Engineering and Technical Teaching Equipment

Protection Measures in Electrical Installations Application

AEL-PMEI

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PRODUCTS
4.- ELECTRICITY

INTRODUCTION

Protection devices are essential for maintaining the integrity, reliability, and safety of electrical installations. It safeguards unit, prevents downtime, enhances system reliability, and ensures compliance with industry standards and regulations. Implementing effective protection scheme measures is a proactive approach to maintaining the optimal performance and safety of electrical systems. The students who begin their professional careers as installers and electrical maintenance technicians require hands-on learning with units that closely reflect the electrical installations in which they will work in the future. The election of the electrical protections in an installation, as well as the correct verification of the same with the appropriate instrumentation is one of the many skills that will be acquired with this application.

The Protection Measures in Electrical Installations Application, "AEL-PMEI", has been designed by EDIBON for training practical and professional level in the field of installation and testing of the main electrical protections for the housing and industry and devices involved in the basic circuits. This application will provide future professionals with the essential knowledge and skills on the installation and verification of the different electrical protections used in homes, industries and buildings, such as circuit breakers, differentials, surge protections and fuses, and also about points of light and power outlets.

The learning goals of this application can be summarized as follows: understanding of electrical installations, measure protections for different installations, selection and test of measurement instrumentations for the verification of the installation and possible problems, starting the low voltage installation, correct utilization of the personal protection unit and problems solution in electrical systems. In order to acquire complete knowledge, the application includes a specific manual which explains at a theoretical and practical level the aspects related to the installation and test procedures for these installations.

GENERAL DESCRIPTION

The Protection Measures in Electrical Installations Application, "AEL-PMEI", has been designed by EDIBON for training practical and professional level in the field of installation and testing of the main electrical protections for the housing and industry and devices involved in the basic circuits. This application will provide future professionals with the essential knowledge and skills on the installation and verification of the different electrical protections used in homes, industries and buildings, such as circuit breakers, differentials, surge protections and fuses, and also about points of light and power outlets. With this application the user will be able to wire and identify the main protection devices in electrical installations, including protection elements of the entrance installation and indoor installations. Moreover, the user will understand residential and industrial protection schemes.

AEL-PMEI detail

The "AEL-PMEI" application includes the following elements:

- N-ALI01. Industrial Main Power Supply Module.
- N-FUS10. Module with Three 20 A Power Fuses and One 4 A Control Fuse.
- N-MED60. Power Analyzer Module.
- N-REFT300. 300 Ohms Three-Phase Fixed Resistor Module.
- N-TSP42-40. Surge Protection Module 3PH, 4P, Type 2, 40 kA, 230 / 400 V (2 units).
- N-TDM4-25C. Automatic Differential-Magnetic Thermal Switch Module 3PH, 4P, 25 A, Curve C.
- N-TDIF4-63/300C. Differential Protection Module 3PH, 4P, 63 A / 300 mA, Type AC.
- N-TDIF4-40/30A. Differential Protection Module 3PH, 4P, 40 A / 30 mA, Type A.
- N-TDIF4-40/30C. Differential Protection Module 3PH, 4P, 40 A / 30 mA, Type AC.
- N-TDIF. Three-phase Differential Protection Module.
- N-TMT4-20B. Automatic Three-Phase Circuit Breaker Module 4P, 20 A, Curve B.
- N-TMT4-16C. Automatic Three-Phase Circuit Breaker Module 4P, 16 A, Curve C.
- N-TMT3-63D. Automatic Three-Phase Circuit Breaker Module 3P, 63 A, Curve D.
- N-TMT3-25C. Automatic Three-Phase Circuit Breaker Module 3P, 25 A, Curve C.
- N-SMT2-20C. Automatic Circuit Breaker Module 1PH, 2P, 20 A, Curve C.
- N-SMT2-16C. Automatic Circuit Breaker Module 1PH, 2P, 16 A, Curve C (2 units).
- N-SMT2-10C. Automatic Circuit Breaker Module 1PH, 2P, 10 A, Curve C.
- N-INT22. Two-way Surface-Mounted Switches Module (2 units).
- N-INT21. Switch + Conmutators Group + Bell Push-button Module.
- N-SSS-230. Surface-Mounted Socket Module 1PH, 230 VAC (2 units).
- N-TIPS. Industrial Surface-Mounted Socket 3PH Module.
- N-SEL04. Four Light Indicator Module.
- N-SMT2-25C. Automatic Circuit Breaker Module 1PH, 2P, 25 A, Curve C.
- N-SDIF2-25/30C. Differential Protection Module 1PH, 2P, 25 A / 30 mA, Type AC.
- N-SSP23-20. Surge Protection Module 1PH, 2P, Type 3, 20kA, 230 V.
- MED65. Digital Multimeter.
- FP-KIT-5. Measuring Kit.
- Electrical Polarity Tester.
- Franklin Tip.

