ALI01. Industrial Main Power Supply.
- N-MED65. Digital Multimeter.
- N-ARR09. Manual Independent Windings Commutator, 2 speeds.

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT10-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT10-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the asynchronous three-phase motor of two independent speeds with different wiring configurations:
   - Two poles configuration.
   - Four poles configuration.
2.- Start-up of the motor.
3.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

4.- Study of the response of the motor with variable brake torque.
5.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT10-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT10-T/catalog

AEL-EMT10-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT11-T. **Transparent and Functional Asynchronous Single-phase Motor with Starting Capacitor.**

The AEL-EMT11-T includes a transparent and functional motor.

With this application the student can see how work an asynchronous single-phase motor with starting capacitor and visualize how the rotor is moved.

It includes the following modules:

- EMT11-T. Transparent and functional asynchronous single-phase motor with starting capacitor.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT11-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT11-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the asynchronous single-phase motor with starting capacitor.
2.- Put into operation the motor.
3.- Study of the influence of the starting capacitor in the motor.
4.- Study of the main applications of this type of motors.
5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of the response of the motor with variable brake torque.
7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT11-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT11-T/catalog

AEL-EMT11-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT12-T. **Transparent and Functional Universal Motor.**

The AEL-EMT12-T includes a transparent and functional motor.

With this application the student can see how work an universal motor and visualize how the rotor is moved.

It includes the following modules:

- EMT12-T. Transparent and functional universal motor.
- N-WCC/M. DC Motor Speed Controller (intermediate option).
- N-ALI02. Domestic Main Power Supply.
- N-REV. Variable Resistor.
- N-MED65. Digital Multimeter.

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-WCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement module:

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT12-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT12-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-M.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the universal motor in DC.

2.- Study of the universal motor in AC.

3.- Soft starter of the universal motor.

4.- Forward and reverse operations.

5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of the response of the motor with variable brake torque.

7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT12-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT12-T/catalog

AEL-EMT12-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT14-T. **Transparent and Functional Repulsion Motor, Single-phase with Short Circuited Brushes.**

The AEL-EMT14-T includes a transparent and functional motor.

With this application the student can see how work a repulsion motor, single phase with short circuited brushes and visualize how the rotor is moved.

It includes the following modules:

- EMT14-T. Transparent and functional repulsion motor, single phase with short circuited brushes.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.

Optional brakes modules to study this motor: (to chose)

- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT14-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT14-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-M.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the repulsion motor.
2.- Study of the speed control of this type of motors.
3.- Study of the main operations of this type of motors.
4.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

5.- Study of the response of the motor with variable brake torque.
6.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT14-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT14-T/catalog

AEL-EMT14-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT16-T. **Transparent and Functional Asynchronous Single-phase Motor with Starting and Running Capacitor.**

The AEL-EMT16-T includes a transparent and functional motor.

With this application the student can see how work an asynchronous single-phase motor with starting and running capacitor and visualize how the rotor is moved.

It includes the following modules:

- EMT16-T. Transparent and functional asynchronous single-phase motor with starting and running capacitor.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-WCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-MED65. Digital Multimeter.
- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT16-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT16-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the asynchronous single-phase motor with starting and running capacitor.
2.- Study of the influence of the starting and running capacitor in the motor.
3.- Study of the main operations of this type of motors.
4.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

5.- Study of the response of the motor with variable brake torque.
6.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT16-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT16-T/catalog

AEL-EMT16-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT17-T. **Transparent and Functional Asynchronous Three-phase Motor of Squirrel Cage with "Y" Connection.**

The AEL-EMT17-T includes a transparent and functional motor.

With this application the student can see how work an asynchronous three-phase motor of squirrel cage with «Y» connection and visualize how the rotor is moved.

It includes the following modules:

- EMT17-T. Transparent and functional asynchronous three-phase motor of squirrel cage with «Y» connection.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.
- N-VVCA/M. AC Motor Speed Controller (intermediate option).

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT20-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT20-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the asynchronous three-phase motor of squirrel cage with "Y" connection.
2.- Study of the wiring of this type of motors.
3.- Study of the forward and reverse operations.
4.- Study of frequency controller.
5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of the response of the motor with variable brake torque.
7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT17-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT17-T/catalog

AEL-EMT17-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT20-T. **Transparent and Functional Asynchronous Single-phase Motor with Split Phase.**

The AEL-EMT20-T includes a transparent and functional motor.

With this application the student can see how work an asynchronous single-phase motor with split phase and visualize how the rotor is moved.

