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↳ PRODUCTS
↳ 40.- ELECTRICITY

INTRODUCTION

In an industrial electrical system, one of the objects to study are faults in a three-phase system. When a fault happens, it affects at the rest of the electric system because it produces a very increase current which also affects at the voltages of the rest of the equipment connected to the same grid, this means if we have a short circuit, we could damage the rest of the charges of the same electrical system. In addition, the safety of persons is very important in this kind of installations. Therefore, the study of some kind of protections and the selectivity is very significant.



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



European Union Certificate (total safety)



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



"Worlddidac Quality Charter" and Platinum Member of Worlddidac

GENERAL DESCRIPTION

The Three-phase Installations Faults Application, "AEL-AD33T", has been designed to study several protections belonging to industrial installations. Through safety elements, the students can simulate different faults and verify the reasons why each type of protection acts.

It includes some innovative electric devices for the protection of people and installations against the effects of electric current, which ensure the continuity of power availability, as well as people safety. It includes a three-phase transformer in order to simulate earth derivations under safety conditions.

It is also possible to change the configuration of ground connection of the charges connected to the system. Some of those configurations are: TN, IT, TN-S, TN-C, TN-C-S.

Besides, the following protections are included: protection by earthing, protection by differential circuit breaker with automatic reset and protection by differential circuit breaker with variable sensitivity.

To check all protections, a variable resistor is included to control current derivations. It also has meters to know the amount of derivation current and verify the sensitivity of the protections.

The AEL-AD33T includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-MED65. Digital Multimeter.
- N-TRANS03. Three-Phase Autotransformer 400/230 VAC, 1 kVA.
- 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-FAULT. Fault Injection Module with Human Body Impedance Selector.
- N-TSTF3. Tester Protection module (3-phase).
- N-MVA. Analog Voltmeter.
- N-MCA. Analog Ammeter.

Similar applications available:

- AEL-AD33. Single-Phase Installations Faults Application.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-AD33T/ICAI) to reinforce knowledge about this field.

This software is formed by:

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

The application AEL-AD33T can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following rack:

- 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.

SPECIFICATIONS

The application includes the following modules:

- **N-ALI01. Domestic Main Power Supply.**

Supply voltage: 400 VAC, 3PH+N+G.

ON-OFF removable key.

Output voltage connections:

Three-Phase + Neutral: 400 VAC.

Single-Phase: 230 VAC.

Three-Phase supply hose with IP44 3PN+E 32A 400 V connecting plug.

Differential magnetothermal, 4 poles, 25 A, 300 mA AC 6 KA.



N-ALI01

- **N-MED65. Digital Multimeter.**

This module has a digital multimeter of about 3 ½ digits, 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.



N-MED65

- **N-TRANS03. Three-Phase Autotransformer 400/230 VAC, 1 kVA.**

Three-phase autotransformer.

Nominal supply voltage: 400 VAC (3PH).

Nominal output voltage: 3 x 230 VAC (3PH+N).

Nominal power: 1 kVA.

Free configuration (delta, star and zig-zag).

Start/stop commutator for instantaneous connection/disconnection of the grid transformer.

Fuses: 3 x 5 A.



N-TRANS03

- **N-TDIF. Three-phase Differential Protection.**

Rated voltage: 380 VAC.

Rated current: 25 A.

Sensitivity: 30 mA.

L, N: current inlet terminals.

L, N: current outlet terminals.



N-TDIF

- **N-TDIFVS. Three-phase Differential Protection with variable sensitivity.**

Inputs:

Auxiliary voltage UH: AC/DC 12 V, AC/DC 24 ... 380 V.

Voltage range: AC:

0.8 ... 1.1 UN.

DC: 0.9 ... 1.25 UN.

Nominal frequency UH: 50 ... 400 Hz.

Nominal consumption:

AC 230 V: 4 VA.

AC 24 V: 1.6 VA.

DC 24 V: 1 W.

Measuring value adjustable via rotational switch:

AC 0.01; 0.03 A; 0.1 A; 0.3 A; 0.6 A; 1 A; 2 A; 5 A; 10 A.

Frequency range: 20 Hz ... 2 kHz at failure current < 50 Hz and the "auto reset" function, a time delay must be adjusted, so that the relay does not buzz before switching.

Hysteresis: approx. 4% of trip value, fixed.

Accuracy: $\leq \pm 15\%$.

Repeat accuracy: $\leq \pm 1\%$.

Temperature drift: $\leq \pm 0,05\% / K$.

Reaction time: 10 ... 30 ms.

Response delay t_v : 0 ... 10 s adjustable (logarithmic scale in order to allow also short time delay to be adjusted without problems).



N-TDIFVS

Specifications

- **N-TDIFR. Three-phase Differential Protection with automatic resetting.**

Test button on residual current device.

Control switch.

Auto On/Auto Off selection flap:

Auto Off: recloser OFF.

REDtest = residual current device.

Auto On: recloser ON.

REDtest = residual current device + automatic restart.

Operating mode LED.



N-TDIFR

- **N-FAULT. Fault injection module with human body impedance selector.**

Fault injection push-button.

Human impedance selector: 1 Ω , 2 Ω , 20 Ω , 200 Ω .

Input connections (a, b).



N-FAULT

- **N-TSTF3. Leakage to ground tester module Fault.**

Fault injection push-button.

