edibon
Technical Teaching Equipment

Advanced Electrical Laboratories (AEL-LABS):
Electrical Machines Lab
AEL-3

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↳Products
↳Products range
↳Units
↳4.-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.**
- **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.

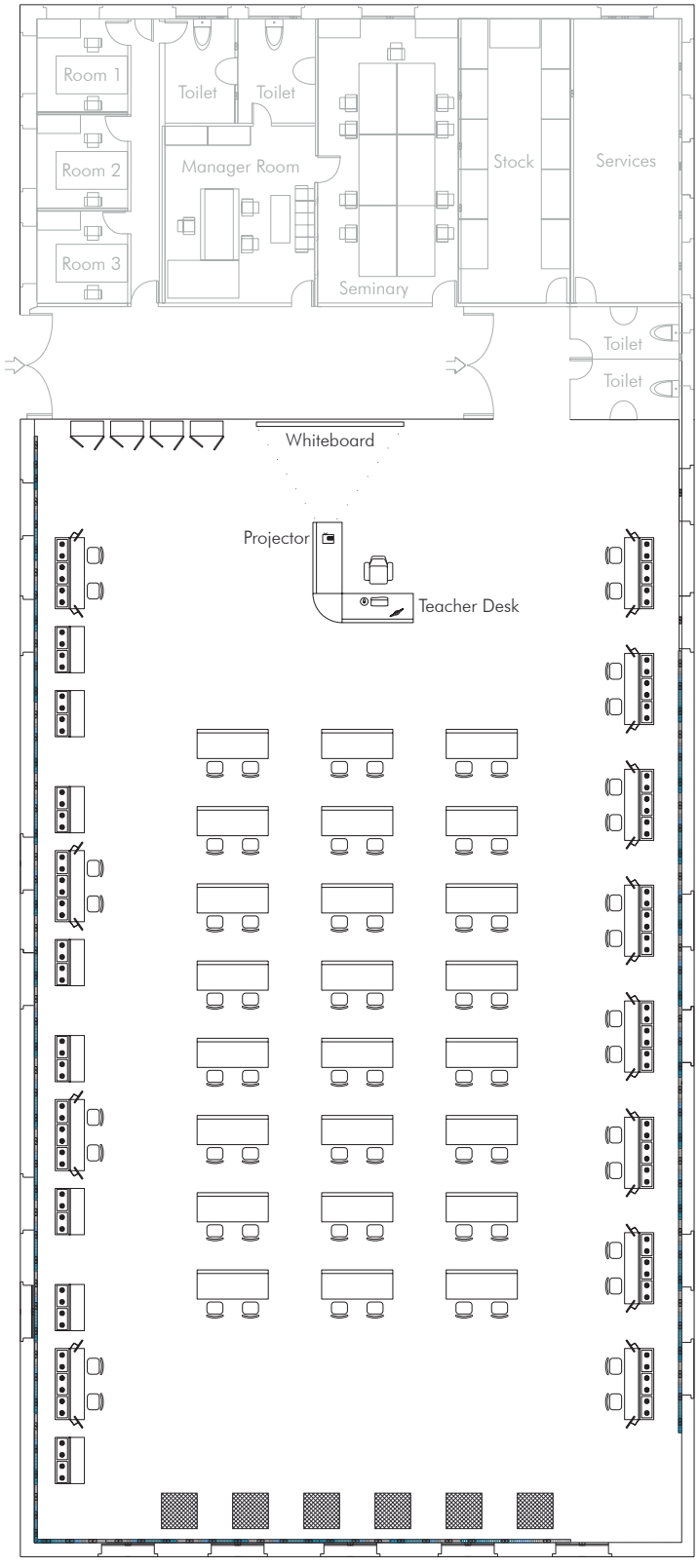
ISO 9000: Quality Management
(for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate
(total safety)

Certificates ISO 14000 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

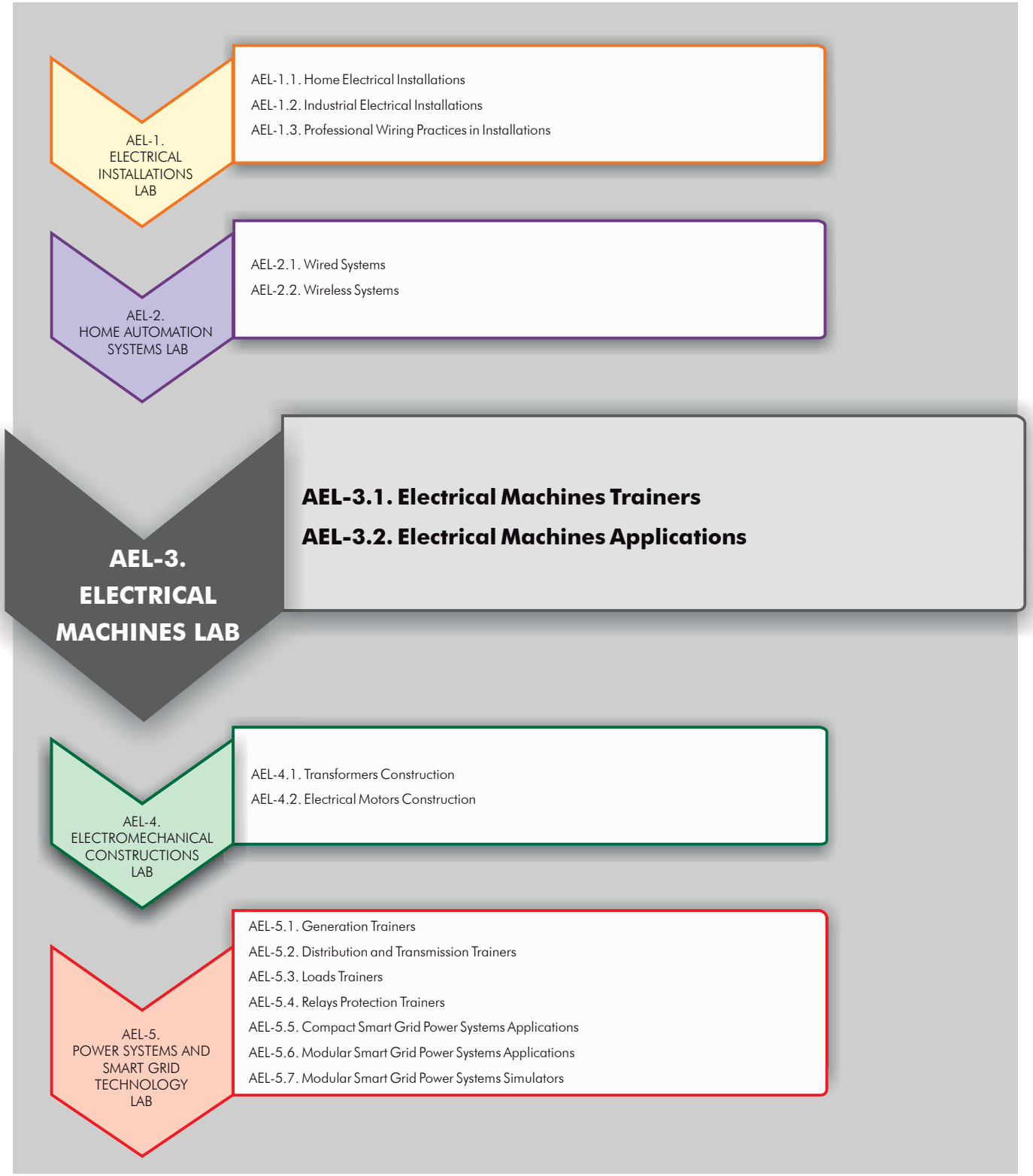
EDIBON, a company with more than 35 years of experience designing and implementing training systems, has a wide variety of applications adapted to XXI century new technologies.

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-3. Electrical Machines Lab.**"



AEL-3. **Electrical Machines Lab**

The AEL-3. Electrical Machines Lab is formed by:

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

+

Applications
(to be mounted on rail)

AEL-AD33

AEL-AD3A

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

+

Applications + Rack

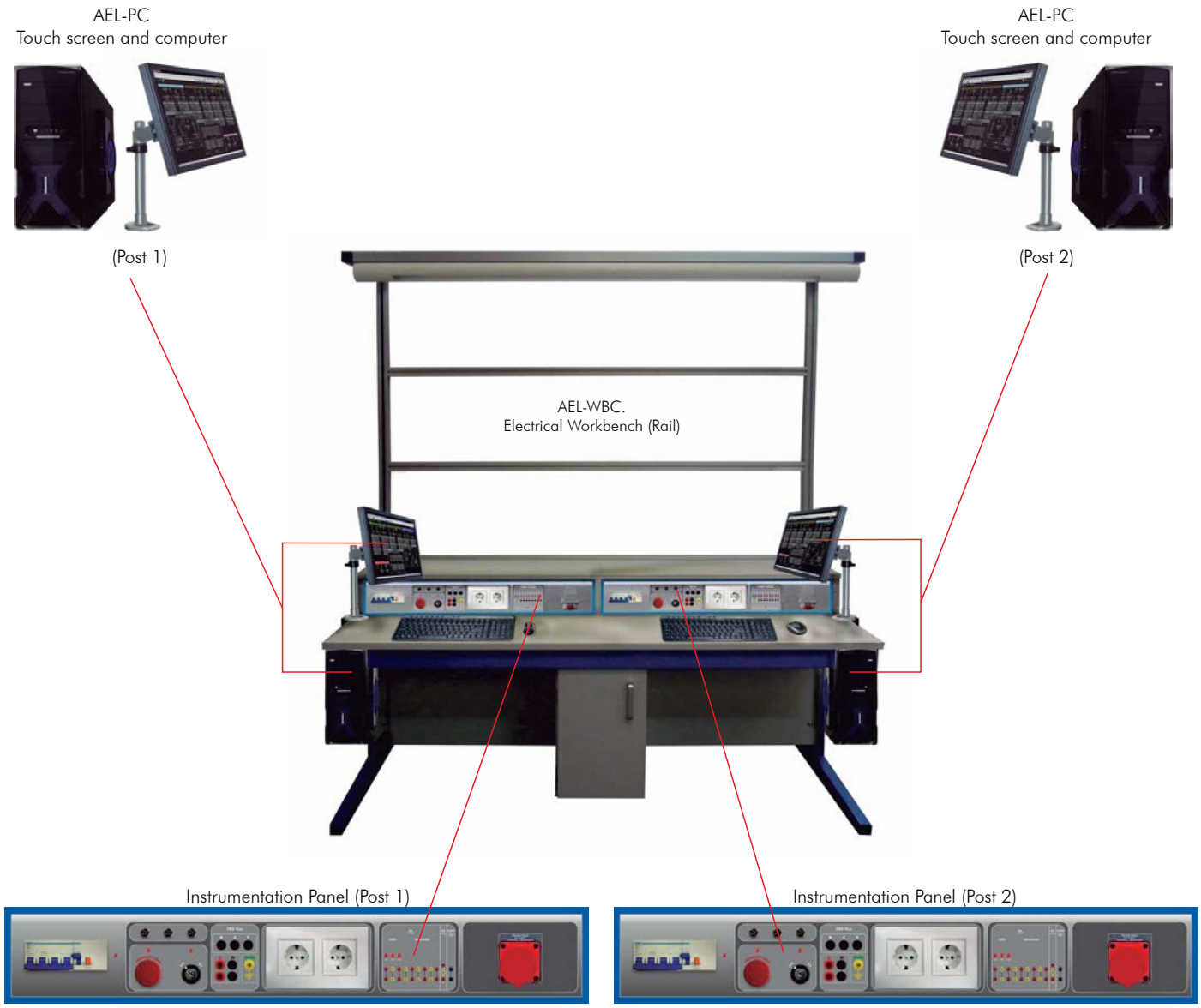
AEL-AD33 + N-RACK-A

AEL-AD3A + N-RACK-A

+

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).

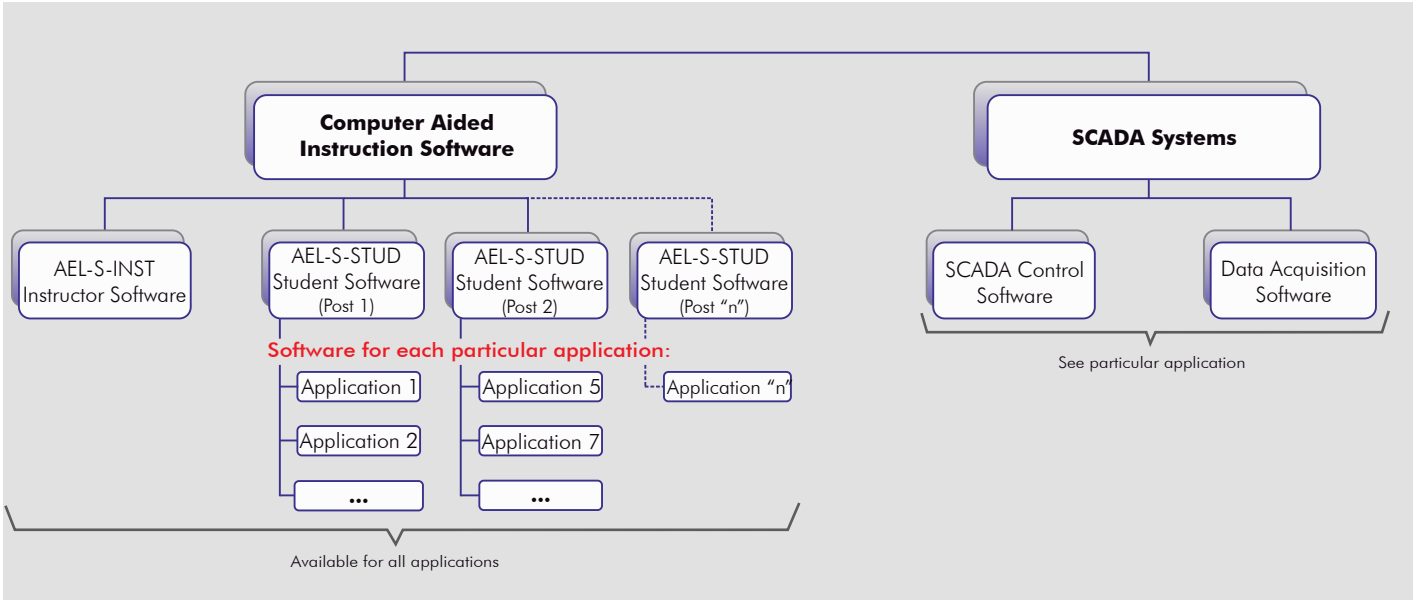
The AEL-WBR is a workbench designed with strong rack in order to fix all electrical modules.

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.



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

Computer Aided Instruction Software

- AEL-S-INST. **Instructor Software**:

This software is recommended as a comprehensive, multi-level, instructional tool that directs students to work independently and at their own speed, while also freeing the instructor to provide specific guidance whenever needed.

- AEL-S-STUD. **Student Software**:

This software includes theory about the applications and assesses the students' knowledge through tests and exams.

NOTE: Will be necessary acquire a license per student.

SCADA Systems

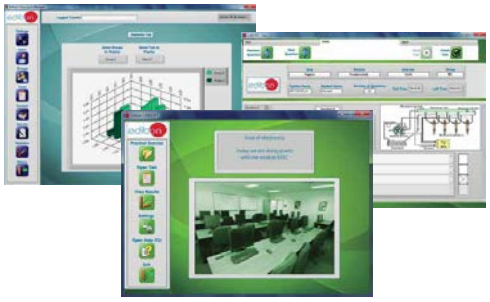
- **SCADA. Control Software**:

Software designed to control different applications that require an advance control system, such as generation systems remote control, distribution systems with control over power flows and isolating switches, etc. It is included if the application required it.

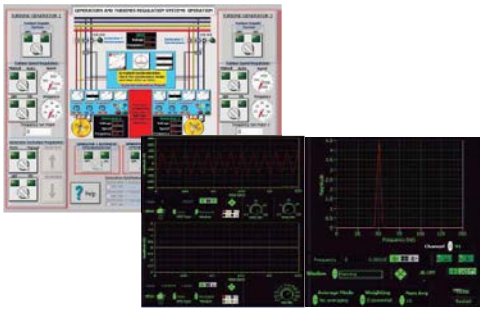
- **Data Acquisition Software**:

This software has been designed to acquire different signals to know the state of the processes. For example, to study the dynamic characteristics of an induction squirrel cage motor, the data acquisition system allows to monitor, in real time, the mechanical torque curves, speed, electrical power, etc. to obtain thus all the electrical parameters of the machine. It is included if the application required it.

Example of some Software Screens:



Computer Aided Instruction Software screens



SCADA Control and Data Acquisition Softwares screens

List of **Applications**

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-DTT. Distribution Transformer Trainer.
- AEL-AI13-D. Modular Trainer for Electrotecnics (Transformers).