It includes the following modules:

- EMT20-T. Transparent and functional asynchronous single-phase motor with split phase.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.
- N-WCA/M. AC Motor Speed Controller (intermediate option).

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-WCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT21-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT21-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the asynchronous single-phase motor with split phase.
2.- Study of the connections diagram of this type of motors.
3.- Study of the characteristics of these motors.
4.- Study of frequency controller.
5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of the response of the motor with variable brake torque.
7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT20-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT20-T/catalog

AEL-EMT20-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT21-T. **Transparent and Functional Three-phase Reluctance Motor.**

The AEL-EMT21-T includes a transparent and functional motor.

With this application the student can see how work a three-phase reluctance motor and visualize how the rotor is moved.

It includes the following modules:

- EMT21-T. Transparent and functional three-phase reluctance motor.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.
- N-VVCA/M. AC Motor Speed Controller (intermediate option).

Optional brakes modules to study this motor: (to chose)

- FREND. Dynamo Brake.
- DI-FRE. Pendular Dynamo Brake.
- FRECP. Eddy Current Brake.

  This brake requires the DC Motor Speed Controller (N-VVCC/M).
- FRENP. Magnetic Powder Brake.
- FRE-FE. Electronic Brake.

Optional measurement modules: (to chose)

- N-EAL. Network Analyzer Unit.
- STRO. Stroboscope.

If the Option A (modules mounted on rack) is chosen, the rack/s required will depend on the optional modules requested by the customer.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT22-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT22-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the three-phase reluctance motor.
2.- Study of the connections diagram of this type of motors.
3.- Study of the characteristics of these motors.
4.- Study of frequency controller.
5.- Measurement of electrical parameters.

Additional practical possibilities (with the optional modules):

6.- Study of the response of the motor with variable brake torque.
7.- Measurement of voltages and currents in function of the brake torque.

For more information see **AEL-EMT21-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT21-T/catalog

AEL-EMT21-T

Applications:

AEL-4.2
Electrical Motors Construction

Transparent and Functional Electrical Motors

AEL-EMT22-T. **Transparent and Functional Single-phase Shaded Pole Motor.**

The AEL-EMT22-T includes a transparent and functional motor. With this application the student can see how work a single-phase shaded pole motor and visualize how the rotor is moved.

It includes the following modules:

- EMT22-T. Transparent and functional single-phase shaded pole motor.
- N-ALI02. Domestic Main Power Supply.
- N-MED65. Digital Multimeter.

Optional measurement modules:

- STRO. Stroboscope.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-EMT22-T/ICAI) to reinforce knowledge about this field. This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-EMT22-T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

Some practical exercises possibilities:

1.- Study of the three-phase shaded pole motor.

2.- Study of the connections diagram of this type of motors.

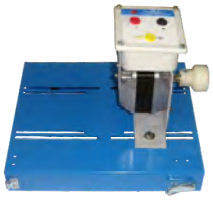
3.- Study of the characteristics of these motors.

4.- Measurement of electrical parameters.

For more information see **AEL-EMT22-T** catalogue.

Click on the following link:

www.edibon.com/en/files/equipment/AEL-EMT22-T/catalog



AEL-EMT22-T

AEL-1. **ELECTRICAL INSTALLATIONS LAB**

AEL-1.1. Home Electrical Installations

Applications

Lighting and Control

- AEL-AD13. Audio Door Entry System.
- AEL-AD14. Audio and Video Door Entry System.
- AEL-AD6A. Luminosity Control Station.
- AEL-AD6B. Basic Luminosity Control Station.
- AEL-AD24. Position Switch.
- AEL-AD5. Stair Lights Timing.
- AEL-AI13-E. Modular Trainer for Electrotecnics (Lighting).

Climatization

- AEL-AD9A. Heating Control Station.
- AEL-AD9B. Basic Heating Control Station.

AEL-1.2. Industrial Electrical Installations

Applications

Industrial Control Engineering

- AEL-CM1. Manual Control Operations.
- AEL-CM2. Operations with Manual Commutators.
- AEL-CM3. Automatic Control Operations.
- AEL-CM4. Automatic Control Operations with contactors and sensors.

Fault Simulators

- AEL-AD33. Single-Phase Installations Faults Simulator.
- AEL-AD33T. Three-Phase Installations Faults Simulator.

Relays Trainer

- AEL-AE4. Test Unit for Differential Automatic Switches.
- AEL-AE5. Relay Control Station.
- AEL-PRTS. Protective Relaying Training System.