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

Option A:

This application needs the following rack:

- N-RACK-A (3 units).
- 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.

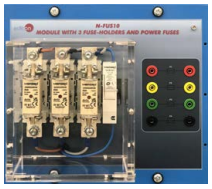
SPECIFICATIONS

The "AEL-PMEI" application includes the following elements:

- N-ALI01. **Industrial Main Power Supply Module.**
  - Supply voltage: 400 VAC, 3PH + N.
  - ON / OFF removable key.
  - Output voltage connections:
    - Three-phase + Neutral: 400 VAC.
    - Single-phase: 230 VAC.
  - Three-phase supply hose with IP44 3PN+E 32 A 400 V connecting plug.
  - Differential magnetothermal 4 poles, 25 A, 30 mA AC 6 KA.
  - Emergency stop push-button.

N-ALI01

- N-FUS10. **Module with Three 20 A Power Fuses and One 4 A Control Fuse.**
  - Four fuseholders and their respective fuses:
    - Three fuses of 20 A.
    - Fuse of 32 A.
  - Input terminals: 3PH + N.
  - Output terminals: 3PH + N.



N-FUS10

- N-MED60. **Power Analyzer Module.**
  - ON / OFF switch.
  - Supply voltage: 400 VAC.
  - Input terminals: input connection with the measurement point.
  - Output terminals: output connection with the measurement point.
  - Fuses: 3 x 10 A.
  - Display of the network analyzer, where it is shown:
    - Active, reactive and apparent power.
    - Active, reactive and apparent energies.
    - Lines and phase currents.
    - Line and phase voltages.
    - Frequencies.
    - Power factor.

N-MED60

- N-REFT300. **300 Ohms Three-Phase Fixed Resistor Module.**
  - Nominal voltage: 400 VAC.
  - Resistor value: 3 x 300 Ohms.
  - Nominal power: 3 x 200 W.
  - Manual commutator to switch ON / OFF the resistors.
  - Fuses: 3 x 5 A.
  - Terminals:
    - Three input terminals (3PH).
    - Three output terminals (3PH).

N-REFT300

- N-TSP42-40. **Surge Protection Module 3PH, 4P, Type 2, 40 kA, 230 / 400 V (2 units).**
  - Three-phase four poles surge arrester:
    - Nominal voltage: 230 / 400 VAC.
    - Maximum discharge current: 40 kA.
    - Type 2.
  - Input terminals.
  - Ground terminal.

N-TSP42-40

- N-TDM4-25C. **Automatic Differential-Magnetic Thermal Switch Module 3PH, 4P, 25 A, Curve C.**
  - Three-phase four poles differential-magneto-thermal switch:
    - Nominal voltage: 400 VAC.
    - Nominal current: 25 A.
    - Magneto-thermal switch with curve type C.
    - Differential switch type A, sensitivity=30 mA.
  - Input terminals.
  - Output terminals.

N-TDM4-25C

- N-TDIF4-63/300C. **Differential Protection Module 3PH, 4P, 63 A / 300 mA, Type AC.**
  Three-phase four poles differential circuit breaker:
  Nominal voltage: 400 VAC.
  Nominal current: 63 A.
  Type AC.
  Sensitivity: 300 mA
  Input terminals.
  Output terminals.


N-TDIF4-63/300C

- N-TDIF4-40/30A. **Differential Protection Module 3PH, 4P, 40 A / 30 mA, Type A.**
  Three-phase four poles differential circuit breaker:
  Nominal voltage: 400 VAC.
  Nominal current: 40 A.
  Type A.
  Sensitivity: 30 mA.
  Input terminals.
  Output terminals.