Generators/Motors Trainers

- AEL-EEA. Alternator Study Unit.
- AEL-EGMG24. Motor-Generator Group.
- AEL-EEEM. Energy Efficiency in Electrical Motors.
- AEL-EMSS. Electrical Machines Soft Starter.
- AEL-EMCF. Electrical Machines Control through Frequency Controller.
- AEL-EMRP. Electrical Machines Relays Protection Trainer.
- AEL-ACINT. AC Three-Phase Induction Motor of Squirrel Cage Trainer.
- AEL-ACDHT. AC Dahlander Three-Phase Induction Motor Trainer.
- AEL-DCSET. DC Series Excitation Motor Trainer.
- AEL-DCSHT. DC Shunt Excitation Motor Trainer.
- AEL-DCCOT. DC Compound Excitation Motor Trainer.
- AEL-DCSPT. DC Separately Excited Motor Trainer.
- AEL-UMT. Universal Motor Trainer.
- AEL-ACRLT. AC Three-Phase Reluctance Motor Trainer.
- AEL-ACSPT. Asynchronous Single-Phase Motor with Split Phase Trainer.
- AEL-SERIN/CA-1KW. Computer Controlled Advanced Industrial Servosystems Trainer - 1 kW (for AC Motors).
- AEL-AI13. Modular Trainer for Electrotecnics (RLC Circuits, Electrostatics, Motors, Transformers, Lighting).
- AEL-AI13-C. Modular Trainer for Electrotecnics (Motors).
- AEL-C-04S. Dynamics Loads, with SCADA.

Fault Simulator Trainers in Electrical Machines

- AEL-ESAM. Fault Simulation Trainer in Electrical motors.
- AEL-ESAE. Electrical Faults Simulation Trainer.
- AEL-MMRT. Motor Management Relays Trainer.

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 Excitation Motors.
- AEL-DCSHA. Applications of DC Shunt Excitation Motors.
- AEL-DCCOA. Applications of DC Compound Excitation 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.

SPECIFICATIONS

The Electrical Machines Lab (AEL-3) covers all the field of electric machines. It has different motors, as well as transformers trainers to study them.

Furthermore, to study more advanced electric machines systems, it includes a great variety of brakes for their dynamic test.

It also includes motor protection relays trainers to study their calibration and how to develop a selective protection plan.

This Electrical Machines section consists of a group of applications, trainers, faults simulators and units dedicated for studying the electrical machines used nowadays.

Due to the great variety of electrical motors, electronic braking devices, real time measuring systems, different types of electrical loads, etc., the Electrical Machines area becomes the ideal laboratory to study this field.

Besides, EDIBON has a control and data acquisition system for more advanced students, so that they can study the electrical machines in depth, with test benches to study the braking torque, mechanical power, efficiency calculations, etc.

The complete Home Electrical Machines Lab (AEL-3) 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).

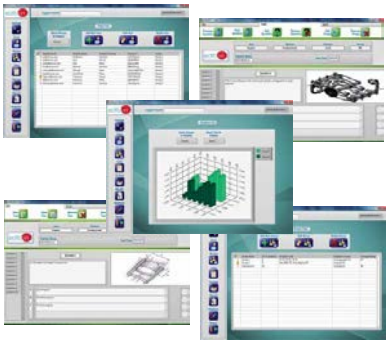
The workbench can be supplied with one or two touch screens and computers.

Software packages:

Computer Aided Instruction Software:

AEL-S-INST. **Instructor Software:**

It is software designed for the teacher. The teacher can administrate the classroom and students, schedule specific task for single student or groups, follow the progress of the class through the practical exercises and tests. It is composed of:



Student Manager:

- Administration of an unlimited number of students and courses.
- Addition, deletion and editing of students and student data.

Classroom Editor:

- Wizard for creation of new courses.
- Addition, deletion and editing of student groups.
- Creating, deletion and editing courses.
- Assignment of students to classes.
- Assignment of Scheduled practical exercises and tests to students or classes.

Test & Questioner Creator:

- Creating, deletion and editing custom test.
- Programming of the number of questions, number of answers, time to perform the test and more.
- Specific questions or an arbitrary set of question taken from a database.
- Test preview.
- Insertion of graphics, animations and tables.
- Insertion of test questions.
- Editing questions.
- Seven different types of question: single and multiple choice, missing text, assignment, matrices, arbitrary text, selection of images.
- Ability to input meta data (points, time for questions, difficulty, etc.)

Reporter & Static Results:

- Presentation of the results, selecting users, groups, tests or a mix.
- Statistics of users or groups, to view the evolution and progress.
- Graphical presentation of progress in courses and tests.
- Reports on courses, tests, single user or classes.
- Summary of results and time.
- Calculation of average results for groups

AEL-S-STUD. **Student Software:**

It allows students to complete practical exercises with a PC. It loads programmatically practical exercises scheduled by the teacher, allows student to do test and view the results obtained. To help to follow the practical exercises, it provides gadgets such as animation loaders, video help players and more. It software are composed of:

Registration:

- Easy student registration.

Practical Exercise:

- Automatically load of practical exercise files (PDFs) scheduled by the teacher by date, classroom or course.
- Windows Calculator and Notepad integration.
- Default web browser integration.
- Custom Spreadsheet. This gadgets loads a file containing the information about the most common equations used in each practical exercise. It has the following features:
  - Allows the student to fill the table and computes student input data.
  - It can load and save tables with full data.
  - It can plot the table data linking with two variables.
  - It can plot the equations used in the practical test.
  - It can export data to an XLS file.
- Allows student to record an audio or a video and send it to the teacher.
- The student can load additional help, such as PDFs, GIFs, Flash animations or videos.
- Student and teacher can chat through the application.

Exercises:

- Student can perform provided tests, or customized tests created by the teacher.

Result Viewer:

- Students can see the results obtained on their tests attempts.
- Summary of single user results and time.
- Reports on single user results.

Applications:

AEL-3.1
Electrical Machines Trainers

Transformers Trainers

AEL-SPTT. **Single-Phase Transformer Trainer**

The Single-Phase Transformer Trainer "AEL-SPTT" allows to analyze the behaviour of single-phase transformers under different conditions. It has an instrumentation panel to measure the primary and secondary voltages and currents.

Besides, the AEL-SPTT Trainer has a short-circuit commutator to test the transformer.

The application AEL-SPTT is mounted on rack:

This application needs the following rack:

- N-RACK-M.

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

See additional elements at the beginning of the catalogue.

Optional:

- MUAD. Electric Power Data Acquisition System.

Some practical possibilities:

1.- Analyze single-phase transformer with load.
2.- Analyze a single-phase transformer without load.
3.- Single-phase transformer short-circuit study.
4.- Calculate the nominal parameters of the single-phase transformer.

AEL-TPTT. **Three-Phase Transformer Trainer**

The Three-Phase Transformer Trainer "AEL-TPTT" allows to analyze the behaviour of three-phase transformers under different conditions. It has an instrumentation panel to measure the primary and secondary voltages and currents.

Besides, the AEL-TPTT Trainer has a short-circuit commutator to test the transformer.

The application AEL-TPTT is mounted on rack:

This application needs the following rack:

- N-RACK-M.

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

See additional elements at the beginning of the catalogue.

Optional:

- MUAD. Electric Power Data Acquisition System.

Some practical possibilities:

1.- Analyze three-phase transformer with load.
2.- Analyze a three-phase transformer without load.
3.- Three-phase transformer short-circuit study.
4.- Calculate the nominal parameters of the three-phase transformer.

AEL-TPTT + RACK

Applications:

AEL-3.1
Electrical Machines Trainers

Transformers Trainers

AEL-DTT. **Distribution Transformer Trainer**

The Distribution Transformer Trainer "AEL-DTT" is a hand-on trainer designed to allow the students to develop wirings in three-phase transformers with voltage regulation similar to those performed in the field.

The application AEL-DTT is mounted on rack:

This application needs the following rack:

- N-RACK-M.

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

See additional elements at the beginning of the catalogue.

Optional:

- MUAD. Electric Power Data Acquisition System.

Some practical possibilities:

1.- Wire up the transformer regulator step by step.

2.- Configure the transformer winding connections (star-delta).

3.- Simulate drop voltage with the Transmission Lines Simulation Module (N-AE1), and compensate drop voltages through the voltage regulator with different loads using the manual commutator (+-2,5%,+-5%+-7,5%).

AEL-AI13-D. **Modular Trainer for Electrotecnics (Transformers)**

The Modular Trainer for Electrotecnics (Transformers) "AEL-AI13-D" is a complete transformers application that allows the student to learn the basic concepts about the transformers.

It is provided with a set of practices, through which the user will understand how to work with different types of transformers.

The AEL-AI13-D includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- VAR17. Dismantled Transformer Kit.
- TRA28. Three-phase Transformer.
- N-MED65. Digital Multimeter.

The application AEL-AI13-D can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Step-Down Transformer.

2.- Step-Up Transformer.

3.- Auto-transformer.

4.- Connection as single-phase transformer.

5.- Direct delta/delta three-phase connection.

6.- Star/delta three-phase connection.

7.- Three-phase/six-phase connection.

8.- Transformer with coils in series phase.

AEL-AI13-D + RACK

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-EEA. **Alternator Study Unit**

This motor-generator trainer allows to study the behaviour of electrical generators with independent excitation.

The Alternator Study Unit "AEL-EEA" allows the students to know the parameters required to control a generation system:

excitation controller (reactive power),

frequency controller (main power),

power generation.

The AEL-EEA includes the following modules:

- N-ALI02. Main Power Supply.
- N-WVCA/M. AC Motor Speed Controller.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- EMT6. AC Synchronous three-phase motor alternator.
- N-VREG. Voltage Regulator Module.
- N-REFT300. 300 Ohms Three-Phase Fixed Resistor Module.
- N-INDT. Three-phase Variable Inductive Load with commutator.
- N-CONT. Three-phase Variable Capacitor Load with commutator.
- N-EAL. Network Analyzer Unit.

  It allows to measure all necessary electrical parameters (P, Q, S, I, V, cosφ, f).

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional:

- EM-SCADA. Control and Data Acquisition System of Electrical Motors.

This system is very useful in order to carry out accurate measurements and analyze wave forms of currents and voltages.

Some practical possibilities:

1.- Voltage control generation through excitation control.

2.- Frequency control generation through main motor.

3.- Study of electrical generator with load.

4.- Study of electrical generator with no load changing the generator parameters.

5.- Study of electrical generator with different power factors.

6.- Study of power factor compensation.

AEL-EEA + RACK

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-EGMG24. **Motor-Generator Group**

The Motor-Generator Group "AEL-EGMG24" allows to study the behaviour of permanent magnet alternator with main motor control.

It includes the following modules:

- N-ALI02. Main Power Supply.
- N-WVCA/M. AC Motor Speed Controller.
- EMT7-C. Asynchronous three-phase Motor of squirrel cage (8 poles).
- EMT6-B. Permanent magnets synchronous three-phase generator.
- N-TRA30. Three-phase Isolating Transformer 24Vac/380 Vac.
- N-RET300. 300 Ohms Three-Phase Fixed Resistor Module. (2 units)
- N-INDT. Three-phase Variable Inductive Load with commutator.
- N-CONT. Three-phase Variable Capacitor Load with commutator.
- N-EAL. Network Analyzer Unit.

The application AEL-EGMG24 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.

See additional elements at the beginning of the catalogue.

Optional:

- EM-SCADA. Control and Data Acquisition System of Electrical Motors.

This system is very useful in order to carry out accurate measurements and analyze wave forms of currents and voltages.

Some practical possibilities:

It allows the students know the basic control of electrical generators:

1.- Frequency/speed control of permanent magnet synchronous generator.

2.- Voltage control generation.

3.- Study of electrical generator with load.

4.- Study of electrical generator with no load.

5.- Study of electrical generator with different power factors.

AEL-EGMG24 + RACKS

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-EEEM. **Energy Efficiency in Electrical Motors**

This application allows the students to know cutting-edge devices used in high performance systems to control electrical motors: frequency controllers versus conventional electrical power.

Actual frequency controllers can automatically control (PID) the speed of the motors depending on different conditions, such as loads variations.

The AEL-EEEM shows how to program the frequency controller to get an optimal consumption depending on the load.

The AEL-EEEM includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-EAL. Network Analyzer Unit.

  It allows to measure all necessary electrical parameters (P, Q, S, I, V, cosφ, f).
- FRECP. Eddy Current Brake. (Brake to control the braking torque of the motor).
- N-VVCC/M. DC Motor Speed Controller.
- N-VVCA/M. AC Motor Speed Controller.
- EMT7. Asynchronous three-phase motor of squirrel cage.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional:

- EM-SCADA. Control and Data Acquisition System of Electrical Motors.

  This system is very useful in order to carry out accurate measurements and analyze wave forms of currents and voltages.

Some practical possibilities:

1.- Start-up of a motors control system.

2.- Comparison of the energy consumption by the conventional electrical power and the frequency controllers.

3.- Programming of the frequency controller according to different electrical machines operations.

4.- Checking the behaviour of the electrical machine in function of the braking torque.

AEL-EEEM + RACK

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-EMSS. **Electrical Machines Soft Starter**

The AEL-EMSS application has been designed to instruct the student in managing soft-starters of three-phase electrical machines. The objective is to teach the students which the required parameters to be considered in order to configure the electrical machine starter through a PWM frequency controller are.

The AEL-EMSS includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-VVCA. Advanced AC Motor Speed Controller.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- FRECP. Eddy Current Brake. (Brake to control the braking torque of the motor).
- N-VVCC/M. DC Motor Speed Controller.
- N-ARR01. Manual Star-Delta Starter.
- N-TRANS03. Three-phase Autotransformer.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional:

- EM-SCADA. Control and Data Acquisition System of Electrical Motors.

This system is very useful in order to carry out accurate measurements and analyze wave forms of currents and voltages.

Some practical possibilities:

1.- Put in operation of the electrical machine.
2.- Parameterization of the acceleration ramp.
3.- Parameterization of the deceleration ramp.
4.- Parameterization of the starting voltage .
5.- Study of currents and voltages at startup.
6.- Starting with different load conditions.
7.- Comparison with Star/Delta starter.

AEL-EMSS + RACK

AEL-EMCF. **Electrical Machines Control through Frequency Controller**

The AEL-EMCF application has been designed to instruct the student in managing frequency controllers for the control of three phase induction electrical machines.

The AEL-EMCF includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- FRECP. Eddy Current Brake. (Brake to control the braking torque of the motor).
- N-VVCC/M. DC Motor Speed Controller.
- N-VVCA/M. AC Motor Speed Controller.
- EMT7. Asynchronous three-phase motor of squirrel cage.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Commissioning of the frequency controller.
2.- Programming of the basic functions of the frequency controller:
   - Adjusting the necessary values.
   - Adjusting the rotation direction.
   - Adjusting the start function.
   - Adjusting the frequency commutation, nominal voltage, nominal current, nominal frequency, etc
   - Study the operational performance.
   - Measuring power and RMS.
   - Different experiments with loads.
   - U/f function optimization.

AEL-EMCF + RACK

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-EMRP. **Electrical Machines Relays Protection Trainer**

Squirrel cage induction motors are designed to work at constant load. Load variations and high inrush currents could heat the motor.

The Electrical Machines Relays Protection Trainer "AEL-EMRP" has been designed to train the students in electrical protection systems of electrical machines.

The AEL-EMRP includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- FRE-FE. Electronic Brake.
- N-MPS. Motor protection module.

  This module consists of various systems for protection of three-phase asynchronous motors:

  - Motor protection switches.
  - Motor protection relays.
  - Thermistor protection circuits.
  - Load protection for disconnecting the power supply to the motor.
- N-EAL. Network Analyzer Unit.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Study of motor protection circuit breaker.

2.- Study of motor protection relay.

3.- Study of thermistor protection.

4.- Study of motor overload protection.

5.- Triggering characteristics for protection systems.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-ACINT. **AC Three-Phase Induction Motor of Squirrel Cage Trainer**

The AEL-ACINT is designed for the study of the characteristic electrical and mechanical parameters of the AC Three-Phase Induction Motor of Squirrel Cage in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRE-FE. Electronic Brake.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- N-ACPWS. AC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) AC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL. Network Analyzer Unit.

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With AC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-ACDHT. **AC Dahlander Three-Phase Induction Motor Trainer**

The AEL-ACDHT is designed for the study of the characteristic electrical and mechanical parameters of the AC Dahlander Three-Phase Induction Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRE-FE. Electronic Brake.
- EMT9. Dahlander three-phase motor.
- N-ACPWS. AC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) AC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL. Network Analyzer Unit.

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With AC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-DCSET. **DC Series Excitation Motor Trainer**

The AEL-DCSET is designed for the study of the characteristic electrical and mechanical parameters of the DC Series Excitation Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- N-VVCC/M. DC Motor Speed Controller.
- EMT2. DC Series excitation motor-generator.
- N-DCPWS. DC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) DC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL-DC. DC Network Analyzer Unit.