Loads

- AEL-AI13-A. Modular Trainer for Electrotecnics (RLC Circuits).
- AEL-MED. Industrial Measurement Technology.

AEL-1.3. Professional Wiring Practices in Installations

Applications

Cubicle Wiring Installations

- AEL-AEBI. Assembly Exercises in Building Installations.
- AEL-AEBM. Assembly Exercises on Building Mains Feeds and Meter Cabinets.
- AEL-AESI. Assembly Exercises for Signals Electrical Installations.
- AEL-AESU. Assembly Exercises on Switching Units.

See catalogue of: **AEL-1. Electrical Installations Lab**
www.edibon.com/en/files/equipment/AEL-1/catalog

AEL-2. **HOME AUTOMATION SYSTEMS LAB**

AEL-2.1. Wired Systems

Applications

General Wired Home Automation Systems

- AEL-AD1A. Robbery Alarm Station.
- AEL-AD1B. Basic Robbery Alarm Station.
- AEL-AD3A. Fire Alarm Station.
- AEL-AD3B. Basic Fire Alarm Station.
- AEL-AD15A. Position Control Station.
- AEL-AD15B. Basic Position Control Station.
- AEL-AD25A. Control Station for Home Electric Service through the telephone.
- AEL-AD22. Flooding Control Station.
- AEL-AD30. Gas Control Station.
- AEL-AD31. Movement and Sound Detection and Control.
- AEL-AD40. Remote Control Station Via Telephone.

KNX/EIB Systems

- AEL-KNX1. KNX/EIB Lighting and Shutter Control System.
- AEL-KNX2. KNX/EIB Heating Control System.
- AEL-KNX3. KNX/EIB Robbery Alarm System.
- AEL-KNX4. KNX/EIB Fire Alarm System.
- AEL-BCS. BacNet Systems.

AEL-2.2. Wireless Systems

Applications

General Wired Home Automation Systems

- AEL-AD28A. Integral Control Station of Home Electric Systems.
- AEL-AD28B. Basic Control Station of Home Electric Systems.
- AEL-AD28C. Elementary Control Station of Home Electric Systems.
- AEL-AD23. Wireless Basic Control Station (RF).

See catalogue of: **AEL-2. Home Automation Systems Lab**
www.edibon.com/en/files/equipment/AEL-2/catalog

AEL-3. **ELECTRICAL MACHINES LAB**

AEL-3.1. **Electrical Machines Trainers**

Applications

Transformers Trainers

- AEL-SPTT. Single-Phase Transformer Trainer.
- AEL-TPTT. Three-Phase Transformer Trainer.
- AEL-AI13-D. Modular Trainer for Electrotecnics (Transformers).

Generators/Motors Trainers

General Trainers

- AEL-EEEM. Energy Efficiency in Electrical Motors.
- AEL-EMSS. Electrical Machines Soft Starter.
- AEL-EMCF. Electrical Machines Control through Frequency Controller.
- AEL-AI13. Modular Trainer for Electrotecnics (RLC Circuits, Electrostatics, Motors, Transformers, Lighting).
- AEL-AI13-C. Modular Trainer for Electrotecnics (Motors).
- AEL-EMRP. Electrical Machines Relays Protection Trainer.
- AEL-SERIN/CA-1k. Computer Controlled Advanced Industrial Servo systems Trainer- 1 kW (for AC Motors).
- AEL-MMRT. Motor Management Relays Trainer.
- AEL-AI12. Modular Application (AC Motors).
- AEL-IMSU. General Applications of AC Induction Motors.
- AEL-PRTS. Protective Relaying Training System.

AC Machines

Synchronous Machines

- AEL-EEA. Alternator Study Unit.
- AEL-EGMG24. Motor-Generator Group.

Asynchronous Machines

- AEL-ACEMT. AC Electrical Motors Trainer.
  - Option 1 (EMT7): Study of Three-Phase Asynchronous Motor of Squirrel cage.
  - Option 2 (EMT8): Study of Three-Phase Asynchronous Motor of wound rotor.
  - Option 3 (EMT9): Study of Three-Phase Dahlander Motor.
  - Option 4 (EMT10): Study of Asynchronous three-phase motor of two independent speeds.
  - Option 5 (EMT11): Study of Asynchronous single-phase motor with starting capacitor.
  - Option 6 (EMT12): Study of Universal Motor
  - Option 7 (EMT16): Study of Asynchronous single-phase motor with starting and running capacitor.
  - Option 8 (EMT20): Study of Asynchronous single-phase motor with split phase.
  - Option 9 (EMT21): Study of Three-Phase Reluctance Motor.