N-TDIF4-40/30A

- N-TDIF4-40/30C. **Differential Protection Module 3PH, 4P, 40 A / 30 mA, Type AC.**
  Three-phase four poles differential circuit breaker:
  Nominal voltage: 400 VAC.
  Nominal current: 40 A.
  Type AC.
  Sensitivity: 30 mA.
  Input terminals.
  Output terminals.


N-TDIF4-40/30C

- N-TDIF. **Three-phase Differential Protection Module.**
  Three-phase four poles differential circuit breaker:
  Nominal voltage: 400 VAC.
  Nominal current: 25 A.
  Type AC.
  Sensitivity: 30 mA.
  Input terminals.
  Output terminals.


N-TDIF

- N-TMT4-20B. **Automatic Three-Phase Circuit Breaker Module 4P, 20 A, Curve B.**
  Three-phase four poles magneto-thermal switch:
  Nominal voltage: 400 VAC.
  Nominal current: 20 A.
  Curve type B.
  Input terminals.
  Output terminals


N-TMT4-20B

- N-TMT4-16C. **Automatic Three-Phase Circuit Breaker Module 4P, 16 A, Curve C.**
  Three-phase four poles magneto-thermal switch:
  Nominal voltage: 400 VAC.
  Nominal current: 16 A.
  Curve type C.
  Input terminals.
  Output terminals


N-TMT4-16C

- N-TMT3-63D. **Automatic Three-Phase Circuit Breaker Module 3P, 63 A, Curve D.**
  Three-phase three poles magneto-thermal switch:.
  Nominal voltage: 400 VAC.
  Nominal current: 63 A.
  Curve type D.
  Input terminals.
  Output terminals.


N-TMT3-63D

- N-TMT3-25C. **Automatic Three-Phase Circuit Breaker Module 3P, 25 A, Curve C.**
  - Three-phase three poles magneto-thermal switch:
    - Nominal voltage: 400 VAC.
    - Nominal current: 25 A.
    - Curve type C.
  - Input terminals.
  - Output terminals.


N-TMT3-25C

- N-SMT2-20C. **Automatic Circuit Breaker Module 1PH, 2P, 20 A, Curve C.**
  - Single-phase two poles magneto-thermal switch:
    - Nominal voltage: 230 VAC.
    - Nominal current: 20 A.
    - Curve type C.
  - Input terminals.
  - Output terminals.


N-SMT2-20C

- N-SMT2-16C. **Automatic Circuit Breaker Module 1PH, 2P, 16 A, Curve C (2 units).**
  - Single-phase two poles magneto-thermal switch:
    - Nominal voltage: 230 VAC.
    - Nominal current: 16 A.
    - Curve type C.
  - Input terminals.
  - Output terminals.


N-SMT2-16C

- N-SMT2-10C. **Automatic Circuit Breaker Module 1PH, 2P, 10 A, Curve C.**
  - Single-phase two poles magneto-thermal switch:
    - Nominal voltage: 230 VAC.
    - Nominal current: 10 A.
    - Curve type C.
  - Input terminals.
  - Output terminals.


N-SMT2-10C

- N-INT22. **Two-way Surface-Mounted Switches Module (2 units).**
  - Two two-way surfaced mounted switches:
    - Connections: 2302P + T.
    - IP55.
    - Nominal voltage: 230 VAC.
  - Input terminals for the first switch.
  - Output terminals for the first switch.
  - Input terminals for the second switch.
  - Output terminals for the second switch.


N-INT22

- N-INT21. **Switch + Conmutators Group + Bell Push-button Module.**
  - Nominal voltage: 230 VAC (1PH + N).
  - Switch:
    - Switch ON / OFF.
    - Normally open contact (NO).
  - Group commutators:
    - Two commutators.
    - Two normally open contacts (NO).
  - Bell: Sound level: 83 dB.


N-INT21

- N-SSS-230. **Surface-Mounted Socket Module 1PH, 230 VAC (2 units).**
  - Two single phase surface-mounted sockets.
  - Each socket contains its line and neutral terminals.


N-SSS-230

- N-TIPS. **Industrial Surface-Mounted Socket 3PH Module.**
  - One three phase industrial surface-mounted socket.
  - Lines and neutral terminals.


N-TIPS

- N-SEL04. **Four Light Indicator Module.**
  Two red lamps.
  Input voltage: 2 terminals for each lamp of 230 VAC.
  Two green lamps.
  Input voltage: 2 terminals for each lamp of 230 VAC.