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With DC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Power, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-DCSHT. **DC Shunt Excitation Motor Trainer**

The AEL-DCSHT is designed for the study of the characteristic electrical and mechanical parameters of the DC Shunt Excitation Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- N-VVCC/M. DC Motor Speed Controller.
- EMT3. DC Shunt excitation motor-generator.
- N-DCPWS. DC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) DC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL-DC. DC Network Analyzer Unit. (2 units)

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With DC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Power, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-DCCOT. **DC Compound Excitation Motor Trainer**

The AEL-DCCOT is designed for the study of the characteristic electrical and mechanical parameters of the DC Compound Excitation Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- N-WCC/M. DC Motor Speed Controller.
- EMT4. DC Compound excitation motor-generator.
- N-DCPWS. DC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) DC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL-DC. DC Network Analyzer Unit.

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With DC Conventional Measurement Instruments:
  1.- Torque/Speed digital measurement.
  2.- Measuring of Voltages, Currents, Power, etc.
  3.- Braking tests.
  4.- Comparison of theoretical parameters with real experiments of the electrical machine.
- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:
  5.- Torque/Speed measurement waveforms.
  6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
  7.- Electrodynamic study of electrical machines.
  8.- Obtained results storage.
  9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-DCSPT. **DC Separately Excited Motor Trainer**

The AEL-DCSPT is designed for the study of the characteristic electrical and mechanical parameters of the DC Separately Excited Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- N-VVCC/M. DC Motor Speed Controller.
- EMT1. DC Independent excitation motor-generator.
- N-DCPWS. DC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) DC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL-DC. DC Network Analyzer Unit. (2 units)

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With DC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Power, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-UMT. **Universal Motor Trainer**

The Universal Motor Trainer "AEL-UMT" is designed for the study of the characteristic electrical and mechanical parameters of the Universal Motor in steady state and transient state.

The AEL-UMT consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- N-VVCC/M. DC Motor Speed Controller.
- EMT12. Universal motor.
- N-ACPWS. AC Motor Power Supply.
- N-CAR34. Single-phase rectifier diodes.
- N-REV. Variable Resistor.

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) Conventional Measurement Instruments:

To measure electrical parameters:

- N-MED21. AC Voltmeter (0-250 V).
- N-MED09. AC Ammeter (0-2.5 A).
- N-MED17. DC Voltmeter (0-200 V).
- N-MED05. DC Ammeter (0-1.5 A).

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With Conventional Measurement Instruments:
  1.- Torque/Speed digital measurement.
  2.- Measuring of Voltages, Currents, Power, etc.
  3.- Braking tests.
  4.- Comparison of theoretical parameters with real experiments of the electrical machine.
- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:
  5.- Torque/Speed measurement waveforms.
  6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
  7.- Electrodynamic study of electrical machines.
  8.- Obtained results storage.
  9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-ACRLT. **AC Three-Phase Reluctance Motor Trainer**

The AEL-ACRLT is designed for the study of the characteristic electrical and mechanical parameters of the AC Three-phase Reluctance Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- EMT21. Three-phase reluctance motor.
- N-ACPWS. AC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) AC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL. Network Analyzer Unit.

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With AC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA.Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-ACSPT. **Asynchronous Single-Phase Motor with Split Phase Trainer**

The AEL-ACSPT is designed for the study of the characteristic electrical and mechanical parameters of the Asynchronous Single-Phase Motor with Split Phase Motor in steady state and transient state. It consists of a test bench to test the operation of electrical machines in depth.

Modules included:

- LOCL. Load Cell.
- FRECP. Eddy Current Brake.
- EMT20. Asynchronous single-phase motor with split phase.
- N-ACPWS. AC Motor Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measurement systems to be chosen:

a) AC Conventional Measurement Instruments:

To measure electrical parameters:

- N-EAL. Network Analyzer Unit.

To measure mechanical parameters:

- N-TM. Torque Measurement Unit.
- N-MPDM. Mechanical Power Digital Measurement Unit.

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

b) EM-SCADA. Control and Data Acquisition System of Electrical Motors:

The student can analyze in depth the operation of the electrical motors:

- Torque/Speed measurement waveforms.
- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.
- Electrodynamic study of electrical machines.
- Obtained results storage.

Some practical possibilities:

- With AC Conventional Measurement Instruments:

1.- Torque/Speed digital measurement.

2.- Measuring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

3.- Braking tests.

4.- Comparison of theoretical parameters with real experiments of the electrical machine.

- With EM-SCADA. Control and Data Acquisition System of Electrical Motors:

5.- Torque/Speed measurement waveforms.

6.- Real Time Measuring and Monitoring of Voltages, Currents, Active Power, Reactive Power, Power Factor, etc.

7.- Electrodynamic study of electrical machines.

8.- Obtained results storage.

9.- Braking tests and monitoring of results in real time.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motor Trainers

AEL-SERIN/CA-1KW. Computer Controlled **Advanced Industrial Servosystems Trainer-1kW (for AC Motors)**

The AEL-SERIN/CA-1 kW trainer consists on an Control Interface module connected to a three-phase motor and to a computer (PC) (computer not included). The control interface has a resolver for three-phase motors that controls the speed, position and current of the motor.

AEL-SERIN/CA-1KW + RACK

The RS232 communication between the control interface and the PC provides the AEL-SERIN/CA-1kW the possibility of commanding the motor from the PC and visualize the most important signals of the motor. Velocity, Position and Torque Control.

It allows predefined moves and programming.

Control Interface module:

3 Digital outputs:

They have a green LED that indicates if the output is active or not. Two of them have some functions defined by defect, but they can be changed by any other function using the software.

Output 1: this output has the "Fault Reset" function enabled for defect. It can be used to indicate a problem with the drive. Output 2: this output has the "Brake" function enabled.

Emulative encoder outputs:

Two pair of outputs (CH A Out, CH B Out and their respective denied outputs) that are TTL signals of incremental position generated by the resolver feedback. These outputs are in quadrature to simulate an optic encoder.

One pair of outputs (CH Z Out and their denied) that TTL works as marker of pulses.

Analog output 4 (relay):this output is a relay, and it belongs together with the output 4 that it can be in the software inside the I/O digital label.

Analog outputs of the DAC monitor: these analog outputs are monitored points of general character. Each DAC monitor can be controlled by software to be a certain value of the internal variables.

6 Digital inputs: digital inputs for those signals that are introduced to enable the different available functions in the software.

6 Buttons: they are good to enable the digital inputs. When the button is pressed, the digital Input will be activated, making what has been defined by the software.

6 Switches: they have the same function as the buttons, but with the only difference that they are switches and, therefore, maintain the position fixed (open or closed).

Switch outfitter of digital inputs: there is a switch that enables the digital inputs. When the green LED is on, the inputs will be enabled.

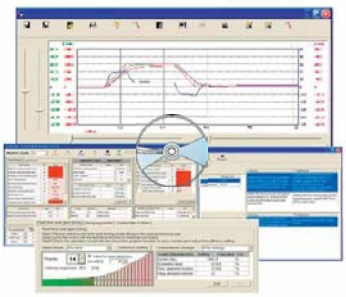
Analog input: this input allows an analog use directly of the user. It is an A/D input.

Voltage supply: 3 sources of continuous in the unit. One of +24 V. DC, another of +12V. DC and other of -12V. DC.

2 Potentiometers: they present three pegs.

Motor:

AC motor, 1 kW, 5 A ac, 4200 rpm, 400V ac., 7.2 Nm., IP65, Sensor RESOLVER :1 Speed, 1X/RX, 3-phase.



AEL-SERIN/CA-1KW/CCSOF

AEL-SERIN/CA-1kW/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process in screen. Compatible with the industry standards.

Registration and visualization of all process variables in an automatic and simultaneous way.

Flexible open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters. Management, processing, comparison and storage of data. Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

The application AEL-SERIN/CA-1kW is mounted on rack:

- N-RACK-B.

See additional elements at the beginning of the catalogue.

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-AI13. **Modular Trainer for Electrotecnics (RLC Circuits, Electrostatics, Motors, Transformers, Lighting)**

The Modular Trainer for Electrotecnics (RLC Circuits, Electrostatics, Motors, Transformers, Lighting) "AEL-AI13" is an application designed to study the static electricity, magnetism, electromagnetism, electromagnetic induction, direct current and alternating current, electric capacity, dynamic electricity, motors, transformers, RL, RC and RCL circuits, rectification and filtrate and electric circuits of application.

The AEL-AI13 includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ALI10. Power Supply Module.
- N-CAR30. Inductances Module.
- N-CAR31. Capacitors Module.
- N-CAR32. Rectifier Diodes Module.
- N-CAR33. Resistive Components Module.
- N-LAM26. Lighting Module.
- N-LAM09. Fluorescent Lamp.
- N-MED65. Digital Multimeter.
- N-REL50. Relays Module.
- TRA28. Three-phase Transformer.
- VAR17. Dismantled Transformer Kit.
- EMT16. Asynchronous single-phase motor with starting and running capacitor.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- EMT12. Universal Motor.
- N-VAR16. Electromagnetism Kit with group of motor/generator.
- VAR18. Electrostatic Kit.

The application AEL-AI13 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Checking the operation of the Industrial Main Power Supply (N-ALI01).
2.- Checking the operation of the Auxiliary Power Supply (N-ALI10).
3.- Electrostatic demonstration on several materials.
4.- The Electroscope.
5.- The Acetate.
6.- Sign of the charge.
7.- Resistance measurement.
8.- Resistors in series association.
9.- Resistors in parallel association.
10.- Coils in series association.
11.- Coils in parallel association.
12.- Star/delta transformation.
13.- Delta/star transformation.
14.- Capacity measurement of a capacitor.
15.- Capacitors series association.
16.- Capacitors parallel association.
17.- Charge of a capacitor.
18.- Discharge of a capacitor.
19.- Time constant.
20.- Single-phase motor.
21.- Universal motor.
22.- Squirrel-cage three-phase motor.
23.- Electric energy into mechanic energy conversion.
24.- Mechanic energy into electric energy conversion.
25.- Electric energy into magnetic energy conversion.
26.- Magnetic induction: Lenz´s Law.
27.- Assembling the transformer.
28.- Back transformer.
29.- Boost transformer.
30.- Auto-transformer.
31.- Connection as single-phase transformer.
32.- Direct delta/delta three-phase connection.
33.- Star/delta three-phase connection.
34.- Three-phase/six-phase connection.
35.- Transformer with coils in series in phase.
36.- Time constant.
37.- Analysis of a RL circuit in series.
38.- Analysis of a RL circuit in parallel.
39.- Analysis of a RC circuit in series.
40.- Analysis of a RC circuit in parallel.
41.- Analysis of a RCL circuit in series.
42.- Low-pass filter.
43.- High-pass filter.
44.- Lamp controlled by a switch and a push button.
45.- Lamp controlled from two points
46.- Lamp controlled from three points.
47.- Lamp controlled by relays.
48.- Acoustic circuit.
49.- Fluorescent tube.

AEL-AI13 + RACKS

Applications:

AEL-3.1
Electrical Machines Trainers

Generators/Motors Trainers

AEL-AI13-C. **Modular Trainer for Electrotecnics (Motors)**

This application has been designed to study different motor types: single-phase induction motor with starting and running capacitor, universal motor, three-phase squirrel cage induction motor.

The AEL-AI13-C includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ALI10. Power Supply Module.
- EMT16. Asynchronous single-phase motor with starting and running capacitor.
- EMT12. Universal Motor.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- N-VAR16. Electromagnetism Kit with group of motor/generator.
- N-MED65. Digital Multimeter.

The application AEL-AI13-C can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Checking the operation of the Industrial Main Power Supply (N-ALI01).
2.- Checking the operation of the Power Supply (N-ALI10).
3.- Electric energy into mechanic energy conversion.
4.- Mechanic energy into electric energy conversion.
5.- Electric energy into magnetic energy conversion.
6.- Magnetic induction: Lenz's Law.
7.- Single-phase motor.
8.- Universal motor.
9.- Squirrel-cage three-phase motor.

AEL-AI13-C + RACK

AEL-C-04S. **Dynamics Loads, with SCADA**

The AEL-C-04S is an application designed to study the dynamic loads response. This application consists of a test bench with a coupled servomotor and three-phase squirrel cage induction motor (dynamic load) that will be studied in depth with a SCADA Control and Data Acquisition Software with which the user will analyze different response waves of the electrical machine.

This application includes a start-delta starter module to analyze the induction motor response during the commutation. Through the SCADA Control and Data Acquisition Software can be seen different torque, current, power waves, etc.

A motor protection module is included in order to protect the electrical machine against overloads.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Study of three phase induction motor as dynamic load.
2.- Study of the response of the induction motor during the starting maneuver.
3.- Study of the response of the induction motor during the star-delta starter maneuver.
4.- Analyze of different waves of the dynamic load with the SCADA Control and Data Acquisition Software.

Applications:

AEL-3.1
Electrical Machines Trainers

Fault Simulator Trainers in Electrical Machines

AEL-ESAM. **Fault Simulation Trainer in Electrical motors**

Teaching application to simulate non-destructive faults in three-phase motors and application of diagnostic and localization techniques.

The AEL-ESAM includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-FMAC. Fault Injection module for three-phase induction motors.
- N-MED65. Digital Multimeter.
- Three-phase induction motor.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Detection of fault on a phase.
2.- Detection of fault on the supply voltage.
3.- Coils with turns in short circuit.
4.- Measurement the resistance of the windings.
5.- Detection of open-ended coil.
6.- Detection of short circuit in coils from different phase.
7.- Measurement the resistance between coils from different phases.
8.- Detection of ground fault.
9.- Measurement of the insulation resistance between the winding and the motor case.
10.- Motor in star connection.
11.- Motor in delta connection.

AEL-ESAE. **Electrical Faults Simulation Trainer**

The Electrical Faults Simulation Trainer "AEL-ESAE" has been designed in order to simulate different faults and locate them.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

With this trainer the following troubles or faults, among others, may be fixed and determined:

- Power off.
- Fuse blown.
- Defective main circuit broker.
- Defective leak current coil relay.
- Capacitor:
  - Starting capacitor open and run capacitor open.
  - Starting capacitor shorted and run capacitor shorted.
- Thermostat contacts stuck open and closed.
- Relay contacts stuck closed.
- Relay windings open.
- Fan:
  - Fan motor windings open and shorted.
  - Fan relay windings open and shorted. Fan relay contacts stuck closed. Fan relay contacts are rusting.
  - Fan thermostat contacts stuck closed. Fan thermostat sensor bulb stuck opened.
- Motor:
  - Starting motor windings open and shorted.
  - Running motor windings open and shorted.
- Low voltage.

Applications:

AEL-3.1
Electrical Machines Trainers

Fault Simulator Trainers in Electrical Machines

AEL-MMRT. **Motor Management Relays Trainer**

The Motor Management Relays Trainer "AEL-MMRT" has been designed to study the behaviour of three-phase induction motors. It allows the student verify, with the optional data acquisition software, all parameters of the induction motors. Furthermore, the students will learn the main operations and programs, through the PLC, in order to carry out different functions.

The AEL-MMRT includes the following modules:

- FRECP. Eddy Current Brake.
- N-VVCC/M. DC Motor Speed Controller.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- FLYW. Flywheel.
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ACPWS. AC Motor Power Supply.
- N-EME-PLCE. Electrical Machines PLC Unit.

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional:

- LOCL. Load Cell
- EM-SCADA. Control and Data Acquisition System of Electrical Motors.

Some practical possibilities:

1.- Configuration and operation of the installation (commissioning software and hardware).

2.- Programming the main functions through PLC software:

   - Direct starter motor, start-delta starting, starting of polarity-switchable motors, etc.

3.- Measurement of power and RMS values.

4.- Loads Experiments.

5.- Investigation of operating response. (with the optional EM-SCADA)

6.- Determination of operating points. (with the optional EM-SCADA)

7.- Measurement of dynamic processes during start-up. (with the optional EM-SCADA)

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-ACINA. **Applications of AC Three-Phase Induction Motors of Squirrel Cage**

The AEL-ACINA is designed for the study of the main operations performed in the industrial field with this type of electrical machines. The student can simulate the operation of these electrical machines faithfully by using commutators, timers and contactors.

The AEL-ACINA includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (4 units)
- N-ARR01. Manual Star-Delta Starter.
- N-REL30. Synchronization Relay. (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- N-TRANS03. Three-phase Autotransformer.
- FLYW. Flywheel.
- N-ARR13. Direct Starter with Inversion.

The application AEL-ACINA 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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation to be chosen:

To measure electrical parameters:

The user can choose either digital or analog instrumentation.

- Digital Instrumentation:
  - N-EAL. Network Analyzer Unit.
  - N-EALD. Network Analyzer Unit with Computer Data Acquisition.
- Analog Instrumentation:
  - N-MED10. AC Ammeter (0-5 A).
  - N-MED22. AC Voltmeter (0-400 Vac).
  - N-MED33. 3-Phase Balanced Wattmeter 440 V.
  - N-MED31. 3-Phase Phasemeter 400V.
  - N-MED39. 3-Phase Balanced Varmeter 440 V.