DC Machines

- AEL-DCEMT. DC Electrical Motors Trainer.
  - Option 1 (EMT1): Study of DC Machine with independent excitation.
  - Option 2 (EMT2): Study of DC Machine with Series excitation.
  - Option 3 (EMT3): Study of DC Machine with shunt excitation.
  - Option 4 (EMT4): Study of DC Machine with Compound excitation.
  - Option 5 (EMT5): Study of all types of DC Machines.

Faults Trainers

- AEL-ESAM. Faults Simulation Trainer in Electrical Motors.
- AEL-ESAT. Faults Simulation Trainer in Transformers.

AEL-3.2. **Electrical Machines Applications**

Applications

Generators/Motors Applications

- AEL-ACINA. Applications of AC Three-Phase Induction Motors of Squirrel Cage.
- AEL-ACDHA. Applications of AC Dahlander Three-Phase Induction Motors.
- AEL-ACWRA. Applications of AC Three-Phase Induction Motors of Wound Rotor.
- AEL-ACLA. Applications of AC Linear Motor Operations.
- AEL-DCSEA. Applications of DC Series Motors.
- AEL-DCSHA. Applications of DC Shunt Motors.
- AEL-DCCOA. Applications of DC Compound Motors.
- AEL-DCSPA. Applications of DC Separately Excited Motors.
- AEL-DCGEA. Applications of DC Generators.
- AEL-UMA. Applications of Universal Motors.
- AEL-STMA. Applications of Stepper Motors.
- AEL-DCPMA. Applications of DC Permanent Magnet Motors.
- AEL-DCBRA. Applications of DC Brushless Motors.
- AEL-ACRLA. Applications of AC Three-Phase Reluctance Motors.
- AEL-ACSPA. Applications of Asynchronous Single-Phase Motor with Split Phase.
- AEL-AI12. Modular Application (AC Motors).
- AEL-IMSU. General Applications of AC Induction Motors.

AC Machines

Synchronous Machines

- AEL-EEA. Alternator Study Unit.
- AEL-EGMG24. Motor-Generator Group.

Asynchronous Machines

- AEL-ACEMA. AC Electrical Motors Application
  - Option 1 (EMT7): Study of Three-Phase Asynchronous Motor of Squirrel cage.
  - Option 2 (EMT8): Study of Three-Phase Asynchronous Motor of wound rotor.
  - Option 3 (EMT9): Study of Three-Phase Dahlander Motor.
  - Option 4 (EMT10): Study of Asynchronous three-phase motor of two independent speeds.
  - Option 5 (EMT11): Study of Asynchronous single-phase motor with starting capacitor.
  - Option 6 (EMT12): Study of Universal Motor
  - Option 7 (EMT16): Study of Asynchronous single-phase motor with starting and running capacitor.
  - Option 8 (EMT20): Study of Asynchronous single-phase motor with split phase.
  - Option 9 (EMT21): Study of Three-Phase Reluctance Motor.

DC Machines

- AEL-DCEMA. DC Electrical Motors Application
  - Option 1 (EMT1): Study of DC Machine with independent excitation
  - Option 2 (EMT2): Study of DC Machine with Series excitation
  - Option 3 (EMT3): Study of DC Machine with shunt excitation
  - Option 4 (EMT4): Study of DC Machine with Compound excitation
  - Option 5 (EMT5): Study of all types of DC Machines.
  - Option 6: (EMT15): Study of Permanent Magnet DC Motor.
  - Option 7: (EMT1): Study of DC Generator.
- AEL-STMA. Applications of Stepper Motors.
- AEL-DCBRA. Applications of DC Brushless Motors.

See catalogue of: **AEL-3. Electrical Machines Lab**
www.edibon.com/en/files/equipment/AEL-3/catalog

AEL-4. ELECTROMECHANICAL CONSTRUCTIONS LAB

AEL-4.1. Electrical Machines Construction

Applications

Dissectible and Configurable Electrical Motors Application

- AEL-EMT-KIT. Advanced Dissectible and Configurable Electrical Machines.

Wiring & Construction of Motors, Generators and Transformers

- AEL-MGTC. Motors, Generators and Transformers Construction Application.
- AEL-TPTC. Three-Phase Transformer Construction Kit.