Transformer center earth connection.

Differential protection center.

Fault impedance connection.

Load connection.

Variable earth impedance.



N-TSTF3

- **N-MVA. Analog Voltmeter.**

Range: 0-150 VAC.

Input terminals: Va, Vb.

Accuracy: 1.5 %.

Scale: 90 °.



N-MVA

- **N-MCA. Analog Ammeter.**

Range: 0-500 mA

Input terminal: Va.

Output terminal: Vb.

Accuracy: 1.5 %

Scale: 90 °.



N-MCA

- **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.- Study of basic concepts of three-phase differential protection.
- 2.- Study of three-phase differential protection with variable sensitivity.
- 3.- Study of three-phase differential protection with automatic restore.
- 4.- Adjustment of sensibility of the three-phase differential protection.
- 5.- Study of short-circuits in three-phase system with basic differential protection.
- 6.- Study of short-circuits in three-phase system with short-circuit impedance and basic differential protection.
- 7.- Study short-circuits in three-phase system with differential protection with variable sensitivity.
- 8.- Study short-circuits in three-phase system with short-circuit impedance and differential protection with variable sensitivity.
- 9.- Study short-circuits in three-phase system with differential protection with automatic restore.
- 10.- Study short-circuits in three-phase system with short-circuit impedance and differential protection with automatic restore.
- 11.- Study of isolation coordination.
- 12.- Checking the differences between some different grid system configurations in the face of disturbances.

REQUIRED SERVICES

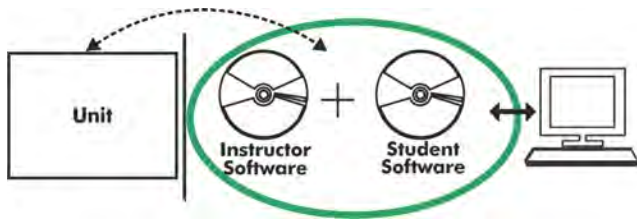
- Electrical supply: three-phase, 380V/50 Hz or 208V/60 Hz, 20 Kw.

DIMENSIONS AND WEIGHTS

- AEL-AD33T:
- Dimensions: 640 x 320 x 920 mm approx.
(25.19 x 12.59 x 32.22 inches approx.)
 - Weight: 60 Kg approx.
(132 pounds approx.)

Optional

AEL-AD33T/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer (PC), 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.

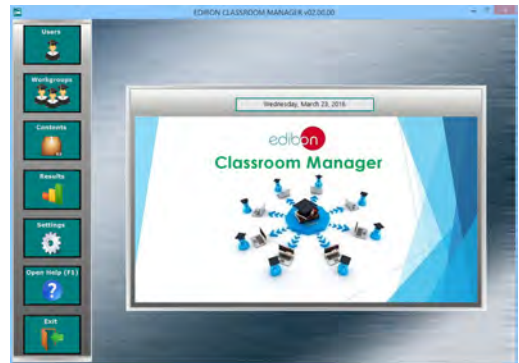
Instructor Software

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

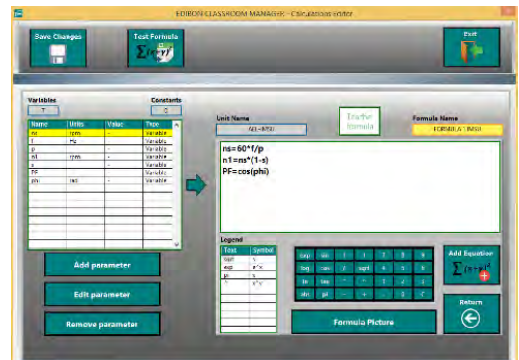
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

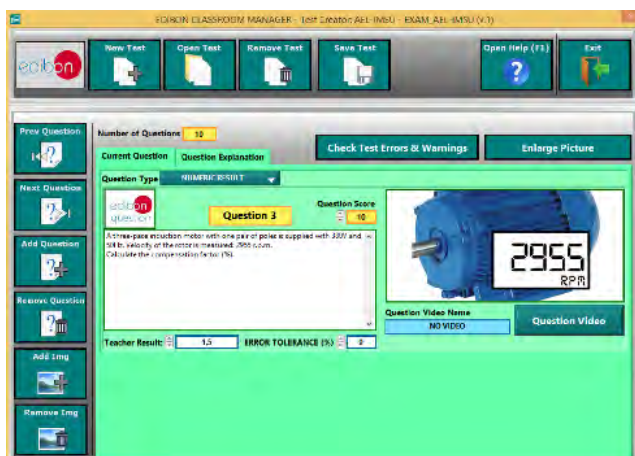
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



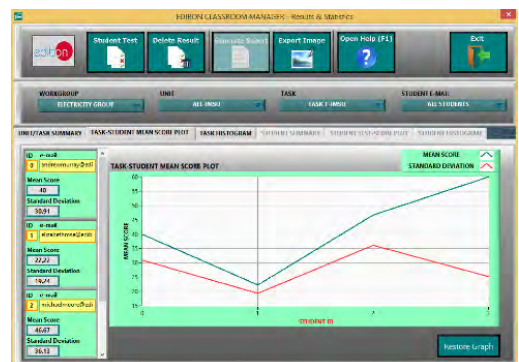
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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