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

Some practical possibilities:

1.- Checking the Industrial Main Power Supply (N-ALI01).
2.- Checking the AC Auxiliary Main Power Supply (N-ALI03).
3.- Checking the lamps.
4.- Study of the control elements of alternating current motors.
5.- Manual star-delta circuit of three-phase induction motor.
6.- Manual reversing operations of three-phase induction motor.
7.- Automatic star-delta starter of three-phase induction motor.
8.- Automatic star-delta reversing circuit of three-phase induction motor.
9.- Use of the flywheel.

AEL-ACINA + RACKS

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-ACDHA. **Applications of AC Dahlander Three-Phase Induction Motors**

The AEL-ACDHA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.
The student can simulate the operation of these electrical machines faithfully by using commutators, timers and contactors.
The AEL-ACDHA includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ARR12. Direct Starter.
- N-ARR01. Manual Star-Delta Starter.
- N-ARR13. Direct Starter with Inversion.
- N-ARR05. Manual Star-Delta Starter with Inversion.
- N-ARR07. Manual Dahlander Commutator, 2 Speeds.
- N-ARR11. Poles Commutation with Inversion.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (4 units)
- N-REL30. Synchronization Relay. (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- N-TRANS03. Three-phase Autotransformer.
- EMT9. Dahlander three-phase motor.
- FLYW. Flywheel.
- EMT7. Asynchronous three-phase motor of squirrel cage.

The application AEL-ACDHA can be mounted on rack (option A) or on rail (option B):
Option A:
This application needs the following racks:
- N-RACK-A. (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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation to be chosen:
To measure electrical parameters:
The user can choose either digital or analog instrumentation.
- Digital Instrumentation:
  - N-EAL. Network Analyzer Unit.
  - N-EALD. Network Analyzer Unit with Computer Data Acquisition.
- Analog Instrumentation:
  - N-MED10. AC Ammeter (0-5 A).
  - N-MED22. AC Voltmeter (0-400 Vac).
  - N-MED33. 3-Phase Balanced Wattmeter 440 V.
  - N-MED31. 3-Phase Phasemeter 400V.
  - N-MED39. 3-Phase Balanced Varmeter 440 V.

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

Some practical possibilities:

1.- Checking the Industrial Main Power Supply (N-ALI01).
2.- Checking the AC Auxiliary Main Power Supply (N-ALI03).
3.- Checking the lamps.
4.- Study of the control elements of alternating-current motors.
5.- Manual star-delta circuit of three-phase induction motor.
6.- Manual star and reverse operation of Dahlander motor.
7.- Manual star-delta with inversion circuit of three-phase induction motor.
8.- Manual speed variation of a Dahlander motor.
9.- Manual speed variation of a Dahlander motor with inversion.
10.- Automatic star-delta starter of three-phase induction motor.
11.- Automatic star-delta reversing circuit of three-phase induction motor.
12.- Automatic velocity variation of a Dahlander motor.
13.- Use of the flywheel.

AEL-ACDHA + RACKS

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-ACWRA. **Applications of AC Three-Phase Induction Motors of Wound Rotor**

The AEL-ACWRA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using commutators, timers and contactors.

The AEL-ACWRA includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ARR12. Direct Starter.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (4 units)
- N-REL30. Synchronization Relay. (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- EMT8. Asynchronous three-phase motor with wound rotor.
- FLYW. Flywheel.
- N-TRANS03. Three-phase Autotransformer.

The application AEL-ACWRA 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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation to be chosen:

To measure electrical parameters:

The user can choose either digital or analog instrumentation.

- Digital Instrumentation:
  - N-EAL. Network Analyzer Unit.
  - N-EALD. Network Analyzer Unit with Computer Data Acquisition.
- Analog Instrumentation:
  - N-MED10. AC Ammeter (0-5 A).
  - N-MED22. AC Voltmeter (0-400 Vac).
  - N-MED33. 3-Phase Balanced Wattmeter 440 V.
  - N-MED31. 3-Phase Phasemeter 400 V.
  - N-MED39. 3-Phase Balanced Varmeter 440 V.

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

Some practical possibilities:

1.- Manual star-delta circuit of Asynchronous three-phase motor with wound rotor.
2.- Manual reversing operations of Asynchronous three-phase motor with wound rotor.
3.- Timer Sequential Control operations of Asynchronous three-phase motor with wound rotor.
4.- Automatic star/delta starter of Asynchronous three-phase motor with wound rotor.
5.- Automatic star-delta reversing circuit of Asynchronous three-phase motor with wound rotor.
6.- Countercurrent braking.
7.- Automatic soft starter of Asynchronous three-phase motor with wound rotor.

AEL-ACWRA + RACKS

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-ACLA. **Applications of AC Linear Motor Operations**

The Linear Motor has been designed to study the basic principles of magnetism as applied to a linear motor operation.

Its simple construction allows students to apply their theoretical knowledge to practical applications and helps them to learn.

The AEL-ACLA includes the following modules:

- N-VVCA/M. AC Motor Speed Controller.
- EMT23. Linear Motor.
- N-REVT. Three-phase Variable Resistor.
- N-DMM. Dynamometer.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Basic practical exercise to study the electromagnetic principles applied to linear induction machines.
2.- Speed control of an induction linear motor.
3.- Operation inversion of an induction linear motor.
4.- Study of an induction linear motor force with a dynamometer.

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCSEA. **Applications of DC Series Excitation Motors**

The AEL-DCSEA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using commutators and speed controllers.

The AEL-DCSEA includes the following modules:

- N-ALI02. Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- FLYW. Flywheel.
- N-VVCC/M. DC Motor Speed Controller.
- N-REV. Variable Resistor.
- EMT2. DC Series excitation motor-generator.

Some practical possibilities:

1.- DC motor speed control.

2.- DC machine turning direction control.

3.- DC machine speed reading.

4.- Excitation current control.

AEL-DCSEA + RACK

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

- N-MED17. DC Voltmeter (0-200 V).
- N-MED16. DC Voltmeter (0-50 V).
- N-MED05. DC Ammeter (0-1.5 A).

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

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCSHA. **Applications of DC Shunt Excitation Motors**

The AEL-DCSHA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using commutators and speed controllers.

The AEL-DCSHA includes the following modules:

- N-ALI02. Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-Pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- FLYW. Flywheel.
- N-VVCC/M. DC Motor Speed Controller.
- N-REV. Variable Resistor.
- EMT3. DC Shunt excitation motor-generator.

Some practical possibilities:

1.- DC motor speed control.

2.- DC machine turning direction control.

3.- DC machine speed reading.

4.- Excitation current control.

AEL-DCSHA + RACK

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

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

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

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCCOA. **Applications of DC Compound Excitation Motors**

The AEL-DCCOA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using commutators and speed controllers.

The AEL-DCCOA includes the following modules:

- N-ALI02. Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- FLYW. Flywheel.
- N-VVCC/M. DC Motor Speed Controller.
- N-REV. Variable Resistor. (2 units)
- EMT4. DC Compound excitation motor-generator.

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation to be chosen:

The user can choose either digital or analog instrumentation.

- Digital Instrumentation:
  - N-EAL-DC. DC Network Analyzer Unit.
- Analog Instrumentation:
  - N-MED17. DC Voltmeter (0-200 V).
  - N-MED05. DC Ammeter (0-1.5 A).

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

Some practical possibilities:

1.- DC motor speed control.

2.- DC machine turning direction control.

3.- DC machine speed reading.

4.- Armature current control.

5.- Field current control.

AEL-DCCOA + RACK

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCSPA. **Applications of DC Separetely Excited Motors**

The AEL-DCSPA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using commutators and speed controllers.

The AEL-DCSPA includes the following modules:

- N-ALI02. Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- FLYW. Flywheel.
- N-VVCC/M. DC Motor Speed Controller. (2 units)
- N-REV. Variable Resistor.
- EMT1. DC Independent excitation motor-generator.

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

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

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

Some practical possibilities:

1.- DC motor speed control.

2.- DC machine turning direction control.

3.- DC machine speed reading.

4.- Armature current control.

5.- Field current control.

AEL-DCSPA + RACK

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCGEA. **Applications of DC Generators**

The AEL-DCGEA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using loads and voltage controllers.

The AEL-DCGEA includes the following modules:

- N-ALI02. Main Power Supply.
- N-WCC/M. DC Motor Speed Controller. (2 units)
- N-REV. Variable Resistor.
- N-REF. Resistor Load with commutator.
- EMT1. DC Independent excitation motor-generator.
- N-WCA/M. AC Motor Speed Controller.
- EMT7. Asynchronous three-phase motor of squirrel cage.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

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

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

Some practical possibilities:

1.- Control of generated voltage.

2.- Control of the excitation of the DC generator.

3.- Driving motor speed variation.

4.- Loading of the DC generator.

AEL-DCGEA + RACK

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-UMA. **Applications of Universal Motors**

The AEL-UMA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student can simulate the operation of these electrical machines faithfully by using commutators, timers and contactors.

The AEL-UMA includes the following modules:

- N-ALI02. Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- FLYW. Flywheel.
- N-VVCC/M. DC Motor Speed Controller.
- N-REV. Variable Resistor. (2 units)
- EMT12. Universal Motor.

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

Option A:

This application needs the following rack:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

- N-MED21. AC Voltmeter (0-250 V).
- N-MED09. AC Ammeter (0-2.5 A).
- N-MED17. DC Voltmeter (0-200 V).
- N-MED05. DC Ammeter (0-1.5 A).

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

Some practical possibilities:

1.- Universal motor speed control.

2.- Universal motor turning direction control.

3.- Universal motor speed reading.

4.- Universal motor current control.

5.- Universal motor operation in AC and DC mode.

AEL-UMA + RACK

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-STMA. **Applications of Stepper Motors**

The Applications of Stepper Motors "AEL-STMA" is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student will learn the operations performed to control the sequence of actions of this type of machines by using the stepper motor controller.

The AEL-STMA includes the following modules:

- EMT19. Stepper motor.
- N-VVPP/B. Stepper Motor Controller (manual control).
- N-ALI02. Main Power Supply.
- N-ALI03. AC Auxiliary Power Supply.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional and recommended:

- N-VVPP. Stepper Motor Controller (manual control and automatic control).

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

Some practical possibilities:

1.- Manual control of the step sequence of the stepper motor (with the N-VVPP/B).
2.- Manual control of the stepper motor shaft position (with the N-VVPP/B).
3.- Automatic control of the turning speed of the stepper motor (with the optional N-VVPP).
4.- PLC programming of the switching sequence of the stepper motor (with the optional N-VVPP).
5.- PLC programming of the switching speed of the stepper motor (with the optional N-VVPP).
6.- PLC automation of the stepper motor motion (with the optional N-VVPP).

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCPMA. **Applications of DC Permanent Magnet Motors**

The AEL-DCPMA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student will simulate the operation of this type of electrical machines faithfully by using commutators, timers and contactors.

The AEL-DCPMA includes the following modules:

- N-ALI02. Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- N-VVCC/M. DC Motor Speed Controller.
- EMT15. DC Permanent magnet motor.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

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

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

Some practical possibilities:

1.- Speed control of the DC permanent magnet motor.
2.- Turning direction control of the DC permanent magnet motor.
3.- Speed reading of the DC permanent magnet motor.
4.- Current control of the DC permanent magnet motor.
5.- Turning inversion of the DC permanent magnet motor.
6.- Starting of the DC permanent magnet motor.

AEL-DCPMA + RACK

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-DCBRA. **Applications of DC Brushless Motors**

The Applications of DC Brushless Motors "AEL-DCBRA" is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student will simulate the operation of these electrical machines faithfully by using the own control system of this type of motors.

The AEL-DCBRA includes the following modules:

- EMT18. DC Brushless motor.
- N-ALI02. Main Power Supply.
- N-ALI03. AC Auxiliary Power Supply.
- N-MED65. Multimeter.

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

Option A:

This application needs the following rack:

- 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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Starting of the DC brushless motor.

2.- Turning speed of the DC brushless motor.

3.- Speed control of the DC brushless motor.

AEL-DCBRA + RACK

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-ACRLA. **Applications of AC Three-Phase Reluctance Motors**

The AEL-ACRLA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student will simulate the operation of this type of electrical machines faithfully, through manual or automatic operations, by using manual commutators, timers and contactors.

The AEL-ACRLA includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ARR12. Direct Starter.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-ARR11. Poles Commutation with Inversion.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (3 units)
- N-ALI03. AC Auxiliary Power Supply.
- N-REL30. Synchronization Relay. (2 units)
- EMT21. Three-phase reluctance motor.
- N-TRANS03. Three-phase Autotransformer.
- FLYW. Flywheel.

The application AEL-ACRLA 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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

- N-EAL. Network Analyzer Unit.

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

Some practical possibilities:

1.- Manual starter of AC Three-Phase Reluctance Motor.

2.- Manual reversing operations of AC Three-Phase Reluctance Motor.

3.- Automatic starter of AC Three-Phase Reluctance Motor.

4.- Automatic reversing operations of AC Three-Phase Reluctance Motor.

5.- Timer Sequential Control operations of AC Three-Phase Reluctance Motor.

6.- Countercurrent braking.

AEL-ACRLA + RACKS

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-ACSPA. **Applications of Asynchronous Single-Phase Motors with Split Phase**

The AEL-ACSPA is designed for the study of the main operations performed in the industrial field with this type of electrical machines.

The student will simulate the operation of this type of electrical machines faithfully by using commutators, timers and contactors.

The AEL-ACSPA includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-PUL48. 3 Double Chamber Push-Buttons.
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (2 units)
- N-REL30. Synchronization Relay. (2 units)
- N-ALI03. AC Auxiliary Power Supply.
- EMT20. Asynchronous single-phase motor with split phase.
- FLYW. Flywheel.

Some practical possibilities:

1.- Manual starter of asynchronous single-phase motor with split phase.

2.- Automatic starter of asynchronous single-phase motor with split phase.

3.- Timer Sequential Control operations of asynchronous single-phase motor with split phase.

4.- Starter of asynchronous single-phase motor with split phase with Flywheel.

AEL-ACSPA + RACK

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

Option A:

This application needs the following racks:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Optional measuring instrumentation:

- N-EAL. Network Analyzer Unit.

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

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-AI12. **Modular Application (AC Motors)**

This application has been designed to demonstrate how work different electrical machines such as: three-phase induction motor of squirrel cage, single-phase induction motor with starting and running capacitor and dahlander motor.

The AEL-AI12 includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ALI03. AC Auxiliary Power Supply.
- N-PUL48. 3 Double Chamber Push-buttons. (2 units)
- N-LAM02. Auxiliary Lamps (3 lamps, 24 Vac).
- N-CON01. 3-pole Contactor (24 Vac). (4 units)
- N-VAR09. Frequency Variator.
- N-REL30. Synchronization Relay.
- N-REL47. Thermal Relay. (2 units)
- N-REL45. Module with disjunctor.
- N-IAM31. 4-pole Magneto-thermal Automatic Switch, 4 A, Curve C.
- N-FUS10. Module with 3 fuse-holders and power fuses.
- TRA06. 3-Phase Power Transformer.
- N-CAR10. Capacitive Load.
- EMT7. Asynchronous three-phase motor of squirrel cage.
- EMT9. Dahlander three-phase motor.
- EMT16. Asynchronous single-phase motor with starting and running capacitor.

The application AEL-AI12 can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks:

- N-RACK-A. (2units)

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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Identification of the element of the Main Power Supply (N-ALI01).
2.- Study of the elements in the control of AC motors.
3.- Study of the protection elements for AC motors.
4.- Direct starting of a three-phase motor through contactor, with some stop and start push-buttons.
5.- Configuration of a magnetic protection system, with stop mush room button.
6.- Direct starting of a three-phase motor with thermal relay with control coil.
7.- Direct starting of a three-phase motor through impulses contactor.
8.- Direct starting of a three-phase motor with thermal relay and with push-buttons and signalling.
9.- Turning inverted starter of a three-phase motor stopping before turning in the opposite direction.
10.- Turning inverted starter of a three-phase motor without stopping before turning in the opposite direction.
11.- Turning inverted starter of a three-phase motor with microswitch and push-buttons box.
12.- Star-delta starting with an turn inverter of a three-phase motor.
13.- Automatic star-delta starting of a three-phase motor.
14.- Turning inverted starter of a three-phase motor with micro switch, with start push-buttons, stop and function cycle. (Direct).
15.- Manual star-delta starting of a three-phase motor.
16.- Control of a single phase motor direct and, with time-delay connection and disconnection.
17.- Starting of a three-phase motor with single-phase voltage.
18.- Motor speed control with a frequency variator.
19.- Parameters of the motor.
20.- Starting and control of a two-speed Dahlander motor.