Disassembly Motors

- AEL-DMG-KIT. Disassembly Motors-Generators Kit.
- AEL-DIM-KIT. 4 Disassembly Induction Motors Kit.

AEL-4.2. Electrical Motors Construction

Applications

Cut Away Electrical Motors

- EMT1-S. Cut away DC independent excitation motor-generator.
- EMT2-S. Cut away DC series excitation motor-generator.
- EMT3-S. Cut away DC shunt excitation motor-generator.
- EMT4-S. Cut away DC compound excitation motor-generator.
- EMT5-S. Cut away DC shunt-series compound excitation motor.
- EMT6-S. Cut away AC synchronous three-phase motor alternator.
- EMT7-S. Cut away asynchronous three-phase motor of squirrel cage.
- EMT8-S. Cut away asynchronous three-phase motor with wound rotor.
- EMT9-S. Cut away Dahlander three-phase motor.
- EMT10-S. Cut away asynchronous three-phase motor of two independent speeds.
- EMT11-S. Cut away asynchronous single-phase motor with starting capacitor.
- EMT12-S. Cut away universal motor.
- EMT14-S. Cut away repulsion motor, single-phase with short circuited brushes.
- EMT15-S. Cut away DC permanent magnet motor.
- EMT16-S. Cut away asynchronous single-phase motor with starting and running capacitor.
- EMT17-S. Cut away asynchronous three-phase motor of squirrel cage with "Y" connection.
- EMT18-S. Cut away DC Brushless motor.
- EMT19-S. Cut away stepper motor.
- EMT20-S. Cut away asynchronous single-phase motor with split phase.
- EMT21-S. Cut away three-phase reluctance motor.
- EMT22-S. Cut away single-phase shaded pole motor.

Transparent and Functional Electrical Motors

- AEL-FTM. Transparent and Functional Motors Application
- AEL-EMT1-T. Transparent and functional DC independent excitation motor-generator.
- AEL-EMT2-T. Transparent and functional DC series excitation motor-generator.
- AEL-EMT3-T. Transparent and functional DC shunt excitation motor-generator.
- AEL-EMT4-T. Transparent and functionalDC compound excitation motor-generator.
- AEL-EMT5-T. Transparent and functional DC shunt-series compound excitation motor-generator.
- AEL-EMT6-T. Transparent and functional AC synchronous three-phase motor alternator.
- AEL-EMT7-T. Transparent and functional asynchronous three-phase motor of squirrel cage.
- AEL-EMT8-T. Transparent and functional asynchronous three-phase motor with wound rotor.
- AEL-EMT9-T. Transparent and functional Dahlander three-phase motor.
- AEL-EMT10-T. Transparent and functional asynchronous three-phase motor of two independent speeds.
- AEL-EMT11-T. Transparent and functional asynchronous single-phase motor with starting capacitor.
- AEL-EMT12-T. Transparent and functional universal motor.
- AEL-EMT14-T. Transparent and functional repulsion motor, single-phase with short circuited brushes.
- AEL-EMT16-T.Transparent and functional asynchronous single-phase motor with starting and running capacitor.
- AEL-EMT17-T. Transparent and functional asynchronous three-phase motor of squirrel cage with "Y" connection.
- AEL-EMT20-T. Transparent and functional asynchronous single-phase motor with split phase.
- AEL-EMT21-T. Transparent and functional three-phase reluctance motor.
- AEL-EMT22-T. Transparent and functional single-phase shaded pole motor.

AEL-5. POWER SYSTEMS AND SMART GRID TECHNOLOGY LAB

AEL-5.1. Generation Trainers

Applications

Basic Synchronization Applications

- AEL-MOSC. Manual Operations of Synchronization Circuits.

Advanced Synchronization Applications

- AEL-EESD. Advanced Digital Synchronization Trainer.

Wind Energy

- AEL-WPP. Wind Power Plants with Double Feed Induction Generator.
- AEL-WPT. Wind Power Trainer with Permanent Magnets Synchronous Generator.
- AEL-WPPI. Wind Power Plants with Induction Generator.

Photovoltaic Energy

- AEL-PHVG. Photovoltaic Application with Connection to Grid.

Fuel Cell Energy

- AEL-FCLL. Fuel Cell Energy Trainer.

Power Plants

- AEL-EPP. Energy Power Plants Trainer.
- AEL-HPPP. Hydroelectric Power Plants Trainer with Pelton Turbine.
- AEL-MEPD. Marine Electrical Power Distribution System.
- TDEGC. Computer Controlled Diesel Engine Electricity Generator.