N-SEL04

- N-SMT2-25C. **Automatic Circuit Breaker Module 1PH, 2P, 25 A, Curve C.**
  Single-phase two poles magneto-thermal switch:
  Nominal voltage: 230 VAC.
  Nominal current: 25 A.
  Curve type C.
  Input terminals.
  Output terminals.


N-SMT2-25C

- N-SDIF2-25/30C. **Differential Protection Module 1PH, 2P, 25 A / 30 mA, Type AC.**
  Single-phase two poles differential circuit breaker:
  Nominal voltage: 230 VAC.
  Nominal current: 25 A.
  Type AC.
  Sensitivity: 30 mA.
  Input terminals.
  Output terminals.


N-SDIF2-25/30C

- N-SSP23-20. **Surge Protection Module 1PH, 2P, Type 3, 20 kA, 230 V.**
  Single-phase two poles surge arrester:
  Nominal voltage: 230 VAC.
  Maximum discharge current: 20 kA.
  Type 3.
  Input terminals.
  Ground terminal.


N-SSP23-20

- FP-KIT-5. **Measuring Kit.**
  Clamp meter:
  Clamp for alternating/direct current measurements contactless.
  The clamp can measure:
  Current.
  Voltage.
  Resistance.
  A voltage and continuity tester:
  Voltage range: 12 – 690 VAC.
  Polarity tester.
  Phases rotating detection in three-phase systems.


FP-KIT-5

- MED65. **Digital Multimeter.**
  This 3 ½ digit digital multimeter, with double-jack ending cables of about 4 mm to facilitate interconnections.
  With this digital multimeter we will be able to measure:
  Voltage.
  Current.
  Resistance.
  Capacitors capacity.
  Temperature.


MED65

- **Electrical Polarity Tester.**
  Electrical polarity tester is an adapter that provides information about the phase position and the presence of the P-N voltage.
  Nominal voltage: 230 VAC.

- **Franklin Tip.**
  Single aluminum Franklin tip.

- **All necessary cables to realize the practical exercises are included.**

Cables and accessories, for normal operation.

Manuals:
This unit is **supplied with the following manuals:** Required services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices manuals.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Wiring and testing of the fuses of a General Protection Box.
2.- Wiring and energy measurement of a network analyzer with a resistive load.
3.- Identification, classification and testing of electrical protection elements of an electrical installation.
4.- Wiring and testing of the elements contained by a residential control and protection panel.
5.- Wiring and test of lights with a simple switch with different connections.
6.- Wiring and lighting a lamp with two commutators.
7.- Wiring and lighting four lamps with two double way switches.
8.- Wiring and testing of residential and industrial sockets.
9.- Wiring and testing of a complete electrical installation.
10.- Study of the importance of selectivity in protections of a low voltage electrical installation.
11.- Verification of the correct operation of an electrical installation.
- Several other exercises can be done and designed by the user.

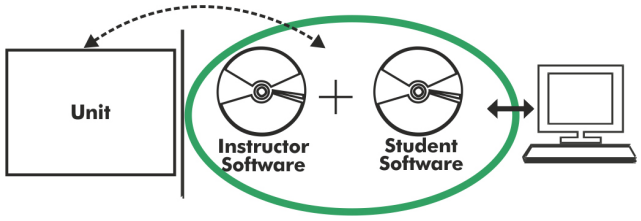
REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz, 3 kW.

DIMENSIONS AND WEIGHTS

AEL-PMEI:
- Dimensions: 1500 x 400 x 1800 mm approx.
  (59.05 x 15.74 x 70.86 inches approx.)
- Weight: 80 Kg approx.
  (176 pounds approx.)

AEL-PMEI/ICAI. Interactive Computer Aided Instruction Software:



With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF)**. Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

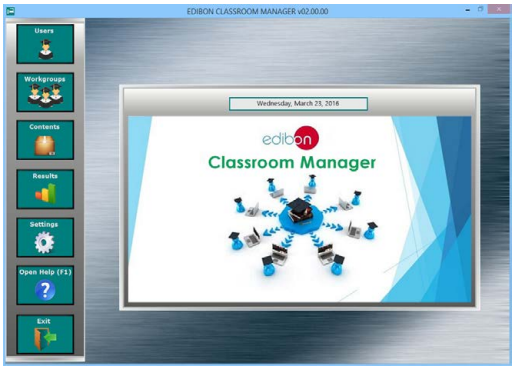
Instructor Software

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

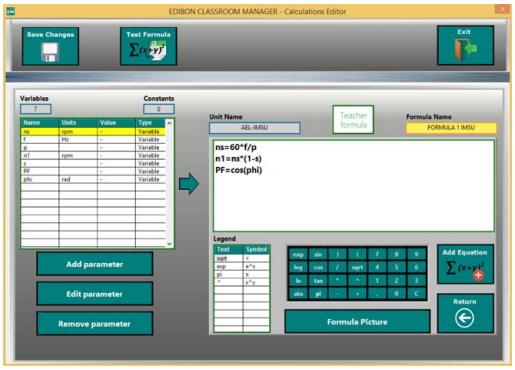
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

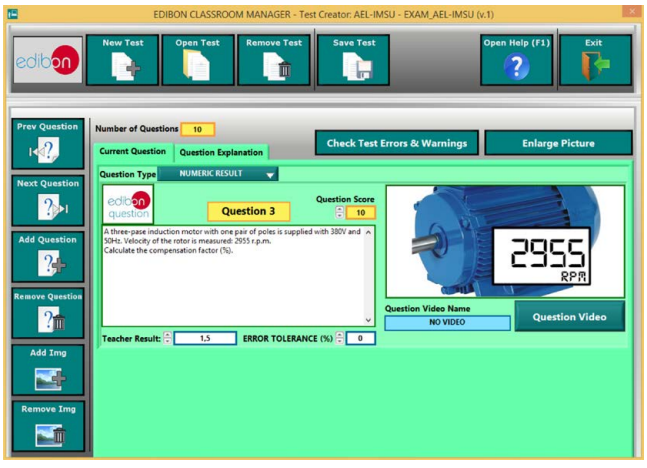
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation System Solver Engine.**
- **Updatable Contents.**
- **Report generation, User Progression Monitoring and Statistics.**



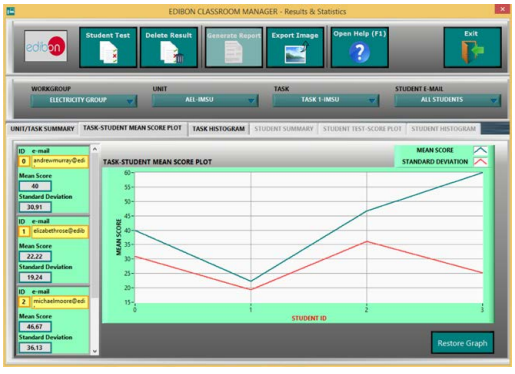
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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



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

Optional

Student Software

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

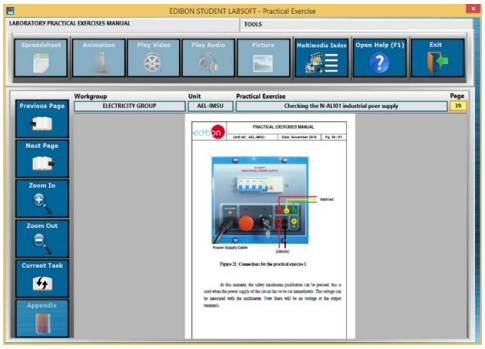
ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge and progression.**
- **Test self-correction.**
- **Calculations computing and plotting.**
- **Equation System Solver Engine.**
- **User Monitoring Learning & Printable Reports.**
- **Multimedia-Supported auxiliary resources.**

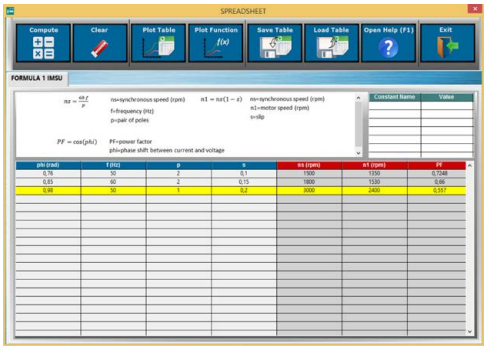
For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/interactive-computer-aided-instruction-software

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



EPE. EDIBON Practical Exercise Program Package Main Screen

ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

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

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