AEL-AI12 + RACKS

Applications:

AEL-3.2
Electrical Machines Applications

Generators/Motors Applications

AEL-IMSU. **General Applications of AC Induction Motors**

The AEL-IMSU is an application designed to study how three-phase squirrel cage induction motors are controlled in industrial installations.

The squirrel cage induction motors are the rote machines most used in the industry. For this reason, on this application are studied in depth different operations carried out with these electrical machines: manual star-delta starter, direct starter with inversion, study of advanced controls in electrical machines with variable frequency controller, etc.

This application includes an Eddy Current Brake to study the induction motor response against different load conditions. Eddy Current brake includes a DC Variable Power Supply with which the user can control the braking torque. When the braking torque is increased, the power consumption of the induction motor is increased too, the power factor changes, etc. In order to see the power consumption of the induction motor, is included a Network Analyzer that shows the main electrical parameters that are relevant in industrial installations: Voltages, Currents, Frequencies, Power Factor, Active Power, Reactive Power, Apparent Power, etc.

The AEL-IMSU includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-VVCA. Advanced AC Motor Speed Controller.
- N-ARR01. Manual Star-Delta Starter.
- N-ARR13. Direct Starter with Inversion.
- N-VVCC/M DC Motor Speed Controller.
- N-ARR12. Direct Starter.
- N-TRANS03. Three-phase Autotransformer.
- FRECP. Eddy Current Brake.
- N-EALD. Network Analyzer Unit with Computer Data Acquisition.
- EMT-7. Asynchronous three-phase motor of squirrel cage.

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

Option A:

This application needs the following racks:

- N-RACK-A.

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.

See additional elements at the beginning of the catalogue.

Some practical possibilities:

1.- Checking the modules.
2.- Advanced programming of a Variable Frequency Controller.
3.- Manual control speed of the induction motor with the frequency controller.
4.- Forward and Reverse operations with the induction motor and the frequency controller.
5.- Programming of the acceleration time of the induction motor with the frequency controller.
6.- Programming of the deceleration time of the induction motor with the frequency controller.
7.- Programming different conditions with digital inputs in the frequency controller to simulate different real situations in the industry.
8.- Programming the speed response of the induction motor with the frequency controller.
9.- Study of load consumption of the induction motor changing the braking torque.
10.- Study of different alarms that can be programmed in the frequency controller.
11.- Manual star-delta starter operation.
12.- Direct starter with inversion operation.

AEL-IMSU + RACK

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).
- AEL-AE4. Test Unit for Differential Automatic Switches.

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.
- AEL-MED. Industrial Measurement Technology.

Fault Simulators

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

Relays Trainer

- AEL-PRTS. Protective Relaying Training System.
- AEL-AE5. Relay Control Station.

Loads

- AEL-AI13-A. Modular Trainer for Electrotecnics (RLC Circuits).

AEL-1.3. **Professional Wiring Practices in Installations**

Applications

Cubicle Wiring Installations

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

Electrical Control Panel Wiring

- AEL-AEPI. Electrical Control Panel Wiring Installation.

See catalogue of: **AEL-1. Electrical Installations Lab**

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.

EIB Systems

- AEL-EIB1. EIB Lighting Control System.
- AEL-EIB2. EIB Shutter Control System.
- AEL-EIB3. EIB Heating Control System.
- AEL-EIB4. EIB Safety Control System.
- AEL-EIB5. EIB PLC, Touch Panel and Timer System.
- AEL-EIB6. EIB Scenery Control System.
- AEL-EIB-T. EIB Complete Control System.

AEL-2.2. **Wireless Systems**

Applications

General Wireless 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**

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-DTT. Distribution Transformer Trainer.
- AEL-AI13-D. Modular Trainer for Electrotecnics (Transformers).

Generators/Motors Trainers
- AEL-EEA. Alternator Study Unit.
- AEL-EGMG24. Motor-Generator Group.
- AEL-EEEM. Energy Efficiency in Electrical Motors.
- AEL-EMSS. Electrical Machines Soft Starter
- AEL-EMCF. Electrical Machines Control through Frequency Controller.
- AEL-EMRP. Electrical Machines Relays Protection Trainer.
- AEL-ACINT. AC Three-Phase Induction Motor of Squirrel Cage Trainer.
- AEL-ACDHT. AC Dahlander Three-Phase Induction Motor Trainer.
- AEL-DCSET. DC Series Excitation Motor Trainer.
- AEL-DCSHT. DC Shunt Excitation Motor Trainer.
- AEL-DCCOT. DC Compound Excitation Motor Trainer.
- AEL-DCSPT. DC Separately Excited Motor Trainer.
- AEL-UMT. Universal Motor Trainer.
- AEL-ACRLT. AC Three-Phase Reluctance Motor Trainer.
- AEL-ACSPT. Asynchronous Single-Phase Motor with Split Phase Trainer.
- AEL-SERIN/CA-1kW. Computer Controlled Advanced Industrial Servosystems Trainer - 1 kW (for AC Motors).
- AEL-AI13. Modular Trainer for Electrotecnics (RLC Circuits, Electrostatics, Motors, Transformers, Lighting).
- AEL-AI13-C. Modular Trainer for Electrotecnics (Motors).
- AEL-C-04S. Dynamics Loads, with SCADA.

Fault Simulator Trainers in Electrical Machines
- AEL-ESAM. Fault Simulation Trainer in Electrical motors.
- AEL-ESAE. Electrical Faults Simulation Trainer.
- AEL-MMRT. Motor Management Relays Trainer.

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.

These applications are in this catalogue:
AEL-3. Electrical Machines Lab

AEL-4. ELECTROMECHANICAL CONSTRUCTIONS LAB

AEL-4.1. Transformers Construction

Applications

Single-Phase Transformers Construction
- AEL-SPTC. Single-Phase Transformer Construction Kit.

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

Professional Practices in wiring Transformers
- AEL-PSPTC. Single-Phase Transformer wiring.
- AEL-PTPTC. Three-Phase Transformer wiring.

See catalogue of: **AEL-4. Electromechanical Constructions Lab**

AEL-4.2. Electrical Motors Construction

Applications

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

Transparent and Functional Electrical Motors
- 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.

Removable Electrical Motors
- AEL-DIM-KIT. 4 Disassembly Induction Motors Kit.
- AEL-TPIC. Three-Phase Induction Motor Construction.
- AEL-SPIC. Single-Phase Induction Motor Construction with starting and running capacitor.
- AEL-DCMC. DC Motor Construction.

Dissectable and Configurable Electrical Motors System
- AEL-EMT-KIT. Dissectable and Configurable Advanced Electrical Motor.

Professional practices in wiring Electrical Motors
- AEL-PSPIM. Single-Phase Induction Motor wiring.
- AEL-PTSIM. Three-Phase Induction Motor wiring.

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.

AEL-5.2. Distribution and Transmission Trainers

Applications

Introduction to Transmission and Distribution Power Systems
- AEL-TI-01. Study of the Regulation of the Distribution Transformer (with TAP).
- AEL-TI-02. Analysis of Three-phase Power Lines.

Basic Distribution and Transmission Trainers
- AEL-AE1A. Aerial Line Model.
- AEL-TDTR. Distribution Transformer with Voltage Regulator.
- AEL-PSCL. Parallel and Series Transmission Lines.

Advanced Distribution and Transmission Trainers
- AEL-TSSG. Transmission Systems with Synchronous Generator.
- AEL-HVDC. High Voltage DC Transmission Lines.

AEL-5.3. Loads Trainers

Applications

Basic Load Controller Trainers
- AEL-MRPC. Manual Reactive Power Compensation.
- AEL-APFC. Single-phase Automatic Power Factor Compensation.
- AEL-EECFP. Advanced Power Factor Controller.
- AEL-DLT. Dynamic Loads Trainer
- AEL-AI8. Reactive Power Compensation (Power Factor Correction).
- AEL-AE6. Energy Counters Control 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. Relays Protection Trainers

Applications

Fundamental Concepts
- AEL-CTFP. Current Transformer Fundaments for Protections Devices.
- AEL-VTFP. Voltage Transformer Fundaments for Protections Devices.

Relays Protection Trainers
- AEL-ERP. Protection Relays Test Trainer.

Protection Systems in Electrical Loads
- AEL-CPT-01. Electrical Machines Protection.
- AEL-CPT-02. Motor Management Relay.

Protection Systems for Generators
- AEL-GPRE. Generator Protection Relay Trainer.

Applications

Protection Systems for Transmission and Distribution Lines
- AEL-TPT-01. Overcurrent Time Protection Relay for Lines.
- AEL-TPT-02. Overvoltage and Undervoltage Protection Relay.
- AEL-TPT-03. Directional Power Protection Relay.
- AEL-TPT-04. Earth-Fault Voltage Protection Relay.
- AEL-TPT-05. Protection Relay of Parallel-Connected Lines.
- AEL-TPT-06. High Speed Distance Protection Relay.

AEL-5.5. Compact Smart Grid Power Systems Applications

Applications
- AEL-CPSS-01S. Compact Smart Grid Power Systems Application, with Automatic Control Generation, Transmission Line and Loads, with SCADA.
- AEL-CPSS-02S. Compact Smart Micro-Grids Power Systems Application, with Automatic Control Generation and Loads, with SCADA.
- AEL-CPSS-03S. Compact Smart Grid Power Systems Application with Two Parallel Generators, Two Distribution Lines and Loads, with SCADA.

AEL-5.6. Modular Smart Grid Power Systems Applications

Generation Systems

Applications

Automatic Control Generation Systems options

Synchronization Studies
- AEL-GCA-P-02S. Generation System with Automatic Control of Synchronous Generator, Synchronization and Protection Relays, with SCADA. (✱)
- AEL-GCA-02S. Generation System with Automatic Control of Synchronous Generator and Synchronization, with SCADA. (✱)
- AEL-GCA-P-03S. Automatic Synchronization System of Synchronous Generator with Servomotor and Protection Relays, with SCADA. (✱)
- AEL-GCA-03S. Automatic Synchronization System of Synchronous Generator with Servomotor, with SCADA. (✱)

Isolated Grid Studies
- AEL-GCA-P-01S. Generation System with Automatic Control of Synchronous Generator in an Isolated Grid and Protection Relays, with SCADA. (✱)
- AEL-GCA-01S. Generation System with Automatic Control of Synchronous Generator in an Isolated Grid, with SCADA. (✱)

Manual Control Generation Systems options

Synchronization Studies
- AEL-GCM-P-02S. Generation System with Manual Control of Synchronous Generator, Synchronization and Protection Relays, with SCADA. (✱)
- AEL-GCM-02S. Generation System with Manual Control of Synchronous Generator and Synchronization, with SCADA. (✱)
- AEL-GCM-P-03S. Manual Synchronization System of Synchronous Generator with Servomotor and Protection Relays, with SCADA. (✱)
- AEL-GCM-03S. Manual Synchronization System of Synchronous Generator with Servomotor, with SCADA. (✱)

Isolated Grid Studies
- AEL-GCM-P-01S. Generation System with Manual Control of Synchronous Generator in an Isolated Grid and Protection Relays, with SCADA. (✱)
- AEL-GCM-01S. Generation System with Manual Control of Synchronous Generator in an Isolated Grid, with SCADA. (✱)

Additional Generation Systems options
- AEL-GAD-01S. Pumping Power Plant, with SCADA. (✱)
- AEL-GAD-02S. Auto-Start Diesel Generator Trainer for Recovery of the Energy System due to Black-Outs, with SCADA. (✱)
- AEL-GAD-03S. Automatic Generation System with Two Parallel Generators, with SCADA. (✱)
- AEL-GAD-04S. Hydroelectric Power Plant, with SCADA. (✱)

(✱) Available application without SCADA, application reference without the last "S".

Each application can work individually or combined with other applications to form systems simulators (Generation + Transmission/Distribution + Loads).

Transmission/Distribution Systems

Applications

Transmission and Distribution Power Systems options

One Line and Regulation Transformer Studies
- AEL-T-P-01S. Transmission and Distribution Power Systems with Regulation Transformer and Protection Relays, with SCADA. (✱)
- AEL-T-01S. Transmission and Distribution Power Systems with Regulation Transformer, with SCADA. (✱)

Two Aerial Lines Studies
- AEL-T-P-02S. Transmission and Distribution Power Systems with Two Aerial Parallel Lines and Protection Relays, with SCADA. (✱)
- AEL-T-02S. Transmission and Distribution Power Systems with Two Aerial Parallel Lines, with SCADA. (✱)

Additional Studies Possibilities
- AEL-T-P-04S. Electrical Distribution Grids Trainer with Protections Relays, with SCADA. (✱)
- AEL-T-04S. Electrical Distribution Grids Trainer, with SCADA. (✱)
- AEL-T-03S. Power Flow Control in Meshed Networks, with SCADA. (✱)

(✱) Available application without SCADA, application reference without the last "S".

Each application can work individually or combined with other applications to form systems simulators (Generation + Transmission/Distribution + Loads).

Loads Systems

Applications

Conventional Loads options
- AEL-C-P-02S. Loads Systems with Automatic Power Factor Compensation and Protection Relays, with SCADA. (✱)
- AEL-C-02S. Loads Systems with Automatic Power Factor Compensation, with SCADA. (✱)
- AEL-C-P-01S. Loads Systems with Manual Power Factor Compensation and Protection Relays, with SCADA. (✱)
- AEL-C-01S. Loads Systems with Manual Power Factor Compensation, with SCADA. (✱)

Special Loads options
- AEL-C-03S. Complex Load, Power Consumption Measurement and Peak Load Monitoring, with SCADA. (✱)

(✱) Available application without SCADA, application reference without the last "S".

Each application can work individually or combined with other applications to form systems simulators (Generation + Transmission/Distribution + Loads).

See catalogue of: **AEL-5. Power Systems and Smart Grid Technology Lab**

AEL-5.7. Modular Smart Grid Power Systems Simulators

- 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.

Alarms:

N-ALA01	Intrusion Alarm Station (8 circuits).
N-ALA02	Fire Alarm Station with battery.
N-ALA03	Coded Electronic key.
N-ALA04	Intrusion Alarm Station by radio with programming (PC).

Audio:

N-AUD01	Analog Sound Regulator.
N-AUD02	Digital Sound Regulator.
N-AUD03	Warnings Emitter Module.
N-AUD04	Speaker of 2",2W,8 ohm.
N-AUD05	Speaker of 4",7W,8 ohm.
N-AUD06	Basic Audio Central.
N-AUD07	Advanced Audio Central.
N-AUD08	Background Music Regulator 3W.
N-AUD09	Background Music Regulator 5W.
N-AUD10	Double Background Music Regulator.
N-AUD11	Plug for Mono Speaker.
N-AUD12	Plug for Stereo Speakers.
N-AUD13	Digital Controls, Walkman Input and Earphones Output.
N-AUD14	FM Digital Turner Controls +Earphones Output.
N-AUD15	Digital Controls for Transmission and Reception of Warnings, Earphones Output and Walkman Input.
N-AUD16	2 Channel Digital Controls with Inter-communicator and Display.
N-AUD17	FM Digital Tuner Controls.
N-AUD18	Warning Selector, 9 zones.
N-AUD19	Amplifier (30 W).
N-AUD20	Analog Sound Regulator (mono-stereo).

Bells:

N-TIM01	Bell 70 dB.
N-TIM02	Buzzer 80 dB, 230 V.
N-TIM03	2 Bells.
N-TIM04	2 Buzzers.
N-TIM05	Bell + Buzzer.
N-TIM06	2 Buzzers 125/230 V.
N-TIM07	2 Buzzers with Tone Regulator.
N-TIM08	2 Piezoelectric Buzzers.
N-TIM09	2 Tones domestic Bell (230 Vac).
N-TIM10	2 Buzzers 24 Vac.
N-TIM11	Bell 24 Vac.
N-TIM12	Bell 230 Vac.

Brakes:

FRE-FE	Electronic Brake.
DI-FRE	Pendular Dynamo Brake.
FREND	Dynamo Brake.
FRENP	Magnetic Powder Brake.
FRECP	Eddy Current Brake.
FYWL	Flywheel.

Busbars:

N-BUS01	Generation Busbar.
N-BUS02	Coupling Busbar.
N-BUS03	Grid Busbar.
N-BUS04	Emitter Transport Bursbar.
N-BUS05	Receptor Transport Busbar.
N-BUS06	Distribution Busbar.
N-BUS07	Power Circuit Breaker.

Commutators:

N-COM01	2 Positions Commutator, 1 inverter.
N-COM02	2 Positions Commutator, 2 inverters.
N-COM03	2 Positions Commutator, 1 NO + 1 NC.
N-COM04	3 Positions Commutator, 1 inverter.
N-COM05	3 Positions Commutator, 2 inverters.
N-COM06	2 Positions Rotary Commutator with return to 0 (Power).
N-COM07	2 Positions Rotary Commutator with return to 0 (Control).
N-COM08	2 Positions Rotary Commutator with Key.
N-COM09	4 Positions Rotary Commutator +Stop.
N-COM10	Rotary Commutator for Voltmeter.
N-COM11	Rotary Commutator for Ammeter.
N-COM12	Commutator/ Switch.
N-COM13	Double Commutator.
N-COM14	2 Commutators.
N-COM15	2 Commutators, 16 A.
N-COM16	2 Commutators with Light.
N-COM17	2 Inverters.
N-COM18	2 Inverters with Light.
N-COM19	Commutator + Inverter.
N-COM20	Commutator +Group of 2 Switches.
N-COM21	Inverter +Group of 2 Commutators.
N-COM22	Commutator with Light +Inverter with Light.
N-COM23	Commutator Group +Bell Push-Button +Switch.
N-COM24	Commutator +Push-Button with Symbol to be chosen by the Customer.
N-COM25	Removable Key Commutator, 2 Positions, 5A.
N-COM26	Key Commutator, 2 Positions, with Interlock, 5A.
N-COM27	Commutator with Label-Holder with Light.
N-COM28	Group of 2 Commutators.
N-COM29	Push-Button Group +Commutator.
N-COM30	Commutator with Puller.
N-COM31	4 Positions Rotary Commutator.
N-COM32	3 Positions Rotary Commutator.
N-COM33	Commutator with zero point.
N-COM34	Commutator 20 A.
N-COM35	Lighting Commutator.
N-COM36	Lighting Commutator with zero point.
N-COM37	Commutator with Luminous Screen (bell, bulb, wc, alarm...).

Contactors:

N-CON01	3-pole Contactor (24 Vac).
N-CON02	3-pole Contactor (220 Vac).
N-CON03	3-pole Contactor (12 Vdc).
N-CON04	3-pole Contactor, work retarded (24 Vac).
N-CON05	3-pole Contactor, work retarded (220 Vac).
N-CON06	3-pole Contactor, work retarded (12 Vdc).
N-CON07	3-poles Contactor, rest retarded (24 Vac).
N-CON08	3-poles Contactor, rest retarded (220 Vac).
N-CON09	3-poles Contactor, rest retarded (12 Vdc).
N-CON10	3-pole Contactor-Inverter (24 Vac).
N-CON11	3-pole Contactor-Inverter (220 Vac).
N-CON12	3-pole Contactor-Inverter (12 Vdc).
N-CON13	4-pole Contactor (24 Vac).
N-CON14	4-pole Contactor (220 Vac).
N-CON15	4-pole Contactor(12 Vdc).

Control:

N-CTR01	Basic Control Module.
N-CTR02	Advanced Control Module.
N-CTR03	Burglar Control Module.
N-CTR04	Power Module 15 W.
N-CTR05	Power Module 72 W.
N-CTR06	Modem Module.
N-PFD	Power Flow Distribution Module.
N-MSM	Manual Synchronization Module.
N-ASYB	Basic Synchronization Module.
N-AVR/P	Automatic Voltage Regulator.
N-ASY3PH	Three-phase Automatic Synchronoscope.
N-BTBINV	Back to Back Inverter.

Detectors:

N-DET01	Flooding Detector.
N-DET02	Gas Detector.
N-DET03	Fitted Power Supply.
N-DET04	Fitted Flooding Detector.
N-DET05	Gas Detector for domestic control.
N-DET06	Smoke Detector.
N-DET07	Ionization Smoke Detector.
N-DET08	Optic Smoke Detector.
N-DET09	Intrusion Detector for domestic control.
N-DET10	Water Electro-valve.
N-DET11	Probe for Water Electro-valve.
N-DET12	Gas Electro-valve.
N-DET13	Wireless Intrusion Detector RF.
N-DET14	Wireless Panic Push-button RF.
N-DET15	Wireless 1-channel Receptor RF.
N-DET16	Battery Module for domestic control.
N-DET17	Temperature Probe.
N-DET18	Passive Infrared Detector PIR.
N-DET19	Twilight Detector.
N-DET20	Light Detector.
N-DET21	Fire Detector through Ionization.
N-DET22	Fire Thermal Detector.
N-DET23	Gas Electronic Detector.
N-DET24	CO Detector with relay output (230 V, 50 Hz).
N-DET25	Microwaves Detector/Switch.
N-DET26	Open Door Magnetic Detector.
N-DET27	Glass Break Detector.
N-DET28	Inertia Detector.
N-DET29	Passive Infrared Presence Detector.
N-DET30	Microwave Presence Detector.
N-DET31	Thermo-velocimetric Detector.
N-DET32	Magnetic Proximity Detector.
N-DET33	Optic Proximity Detector.
N-DET34	CO Detector.
N-DET35	Passive Infrared Alarm-Detector.

EIB Technology modules:

N-LREG	Lighting regulator.
N-BOUT	Binary output.
N-UDIM	Universal dimmer.
N-PUSHM	Pushbuttons module.
N-ACTS	Actuator for the shutters.
N-MOTS	Motor for the shutters.
N-TREG	Temperature regulator.
N-AVAL	Actuator for the valve.
N-COMM	Communication module.
N-MOVS	Motion Sensor.
N-SMDE	Smoke detector.
N-PLAM	Plugs with lamps.
N-CSW	Clock switch.
N-TCH	Touch panel.
N-SEC	Scenery/event controller.

Continue...

Faults Simulation:

N-SAV01	Simulation of 2 Earth Electrodes with Variable Resistance.
N-SAV02	Simulation Equipment of 3 different strange masses.
N-SAV03	Equipotential Collector with 2 strange masses.
N-SAV04	3-Phase + neutral System and AC/DC load, with earth fault simulation.
N-FAULT	Fault Injection module.
N-FMAC	Fault Injection module for three-phase induction motors.

Fuses:

N-FUS01	Fuses 20 A (include 2-5-10-20 A).
N-FUS02	Fuses 32 A (include 8-16-20-32 A).
N-FUS03	3 Fuse-holders16 A, 380 Vac (include 2,4,6,10,16A).
N-FUS04	3 Fuse-holders 10 A,230 Vac (include 2,4,6,10 A).
N-FUS05	5 Sectionalizing Fuse-holders (until 25 A, include fuses 6 A).
N-FUS06	Rail Mount Fuse-holder + Panel Mount Fuse-holder.
N-FUS07	3 Panel Mount Fuse-holders.
N-FUS10	Module with 3 fuse-holders and power fuses.
N-FUS11	4 Panel Mount Fuses.

Indicators:

N-IND01	Nurse Panel.
N-IND02	Patient Room Panel.
N-IND03	Luminous Calling Panel.

Intercom-Interphone System:

N-POR01	Phones Power Supply.
N-POR02	Phone.
N-POR03	Interphone.
N-POR04	Video Camera.
N-POR05	Phone / Monitor.
N-POR06	Lock.
N-POR07	Digital Station.
N-POR08	Video - Interphone Power Supply.

Lamps:

N-LAM01	Lamps.
N-LAM02	Auxiliary Lamps (3 lamps, 24 Vac).
N-LAM03	3 Push-buttons and Lamps.
N-LAM04	3 Push-buttons and Lamps (24 Vac).
N-LAM05	Lamp-holder.
N-LAM06	Signs Indicator.
N-LAM07	Emergency Light.
N-LAM08	2 Lamp-holders+ Incandescent Lamps.
N-LAM08B	Incandescent Lamp.
N-LAM09	Fluorescent Lamp.
N-LAM10	2 Halogen Lamps.
N-LAM11	2 Turning Halogen Lamps.
N-LAM12	Halogen Lamp with Transformer.
N-LAM13	2 Low Consumption Fluorescent Lamps.
N-LAM14	Direction Indicator Lamp (24 Vac).
N-LAM15	Number Indicator Lamp (24 Vac).
N-LAM16	Halogen Lamp.
N-LAM20	Auxiliary lamps (4 lamps).
N-LAM26	Lighting Module.
N-LAM30	Luminous panel, 24 V.
N-LAM32	LED Lamp.
LAMP4	4 Lamps Panel.

Loads:

N-CAR01	Fixed Resistive Load, 150 ohm, 500 W.
N-CAR02	Double Fixed Resistive Load, 150 ohm, 500 W.
N-CAR03	Fixed Resistive Load (custom-made).
N-CAR04	Variable Resistive Load, 150 ohm, 500 W.
N-CAR05	Double Variable Resistive Load, 150 ohm, 500 W.
N-CAR06	Variable Resistive Load (custom made).
N-CAR07	3-phase Variable Resistive Load, 3 x 150 ohm, 500 W.
N-CAR08	3-phase Variable Resistive Load (custom made).
N-CAR09	Capacitive Load 4 x 7 µF.
N-CAR10	Capacitive Load.
N-CAR11	3-phase Capacitive Load.
N-CAR12	Inductive Load 0-33-78-140-193-236 mH.
N-CAR13	Inductive Load (custom made).
N-CAR14	3-phase Inductive Load.
N-CAR15	Current Transformer Load.
N-CAR16	Voltage Transformer Load.
N-CAR17	Line Capacitor.
N-CAR18	Aerial Line Model.
N-CAR18/A	Rheostat for Equivalent Circuit of an Electric Line.
N-CAR18/B	Inductance for Equivalent Circuit of an Electric Line.
N-CAR18/C	Capacitor for Equivalent Circuit of an Electric Line.
N-CAR19	Single-phase Commutable Capacitor Load.
N-CAR20	Diodes and Thyristors.
N-CAR21	Inductive and Capacitive Loads.
N-CAR22	AC Starting Rheostat.
N-CAR23	DC Starting Rheostat.
N-CAR24	Field Rheostat.
N-CAR30	Inductances Module.
N-CAR31	Capacitors Module.
N-CAR32	Rectifier Diodes Module.
N-CAR33	Resistive Components Module.
N-CAR34	Single-phase rectifier diodes.
N-REF	Resistor Load with commutator.
N-REFT	Three-phase Resistor Load with commutator.
N-REFT300	300 Ohms Three-phase Fixed Resistor Module.
N-IND	Variable Inductive Load with commutator.
N-INDT	Three-phase Variable Inductive Load with commutator.
N-CON	Variable Capacitor Load with commutator.
N-CONT	Three-phase Variable Capacitor Load with commutator.
N-REV	Variable Resistor.
N-REVT	Three-phase Variable Resistor.
N-RCL3R	Resistive, Inductive and Capacitive Loads Module.
N-RCL3R/B	Universal Loads Module.
N-CAR19T3	Three-Phase Bank of Commutable Capacitors Module.
N-CAR19T3D	Three-Phase Digital Bank of Commutable Capacitors Module.
N-CAR35T3	Three-Phase Bank of Commutable Resistors Module.
N-CAR35T3D	Three-Phase Digital Bank of Commutable Resistors Module.
N-CAR36T3	Three-Phase Bank of Commutable Inductances Module.
N-CAR36T3D	Three-Phase Digital Bank of Commutable Inductances Module.
N-CAR19T4D	Three-Phase Digital Capacitor Banks Module.
N-CAR19S4D	Single-Phase Digital Capacitor Banks Module.
N-CAR35T3/1.2K	1.2KW Three-Phase step-variable resistor load Module.
N-CAR36T3/0.9K	0.9Kvar Three-Phase step-variable inductive load Module.
N-CAR19T3/0.8K	0.8Kvar Three-Pase step-variable capacitive load Module.

Meters:

N-MED01	DC Micro-ammeter (0-100 microA).
N-MED02	DC Micro-ammeter (0-600 microA).
N-MED03	DC Milliammeter (0-100 mA).
N-MED04	DC Milliammeter (0-600 mA).
N-MED05	DC Ammeter (0-1.5 A).
N-MED06	DC Ammeter (custom-made).
N-MED07	AC Milliammeter (0-100 mA).
N-MED08	AC Milliammeter (0-600 mA).
N-MED09	AC Ammeter (0-2.5 A).
N-MED10	AC Ammeter (0-5 A).
N-MED11	AC Ammeter (0-10 A).
N-MED12	AC Ammeter (custom-made).
N-MED13	DC Millivoltmeter (0-100 mV).
N-MED14	DC Millivoltmeter (0-600 mV).
N-MED15	DC Voltmeter (0-5 V).
N-MED16	DC Voltmeter (0-50 V).
N-MED17	DC Voltmeter (0-200 V).
N-MED18	DC Voltmeter (custom-made).
N-MED19	AC Voltmeter (0-10 V).
N-MED20	AC Voltmeter (0-60 V).
N-MED21	AC Voltmeter (0-250 V).
N-MED22	AC Voltmeter (0-400Vac).
N-MED23	AC Voltmeter (custom-made).
N-MED24	AC Double Voltmeter.
N-MED25	Pointer Frequency Meter (45-65 Hz).
N-MED26	Frequency Meter.
N-MED27	Reed Frequency Meter 60 Hz.
N-MED28	Reed Double Frequency Meter 46-64 Hz.
N-MED29	Tachymetric Voltmeter (custom made).
N-MED30	1-Phase Phasemeter 230 V.
N-MED31	3-Phase Phasemeter 400 V.
N-MED32	1-Phase Wattmeter 230 V.
N-MED33	3-Phase Balanced Wattmeter 440 V.
N-MED34	3-Phase Balanced Wattmeter (4 wires) 440 V.
N-MED35	3-Phase Unbalanced Wattmeter (3 wires) 440 V.
N-MED36	3-Phase Unbalanced Wattmeter with neutral (4 wires) 440 V.
N-MED37	3-Phase Unbalanced Wattmeter (3 systems) 440 V.
N-MED38	1-Phase Varmeter 230 V.
N-MED39	3-Phase Balanced Varmeter 440 V.
N-MED40	3-Phase Balanced Varmater (4 wires)440 V.
N-MED41	3-Phase Unbalanced Varmeter (3 wires) 440 V.
N-MED42	3-Phase Unbalanced Varmeter with neutral (4 wires) 440 V.
N-MED43	3-Phase Unbalanced Varmeter (3 systems) 440V.
N-MED44	Phase Sequence Indicator.
N-MED45	1-Phase Synchronization Equipment.
N-MED46	3-Phase Synchronization Equipment.
N-MED47	Pulse Counter.
N-MED48	Hour Counter 24 V / 50 Hz.
N-MED49	Hour Counter.
N-MED50	Hour Counter 12 - 36 Vdc.
N-MED51	Insulation Indicator 440 V.
N-MED52	Insulation Indicator 440 V with optic and acoustic signalling.
N-MED53	Sound Tester of Continuity.
N-MED54	1-Phase Maximum Current Meter +Alarm.
N-MED55	3-Phase Maximum Current Meter,4 wires.
N-MED56	Maximum Power Meter.
N-MED57	3-Phase Active Energy Meter.
N-MED58	3-Phase Reactive Energy Meter.
N-MED59	Chronometer.
N-MED63	Synchronoscope.
N-MED64	Phase Sequence Indicator.

Continue...

Meters: (continuation)

N-MED65	Digital Multimeter.
N-MED65/A	Advanced Digital Multimeter.
N-MED66	Indicator of Phase Presence / Absence.
N-MED67	Thermometer (Room Temperature).
N-MED68	Hygrometer.
N-MED69	Hygrostat.
N-MED70	Quartz Analog Clock.
N-MED71	Digital Alarm Clock (with Thermometer and 2 Alarms).
N-MED72	Energy Counter.
N-MED73	1-Phase Light Counter.
N-MED74	3-Phase Light Counter.
N-MED75	Digital Meteorological Station.
N-MED76	Thermostat for Heating.
N-MED77	Thermostat for Heating and Refrigeration.
N-MEDV	Analog Voltmeter.
N-MEDI	Analog Ammeter.
N-TMEDV	Three-phase Analog Voltmeter.
N-TMEDI	Three-phase Analog Ammeter.
N-MPDM	Mechanical Power Digital Measurement Unit.
N-MUAD	Electric Power Data Adquisition System.
N-TM	Torque Measurement Unit.
STRO	Stroboscope.
TECNEL/T	Tachogenerator.
TECNEL/TM	Optical Speed Meter.
N-EAL	Network Analyzer Unit.
N-EALAR	Network Analyzer Unit with active and reactive energy counters.
N-EALD	Network Analyzer Unit with Computer Data Acquisition.
N-EALDG	Network Analyzer Unit with Computer Data Acquisition + Oscilloscope Display.
N-EAL-DC	DC Network Analyzer Unit.
N-EALDC/G	DC Generator Analyzer.
N-EAM-VA	Analog Measurement Unit.
N-EAM-DC	Analog Measurement Unit. (DC)
N-EME-SA	Advanced Synchronous Module.
LOCL	Load Cell.
N-DMM	Dynamometer.
N-ASY	Synchronoscope Module.
N-EMSD	Advanced Digital Synchronoscope Module.
N-MSM	Manual Synchronization Module.
N-CTT	Data Concentrator Module.
N-SM	Smart Meter Module.
BRLA	Compass to observe the rotating magnetic field.

Motor Controllers:

DC Motor Controllers

N-VVCC/M	DC Motor Speed Controller.
N-VVCC	Advanced DC Motor Speed Controller.
N-VVPP/B	Stepper Motor Controller (manual control).
N-VVPP	Stepper Motor Controller (manual control and automatic control).

AC Motor Controllers

N-VVCA/M	AC Motor Speed Controller.
N-VVCA	Advanced AC Motor Speed Controller.
N-VVCA4K	4 kW Motor Controller Module.
N-DFGC	Double-feed Generator Control Module.
N-VVCA5K.	5 kW Motor Speed Controller.

Motors:

DC Motors

EMT1	DC Independent excitation motor-generator.
EMT2	DC Series excitation motor-generator.
EMT3	DC Shunt excitation motor-generator.
EMT4	DC Compound excitation motor-generator.
EMT5	DC Shunt-series compound excitation motor.
EMT12	Universal Motor.
EMT15	DC Permanent magnet motor.
EMT18	DC Brushless motor.
EMT19	Stepper motor.

AC Motors

EMT6	AC Synchronous three-phase motor alternator.
EMT6-B	Permanent magnets synchronous three-phase generator.
EMT6/1K	1KW Three-phase Synchronous Machine.
EMT7	Asynchronous three-phase motor of squirrel cage.
EMT7-B	Asynchronous three-phase motor of squirrel cage (4 poles).
EMT7-C	Asynchronous three-phase motor of squirrel cage (8 poles).
EMT8	Asynchronous three-phase motor with wound rotor.
EMT8DF	Double Feed Induction Generator.
EMT8-DF	1.5KW Three-Phase Induction Motor with Slip Rings and Wound Rotor.
EMT9	Dahlander three-phase motor.
EMT10	Asynchronous three-phase motor of two independent speeds.
EMT11	Asynchronous single-phase motor with starting capacitor.
EMT12	Universal Motor.
EMT14	Repulsion motor, single phase with short circuited brushes.
EMT16	Asynchronous single-phase motor with starting and running capacitor.
EMT17	Asynchronous three-phase motor of squirrel cage with «Y» connection.
EMT20	Asynchronous single-phase motor with split phase.
EMT21	Three-phase reluctance motor.
EMT22	Single-phase shaded pole motor.
EMT23	Linear Motor.
GMG4K	4 kW Generator-Group.
GMG4.5K3PH	4.5 KW Generator-Motor Group.
GMG1.5K3PH	1.5KW Slip Ring Generator-Motor Group.
N-SERV1K	1 kW Servomotor Module.

Motors (cut away):

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.

Motors (transparent and functional):

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

Motors (disassembly):

EMT5-D	Disassembly DC shunt-series compound excitation motor.
EMT7-D	Disassembly asynchronous three-phase motor of squirrel cage.
EMT8-D	Disassembly asynchronous three-phase motor with wound rotor.
EMT16-D	Disassembly asynchronous single-phase motor with starting and running capacitor.
EMT20-D	Disassembly asynchronous single-phase motor with split phase.

Continue...

Overvoltage:

N-SOB01	1-Pole Transient Overvoltage Limiter.
N-SOB02	1-Pole +neutral Transient Overvoltage Limiter.
N-SOB03	3-Pole Transient Overvoltage Limiter.
N-SOB04	3-Pole + neutral Transient Overvoltage Limiter.
N-SOB05	2-Pole Transient Overvoltage Limiter (Analog Telephonic Lines).
N-SOB06	2-Pole Transient Overvoltage Limiter (Digital Telephonic Lines).
N-SOB07	2-Pole Permanent Overvoltage Limiter.
N-SOB08	Transient Overvoltage Double Limiter.

PLC modules:

N-EME-PLCE	Electrical Machines PLC Unit.
N-EME-PLCEA	Advanced PLC Unit.
N-PLC01	PLC01 Control Module.
N-PLC02	PLC02 Control Module.
N-PLC03	PLC03 Control Module.
N-PLC04	PLC04 Control Module.
N-PLC05	PLC05 Control Module.
N-PLC06	PLC06 Control Module.

Power Supply:

N-ALI01	Industrial Main Power Supply.
N-ALI02	Main Power Supply.
N-ALI03	AC Auxiliary Power Supply.
N-ALI04	DC Auxiliary Power Supply (+12,0,-12Vdc).
N-ALI05	Jumpers.
N-ALI06	Adjustable AC Power Supply.
N-ALI07	Adjustable DC Power Supply.
N-ALI08	Standby Battery, 12 Vdc.
N-ALI10	Power Supply Module.
N-ACPWS	AC Motor Power Supply.
N-DCPWS	DC Motor Power Supply.
N-EME-U	Electrical Machines Unit - Universal Power Supply.
N-PWFI	Three-phase supply with low voltage protection 400 V/16A.

Push Buttons:

N-PUL01	Emergency Stop Push-Button (220 Vac).
N-PUL02	Mushroom Push-Button (24 Vac).
N-PUL03	Push-Buttons with Light (220 Vac).
N-PUL04	Push-Buttons with Light (24 Vac).
N-PUL05	Power Circuit 3 Push-Buttons.
N-PUL06	Control Circuit 3 Push-Buttons.
N-PUL07	Box of 3 Push-Buttons for Industrial use.
N-PUL08	Box of 3 Auxiliary Push-Buttons.
N-PUL09	Push-Button with Auxiliary Light (230 Vac).
N-PUL10	Push-Button with Auxiliary Light (24 Vac).
N-PUL11	2 Double Push-Buttons (230 Vac).
N-PUL12	2 Double Push-Buttons(24 Vac).
N-PUL13	2 Positions Actuators.
N-PUL14	4 Positions Actuators.
N-PUL15	Hanging Push-Button.
N-PUL16	Push-Button for Industrial use.
N-PUL17	Double Push-Button for Industrial use.
N-PUL18	Waiter Push-Button.
N-PUL19	Bell Push-Button /Open the Door.
N-PUL20	2 Bell Push-Buttons.
N-PUL21	2 Bell Push-Buttons with Light.
N-PUL22	2 Light Push-Buttons.
N-PUL23	2 Push-Buttons with Symbol to be chosen by the Customer.
N-PUL24	2 Light Push-Buttons with pilot-light.
N-PUL25	2 Disconnecting Push-Buttons (NC) with Symbol to be chosen by the Customer.
N-PUL26	2 Push-Buttons with Green/Red pilot-light 24 Vdc.
N-PUL27	Neutral Push-Button.
N-PUL28	Neutral Push-Button with Light.
N-PUL29	2 Push-Buttons Group for Blinds (without Interlock).
N-PUL30	2 Push-Buttons Group for Blinds (with Interlock).
N-PUL31	2 Push Buttons Group (2 inputs + 2 outputs).
N-PUL32	2 Push Buttons Group (1 input + 2 outputs).
N-PUL33	Push-Button with Label-holder with Light.
N-PUL34	Pull Push-Button.
N-PUL35	Push-Button with Label-holder/Commutator with Label-holder.
N-PUL36	Push-Button / Key Commutator.
N-PUL37	Push-Buttons with / without Interlocking, 1NO+1NC.
N-PUL38	Push-Buttons with / without Interlocking, 2NO.
N-PUL39	Lighting Push-Button with Light, NO+NC.
N-PUL40	Lighting Push-Button with Light, NC.
N-PUL41	Lighting Push-Button without Light, NC.
N-PUL42	Push-Button with Luminous Screen (bell, bulb, wc, alarm...).
N-PUL43	Touch-Type Push-Button with Time Delay.
N-PUL44	Numbered Light Push-Buttons (24 Vac).
N-PUL45	2 Double Chamber Push-Buttons.
N-PUL48	3 Double Chamber Push-Buttons.
N-PUL50	3 Luminous pus-buttons for stairs lighting.
N-PUL51	Switch pus-button type and buzzer of 24 V.

Regulators:

N-REG01	Continuous Voltage Regulator 5-12-24 Vdc.
N-REG02	Voltage Electronic Regulator (300 W).
N-REG03	Voltage Electronic Regulator (1000 W).
N-REG04	Voltage Electronic Regulator (500 VA).
N-REG05	Reactive Energy Regulator.
N-REG06	Voltage Electronic Regulator (Switch) Module.
N-REG07	Voltage Electronic Regulator (Switch/Commutator) 40 to 500W/ 230 Vac.
N-REG08	Electronic Regulator for Fluorescent Lamps (Switch / Commutator).
N-REG09	Electronic Regulator for Halogen Lamps with Transformer.
N-REG10	Universal Electronic Regulator (Switch/Commutator) 40 to 420W/ 230 Vac.
N-REG11	Touch Type Voltage Electronic Regulator.
N-REG12	Infrared Voltage Regulator.
N-REG13	Infrared Remote Control.
N-REG14	Light Intensity Regulator (1000 W, 230 Vac).
N-REG15	Tap Regulator Module.
N-VREG	Voltage Regulator Module.
N-CNV	Level controller.
N-CFP	Advanced Power Factor Controller Module.
N-CFPS	Single-phase Automatic Power Factor Controller.

Relays:

N-REL01	Thermal Relay (1 - 1.6 A).
N-REL02	Thermal Relay (1.6 - 2.5 A).
N-REL03	Thermal Relay (2.5 - 4 A).
N-REL04	Thermal Relay (4 - 6 A).
N-REL05	Thermal Relay / 3-pole Phase fault (0.8 - 1.2 A).
N-REL06	Thermal Relay / 3-pole Phase fault (1.8 - 2.6 A).
N-REL07	Thermal Relay / 3-pole Phase fault (2.6 - 3.7 A).
N-REL08	Time Overcurrent Electronic Relay (0.3 -1.5 A).
N-REL09	Time Electronic Relay against Overcurrents (1.2 - 7 A).
N-REL10	Instantaneous Relay.
N-REL11	Time Relay (0.6-60 sec.).
N-REL12	Time Relay (3 - 300 sec.).
N-REL13	Monostable Relay.
N-REL14	Bistable Relay.
N-REL15	Astable Relay.
N-REL16	Solid-state Relay, 10 A, 230 V.
N-REL17	Solid-state Relay, 25 A, 230 V.
N-REL18	Solid-state Relay, 12 A, 400 V.
N-REL19	2 Solid-state Relays,10 A,230 V.
N-REL20	1-Phase Directional Relay.
N-REL21	Overvoltage Relay.
N-REL21B	Subvoltage Relay.
N-REL22	Multi-function Protection Relay (software included).
N-REL23	Overcurrent Relay and Fault to Earth.
N-REL23/A	Earth Leakage Relay.
N-REL23/B	Overcurrent Relay.
N-REL24	Auxiliary Relay.
N-REL25	Detection Relay of Insufficient Voltage.
N-REL26	Reactive Energy Regulator Relay.
N-REL27	Current Control Relay.
N-REL28	Voltage Control Relay.
N-REL29	Harmonics Detector Relay.
N-REL30	Synchronization Relay.
N-REL31	Domestic Control Relay 16 A, 230 Vac, 1NO + 1NC.
N-REL32	Domestic Control Relay 16 A, 230 Vac, 2NO.
N-REL33	Switch Relay 230 Vac.
N-REL34	Commutator Relay 230 Vac.
N-REL35	Switch Relay 24 Vdc.
N-REL36	Commutator Relay 24 Vdc.
N-REL37	Relay with Buzzer.
N-REL38	Current Relay (custom made).
N-REL39	Programmable Relay with Display and Software for PC computer.
N-REL41	Auxiliary relay with disconnection button.
N-REL45	Module with disjunctor.
N-REL46	Thermal Electric Motor Protection Module.
N-REL47	Thermal Relay.
N-REL50	Relays Module.
N-REL51	Reverse power relay.
N-DIF	Differential Protection.
N-DIFVS	Differential Protection with variable sensitivity.
N-DIFR	Differential Protection with automatic resetting.
N-TDIF	Three-phase Differential Protection.
N-TDIFVS	Three-phase Differential Protection with variable sensitivity.
N-TDIFFR	Three-phase Differential Protection with automatic resetting.
N-TSTF	Tester Protection module.
N-TSTF3	Tester Protection module (3-phase).

Continue...

Relays: (continuation)

N-MPS	Motor protection module.
N-GDP	Generator differential protection module.
N-REP	Rotor earth-fault protection module.
N-TOP	Time Overcurrent protection module.
N-ULP	Unbalanced Load protection module.
N-ERP-PGC01	Generator Protection and Control Relay Module.
N-ERP-PDF01	Differential Protection Relay Module.
N-ERP-MA01	Feeder Management Relay Module.
N-ERP-MF01	Digital Fault Simulator Module.
N-ERP-SFT01	Overcurrent Protection Relay Module.
N-ERP-PD01	Distance Protection Relay Module.
ERP-UB	Protection Relays Test Unit.
ERP-PDF	Differential Protection Relay Module.
ERP-MA	Feeders Management Relay Module.
ERP-SFT	Overcurrent and Earth Fault Protection Relay Module.
ERP-SDND	Directional/Non Directional Overcurrent Protection Relay Module.
ERP-PD	Distance Protection Relay Module.

Sensors:

N-SEN01	Instantaneous Micro-switch.
N-SEN02	MBB Micro-switch.
N-SEN03	BBM Micro-switch.
N-SEN01 / N-SEN02 / N-SEN03	Module Control.
N-SEN04	Inductive Proximity Sensor type PNP.
N-SEN05	Cylindrical Inductive Proximity Sensor.
N-SEN06	Flat Inductive Proximity Sensor Type PNP.
N-SEN07	Flat Inductive Proximity Sensor Type NPN.
N-SEN08	Cylindrical Inductive Rotation Control Sensor.
N-SEN09	Flat Inductive Rotation Control Sensor.
N-SEN10	Cylindrical Inductive Proximity Sensor (4 - 20 mA).
N-SEN11	Flat Inductive Proximity Sensor (4 - 20 mA).
N-SEN12	Flat Inductive Proximity Sensor (0 - 10 V).
N-SEN13	DC Cylindrical Capacitive Proximity Sensor.
N-SEN14	Cylindrical Capacitive Proximity Sensor.
N-SEN15	DC Rectangular Capacitive Proximity Sensor.
N-SEN16	AC Rectangular Capacitive Proximity Sensor.
N-SEN17	Ultrasonic Proximity Sensor.
N-SEN18	Cylindrical Photoelectric Sensor.
N-SEN19	Miniature Photoelectric Sensor.
N-SEN20	Compact Photoelectric Sensor.
N-SEN21	Barrier Photoelectric Sensor (Emitter).
N-SEN22	Barrier Photoelectric Sensor (Receptor).
N-SEN23	Reflecting Photoelectric Sensor (Emitter).
N-SEN24	Reflecting Photoelectric Sensor (Receptor).
N-SEN25	Level Magnetic Sensor.
N-SEN26	Presence and Motion Sensor (Wall).
N-SEN27	Presence and Motion Sensor (Ceiling).
N-SEN28	Cylindrical Inductive Proximity Sensor (2 wires).
N-SEN29	Cylindrical Inductive Proximity Sensor.

Signal Plugs:

N-TSE01	Telephony 4 Plugs.
N-TSE02	Telephony 6 Plugs.
N-TSE03	Radio -TV Plug (inductive) Unique.
N-TSE04	Radio -TV Plug (inductive) Intermediate.
N-TSE05	Radio -TV Plug (inductive) Final.
N-TSE06	Radio -TV Plug (inductive) Series.
N-TSE07	Radio -TV + Satellite Plug Unique.
N-TSE08	Radio -TV + Satellite Plug Intermediate.
N-TSE09	Radio -TV + Satellite Plug Final.
N-TSE10	Computer Connection RJ-45.
N-TSE11	Computer Connection RJ-11/12.
N-TSE12	Shaver Plug 115 / 230 V.

Signalling:

N-SEL01	Light Signalling Beacons (lamps).
N-SEL02	Blinking Signalling Beacons.
N-SEL03	3 Pilot-Lights.
N-SEL04	4 Pilot- Lights.
N-SEL05	Rotatory Light Halogen Lamp 70 W.
N-SEL06	Rotatory Light Incandescent Lamp 25 W.
N-SEL07	Industrial Siren.
N-SEL08	Autonomous Emergency Beaconing.
N-SEL09	Double Luminous Signalling red-green.
N-SEL10	Double Luminous Signalling red-green 24 Vac.
N-SEL11	Stop / Go Signalling.
N-SEL12	Digital Indicator Voltmeter / Ammeter.
N-SEL13	Luminous Indicator, 1-Phase Voltage 230 Vac.
N-SEL14	Luminous Indicator of 3-Phase Voltage Fault.
N-SEL15	Lighting Luminous Indicator 230 Vac.
N-SEL16	Siren with Blinking Beacon 24 Vdc.
N-SEL17	Fire Indicators, Bell type.
N-SEL18	Emergency Fluorescent Lamp.
N-SEL19	2 Blinking Beacons.
N-SEL20	Water Proof Hublot + Water Proof Switch / Commutator.
N-SEL21	Indoor Siren.
N-SEL22	Beacon with Flasher Filament and Pyramidal Len.
N-SEL24	3 Blinking lamps, 24 V.
N-SEL40	Sound Element.

Sockets:

N-ENC01	1-Phase European Socket.
N-ENC02	1-Phase American Socket.
N-ENC03	1-Phase Industrial Socket.
N-ENC04	3-Phase Socket.
N-ENC05	3-Phase Socket with ground terminal + neutral.
N-ENC06	3-Phase Socket with ground terminal.
N-ENC07	3-Phase Industrial Socket with ground terminal.
N-ENC08	Universal Socket.
N-ENC09	2-pole European Socket with Safety Device.
N-ENC10	2-pole European Socket with Displaced ground terminal.
N-ENC11	2-pole European Socket with Lateral ground terminal and Safety Device.
N-ENC12	2-pole European Socket, French System.
N-ENC13	Mixed (European-American) 2-pole Polarized Socket with ground terminal.
N-ENC14	Wireless Socket / Receptor.
N-ENC15	British Socket with ground terminal.
N-ENC17	2 Domestic Sockets.
N-ENC18	2 Industrial Single-phase Sockets.
N-ENC20	2 industrial Three-phase Sockets.

Starters/Commutators:

N-ARR01	Manual Star-Delta Starter.
N-ARR02	Temporized Star-Delta Starter.
N-ARR03	Manual Auto-transformer Starter.
N-ARR04	Temporized Auto-transformer Starter.
N-ARR05	Manual Star-Delta Starter with Inversion.
N-ARR06	Temporized Star-Delta Starter with Inversion.
N-ARR07	Manual Dahlander Commutator, 2 Speeds.
N-ARR08	Temporized Dahlander Commutator, 2 Speeds.
N-ARR09	Manual Independent Windings Commutator, 2 speeds.
N-ARR10	Temporized Independent Windings Commutator, 2 speeds.
N-ARR11	Poles Commutation with Inversion.
N-ARR12	Direct Starter.
N-ARR13	Direct Starter with Inversion.
N-ARR14	Switches and Push-buttons Module for motor control.
N-ARR15	Compact Direct Starter.
N-ARR16	Electronic Soft Starter.

Switches: Differential Automatic Switches:

N-IAD01	1-pole + neutral Differential Automatic Switch, 6A, 30 mA, class A.
N-IAD02	1-pole + neutral Differential Automatic Switch, 10A, 30 mA, class A.
N-IAD03	1-pole + neutral Differential Automatic Switch, 10A, 30 mA, class AC.
N-IAD04	1-pole + neutral Differential Automatic Switch, 16A, 30 mA, class A.
N-IAD05	1-pole + neutral Differential Automatic Switch, 16A, 30 mA, class AC.
N-IAD06	1-pole + neutral Differential Automatic Switch, 25A, 30 mA, class A.
N-IAD07	1-pole + neutral Differential Automatic Switch, 25A, 30 mA, class AC.
N-IAD08	1-pole + neutral Differential Automatic Switch, 40A, 30 mA, class A.
N-IAD09	1-pole + neutral Differential Automatic Switch, 40A, 30 mA, class AC.
N-IAD10	2-pole Differential Automatic Switch 16A, 10 mA, class AC.
N-IAD11	2-pole Differential Automatic Switch 25A, 30 mA, class AC.
N-IAD12	2-pole Differential Automatic Switch 40A, 30 mA, class AC.
N-IAD13	3-pole + neutral Differential Automatic Switch, 25A, 300mA, class AC, instantaneous.
N-IAD14	3-pole + neutral Differential Automatic Switch, 25A, 300mA, class AC, selective.
N-IAD15	3-pole + neutral Differential Automatic Switch, 40A, 300mA, class AC, instantaneous.
N-IAD16	3-pole + neutral Differential Automatic Switch, 40A, 300mA, class AC, selective.
N-IAD17	4-pole + neutral Differential Automatic Switch, 63A, 300mA, class AC, instantaneous.
N-IAD18	4-pole + neutral Differential Automatic Switch, 63A, 300mA, class AC, selective.

Continue...

Switches: Magneto-thermal Automatic Switches:

N-IAM01	1-pole Magneto-thermal Automatic Switch 0.5 A, Curve C.
N-IAM02	1-pole Magneto-thermal Automatic Switch 1 A, Curve C.
N-IAM03	1-pole Magneto-thermal Automatic Switch 4 A, Curve C.
N-IAM04	1-pole Magneto-thermal Automatic Switch 10 A, Curve C.
N-IAM05	1-pole Magneto-thermal Automatic Switch 25 A, Curve C.
N-IAM06	1-pole Magneto-thermal Automatic Switch 40 A, Curve C.
N-IAM07	1-pole + neutral Magneto-thermal Automatic Switch, 1 A, Curve C.
N-IAM08	1-pole + neutral Magneto-thermal Automatic Switch, 4 A, Curve C.
N-IAM09	1-pole + neutral Magneto-thermal Automatic Switch, 10A, Curve C.
N-IAM10	1-pole + neutral Magneto-thermal Automatic Switch, 25A, Curve C.
N-IAM11	1-pole + neutral Magneto-thermal Automatic Switch, 40A, Curve C.
N-IAM12	2-pole Magneto-thermal Automatic Switch, 0.5A, Curve C.
N-IAM13	2-pole Magneto-thermal Automatic Switch, 1 A, Curve C.
N-IAM14	2-pole Magneto-thermal Automatic Switch, 4 A, Curve C.
N-IAM15	2-pole Magneto-thermal Automatic Switch, 10 A, Curve C.
N-IAM16	2-pole Magneto-thermal Automatic Switch, 25 A, Curve C.
N-IAM17	2-pole Magneto-thermal Automatic Switch, 40 A, Curve C.
N-IAM18	3-pole Magneto-thermal Automatic Switch, 0.5A, Curve C.
N-IAM19	3-pole Magneto-thermal Automatic Switch, 1 A, Curve C.
N-IAM20	3-pole Magneto-thermal Automatic Switch, 4 A, Curve C.
N-IAM21	3-pole Magneto-thermal Automatic Switch, 10 A, Curve C.
N-IAM22	3-pole Magneto-thermal Automatic Switch, 25 A, Curve C.
N-IAM23	3-pole Magneto-thermal Automatic Switch, 40 A, Curve C.
N-IAM24	3-pole + neutral Magneto-thermal Automatic Switch, 6A, Curve C.
N-IAM25	3-pole +neutral Magneto-thermal Automatic Switch, 10 A, Curve C.
N-IAM26	3-pole +neutral Magneto-thermal Automatic Switch, 16 A, Curve C.
N-IAM27	3-pole +neutral Magneto-thermal Automatic Switch, 25 A, Curve C.
N-IAM28	3-pole+neutral Magneto-thermal Automatic Switch, 40 A, Curve C.
N-IAM29	4-pole Magneto-thermal Automatic Switch, 0.5A, Curve C.
N-IAM30	4-pole Magneto-thermal Automatic Switch, 1 A, Curve C.
N-IAM31	4-pole Magneto-thermal Automatic Switch, 4 A, Curve C.
N-IAM32	4-pole Magneto-thermal Automatic Switch, 10 A, Curve C.
N-IAM33	4-pole Magneto-thermal Automatic Switch, 16 A, Curve C.
N-IAM34	4-pole Magneto-thermal Automatic Switch, 25 A, Curve C.
N-IAM35	4-pole Magneto-thermal Automatic Switch, 40 A, Curve C.

Switches: General Switches:

N-INT01	1-pole Load Switch.
N-INT02	2-pole Load Switch.
N-INT03	3-pole Load Switch.
N-INT04	4-pole Load Switch.
N-INT05	1-pole Rotary Switch.
N-INT06	3-pole Section Switch, 12 A.
N-INT07	3-pole Section Switch, 20 A.
N-INT08	3-pole Section Switch +Safety Stop, 12 A.
N-INT09	3-pole Section Switch +Safety Stop, 20 A.
N-INT10	Twilight Switch.
N-INT11	Twilight Switch with programmer clock.
N-INT12	Analogical Hour Switch.
N-INT13	Digital Hour Switch.
N-INT14	1-pole 2 Switches.
N-INT15	2 Switches with Light.
N-INT16	2-pole Switch (16 A).
N-INT17	2-pole Switch (16 A) with Light.
N-INT18	1-pole Switch + 1-pole Switch with Light.
N-INT19	1-pole Switch + 2-pole Switch.
N-INT20	1-pole Switch with Light + 2-pole Switch with Light.
N-INT21	Switch + Commutator Group + Bell Push-Button.
N-INT22	2 Switches for Blinds.
N-INT23	Group of 2 Switches.
N-INT24	Switch / Commutator for Card.
N-INT25	Wireless Switch / Commutator (Emitter).
N-INT26	Pastille Receptor (Receptor).
N-INT27	Touch Type Electronic Switch / Commutator by TRIAC.
N-INT28	Touch Type Electronic Switch / Commutator by Relay.
N-INT29	Infrared Switch / Commutator by TRIAC.
N-INT30	Infrared Switch / Commutator by Relay.
N-INT31	Intrusion Switch /Detector from 40 to 300W.
N-INT32	Intrusion Switch / Detector.
N-INT33	1-pole Fuse Switch, 16 A.
N-INT34	1-pole Fuse Switch with neutral, 16 A.
N-INT35	2-pole Fuse Switch, 16 A.
N-INT36	3-pole Fuse Switch, 16 A.
N-INT37	3-pole Fuse Switch with neutral, 16 A.
N-INT38	1-pole Lighting Switch, 16 A.
N-INT39	2-pole Lighting Switch, 16 A.
N-INT40	3-pole Lighting Switch, 16 A.
N-INT41	3-pole Lighting Switch with neutral, 25 A.
N-INT42	Lighting Switch with Control Lamp.
N-INT43	1-pole Telecontrol Switch.
N-INT44	2-pole Telecontrol Switch.
N-INT45	3-pole Telecontrol Switch.
N-INT46	Remote Control Switch (heating, refrigeration...).
N-INT47	Switch with Luminous Screen (bell, bulb, wc, alarm...).
N-INT48	1-pole Switch + 1-pole Push-button.
N-INT51	2 Switches, push-button type.
N-SFC	Limit switch.
N-SWT4	Four position selector (measuring point selector).

Switches: Special Switches:

N-INX01	DC 1-pole Special Automatic Switch 1 A, Curve C.
N-INX02	DC 1-pole Special Automatic Switch 2 A, Curve C.
N-INX03	DC 1-pole Special Automatic Switch 6 A, Curve C.
N-INX04	DC 1-pole Special Automatic Switch 10 A, Curve C.
N-INX05	DC 2-pole Special Automatic Switch 1 A, Curve C.
N-INX06	DC 2-pole Special Automatic Switch 2 A, Curve C.
N-INX07	DC 2-pole Special Automatic Switch 6 A, Curve C.
N-INX08	DC 2-pole Special Automatic Switch 10 A, Curve C.
N-INX09	Remote-controlled Switch.
N-INX10	1-pole + neutral Overvoltage Protection.
N-INX11	3-pole + neutral Overvoltage Protection.
N-INX12	Overvoltage Switchable Protection with Luminous Indicator.
N-INX13	RJ-11 Fine Protection - Analog Telephony.
N-INX14	RJ-45 Fine Protection - Digital Telephony.

Test Units:

N-UND01	Brake Control Unit.
N-UND02	Differential Switches Test Unit.
N-UND03	Automatic Switches Test Unit.

Time Control:

N-CTI01	Multi-function Timer.
N-CTI02	24 Hours Timer without Operation Reserve (1NO).
N-CTI03	24 Hours Timer with Operation Reserve (1NO).
N-CTI04	Weekly Timer per hours with Operation Reserve (1NO).
N-CTI05	24 Hours Timer without Operation Reserve (1NONC).
N-CTI06	24 Hours Timer with Operation Reserve (1NONC).
N-CTI07	24 Hours / Week Digital Timer (2NONC).
N-CTI08	Astronomical Digital Timer (2NO).
N-CTI09	Stairs Timer.
N-CTI10	Automatic of Stairs.

Continue...

Transformers:

N-TRA01	1-Phase Power Transformer 220-400/12-24 Vac, 100 VA.
N-TRA02	1-Phase Power Transformer 220-400/115-230 Vac, 1000 VA.
N-TRA03	1-Phase Power Transformer.
N-TRA04	3-Phase Power Transformer 380 / 220 V, 630 VA.
N-TRA05	3-Phase Power Transformer 220 / 127 V, 1000 VA.
N-TRA06	3-Phase Power Transformer.
N-TRA07	Isolating Transformer 230 / 24-12 Vac, 16 A.
N-TRA08	Isolating Transformer 230 / 24-12 Vac, 40 A.
N-TRA09	3-Phase Isolating Transformer 230 - 380/230-380, 500VA.
N-TRA10	Current Transformer 25 / 5 A.
N-TRA11	Current Transformer 40 / 5 A.
N-TRA12	3-Phase Current Transformer.
N-TRA13	1-Phase Auto-transformer.
N-TRA14	3-Phase Auto-transformer.
N-TRA15	Current Adding Transformer, 2 inputs,15 VA.
N-TRA16	Current Adding Transformer, 3 inputs, 15 VA.
N-TRA17	Current Adding Transformer, 4 inputs, 15 VA.
N-TRA18	Petersen Coil.
N-TRA19	Transformer for Experiments (custom made).
N-TRA20	1-Phase Variable Voltage Transformer 220 / 350 VA.
N-TRA21	Electronic Transformer 60 W.
N-TRA22	Electronic Transformer 105 W.
N-TRA23	Transformer with Switch 230/12V,16 A.
N-TRA26	Module with 110-220V input transformer and 24V, 3A output.
TRA28	Three-phase Transformer.
N-TRA29	Three-phase Transformer.
N-TRA30	Three-phase Isolating Transformer 24Vac/380Vac.
N-TRA31	Current Transformer 1000/1.
N-TRANS01	Single-phase Power Transformer.
N-TRANS03	Three-phase Autotransformer.
N-TRANS/3	Three-phase Transformer.
TRANS3/5KGR	5KW Three-Phase Grid Transformer.
N-TRANS3/5KSU	5KW Three-Phase Step-Up Transformer Module.
TRANS3/5KR	5kW Step-Down Transformer with voltage regulator.
N-TRANS3/1KR	Three-Phase Regulation Transformer.
TRANS3/5KSU	5KW Three-Phase Step-Up Transformer.
N-TRMC	Current Transformer.
N-TRTC	Three-Phase Current Transformer.
N-TRMV	Voltage Transformer.
N-TRTV	Three-Phase Voltage Transformer.
N-AUTR	Variable Auto-Transformer.
N-AUTR3PH	Three-phase Variable Auto-transformer.
N-EMPTA	Auxiliary Transformer and Protection Module.
N-ETT	Three-phase and Single Phase Transformer Unit.
N-TPPT	Three-phase Power Transformer Unit.
STC	Single-phase transformer core.
TTC	Three-phase transformer core.

Wireless modules:

N-IOWM	Wireless Outputs Module.
N-WISM	Wireless Intrusion Sensor Module.
N-WLDM	Wireless Leak detector Module.
N-WLSM	Wireless Light Sensor Module.
N-WMSM	Wireless Motion Sensor Module.
N-WSDM	Wireless Smoke Detector Module.
N-WSM	Wireless Switches Module.

Others:

N-VAR01	Motor for Blinds / Curtains.
N-VAR05	Tones Dialing Telephone.
N-VAR07	Kit: Burglar Alarm Central.
N-VAR08	Monitor.
N-VAR09	Frequency Variator.
N-VAR16	Electromagnetism Kit with group of motor/generator.
VAR17	Dismantled Transformer Kit.
VAR18	Electrostatic Kit.
N-HPM	Home Power Module.
MWMT	Manual Winding Machine for Motors and Transformers.
CWC	Copper wire coil.
DPP	Water tank.
N-CPUB	Electrical Control Panel Basic Unit.
CPKIT1	Electrical Control Panel Kit 1.
FTT	Flooding transparent tank.
OTT	Output transparent tank.
WP	Water pump.
N-ADAM	AC/DC/AC Converter Module.
N-AE1	Transmission Lines Simulation Module.
N-AE1C	Commutable Transmission Line Simulation Unit.
N-AE1CD	Commutable Transmission Line Simulator.
N-AE1CD-L1	Line Model 1.
N-AE1CD-L2	Line Model 2.
N-DCTL	DC Transmission Line.
N-FRT	Fault Ride Through Module.
BAT	Battery.
N-INV01	Power Inverter (300W).
N-DCTL	DC Transmission Line.
N-PFD	Power Flow Distribution Module.
EH	Electric Heating Module.
PPINV	Photovoltaic Panel with Inverter.
SWTI	Small Wind Turbine with Inverter.
FVP85	85W Photovoltaic Panel.

✱Specifications subject to change without previous notice, due to the convenience of improvements of the product.

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