Basic Smart Grid Power Systems

- AEL-BSG. Basic Smart Grid Trainer.
- AEL-BSGC. Basic Smart Grid Trainer, with SCADA.

Microgrid Series

- AEL-MGR. Micro-Grids Power System Series.

AEL-5.2. Distribution and Transmission Trainers

Applications

Distribution and Transmission Trainers

- AEL-AE1A. Aerial Line Model.
- AEL-TI-01. Analysis of Three-phase Power Lines.
- AEL-TI-02. Distribution Transformer with Motor Regulation.
- AEL-TI-03. Arc suppression Coil.
- AEL-TI-04. Underground Transmission lines.
- AEL-TI-05. Parallel and Series Transmission Lines.
- AEL-TI-06. Analysis of flow power on Transmission Lines.
- AEL-TI-07. Transmission Systems with Synchronous Generator.
- AEL-SST-01. Basic Operations in Switching Transmission Substation Trainer.
- AEL-SST-02. Switching Substation Protection Trainer.
- AEL-HVDC. High Voltage DC Transmission Lines.

AEL-5.3. Loads Trainers

Applications

Basic Load Controller Trainers

- AEL-MRPC. Manual Reactive Power Compensation.
- AEL-ARPC. Automatic Reactive Power Compensation.
- AEL-EECFP. Advanced Power Factor Compensation.
- AEL-APFC. Single-phase Automatic Power Factor Compensation.
- AEL-DLT. Dynamic Loads Trainer.

Advanced Loads Control

- AEL-FUSG. Final User Smart Grid Trainer.
- AEL-FUSG-M. Final User Smart Grid-Smart Meter Trainer.
- AEL-FUSG-E. Final User Smart Grid-Smart Energy Trainer.
- AEL-FUSG-N. Final User Smart Grid-Net Metering Trainer.

AEL-5.4. Protection Relays Trainers

Applications

Fundamental Concepts

- AEL-CTFP. Current Transformer Fundaments for Protections Devices.
- AEL-VTFP. Voltage Transformer Fundaments for Protections Devices.

Protection Trainers Relays

- ERP. Protection Relays Test Trainer.
- ERP-CBM. Cybersecurity Module.

Protection Systems for Generators

- AEL-GPRE. Generator Protection Relay Trainer.

Protection Systems for Transmission and Distribution Lines

- AEL-TPT-01. Overcurrent Time Protection Relay for Lines.
- AEL-TPT-02. Directional Overcurrent Protection Relay for Transmission Lines.
- AEL-TPT-03. Overvoltage and Undervoltage Protection Relay.
- AEL-TPT-04. Directional Power Protection Relay.
- AEL-TPT-05. Earth-Fault Voltage Protection Relay.
- AEL-TPT-06. Parallel Transmission Lines Protection Relay.
- AEL-TPT-07. High Speed Distance Protection Relay.

AEL-5.5 Cybersecurity Trainers

Applications

- ERP-CBM. Cybersecurity Module.

AEL-5.6. Available "Smart Grid Power Systems"

Applications

- APS12. Advanced Mechanical, Electrical and Smart Grid Power Systems (Utilities).
- AEL-MPSS-01. Modular Smart Grid Power Systems Simulator, with Automatic Control Generation, Transmission Line, Loads and Protection Relays, with SCADA.
- AEL-MPSS-02. Modular Smart Grid Power Systems Simulator, with Automatic Control Generation, Transmission Line and Loads, with SCADA.
- AEL-MPSS-03. Modular Smart Grid Power Systems Simulator, with Manual Control Generation, Transmission Line, Loads and Protection Relays, with SCADA.
- AEL-MPSS-04. Modular Smart Grid Power Systems Simulator, with Manual Control Generation, Transmission Line and Loads, with SCADA.
- AEL-CPSS-01S. Smart Grid Power Systems Application, with Automatic Control Generation, Transmission Line and Loads.
- AEL-CPSS-02S. Smart Micro-Grids Power Systems Application, with Automatic Control Generation and Loads.
- AEL-CPSS-03S. Smart Grid Power Systems Application with Two Parallel Generators, Two Distribution Lines and Loads, with SCADA.

See catalogue of: **AEL-5. Power Systems and Smart Grid Technology Lab**
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✱Specifications subject to change without previous notice, due to the convenience of improvements of the product.

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Issue: ED01/17
Date: September/2017

REPRESENTATIVE: