



① Unit: AEL-SST-02. Switching Substation Protection Trainer

Key features:

- **Advanced Real-Time PSV-SCADA.**
- **Open Control + Multicontrol + Real-Time Control.**
- **Specialized EDIBON Control Software based on LabVIEW.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Capable of doing applied research, real industrial simulation, training courses, etc.**
- **Remote operation and control by the user and remote control for EDIBON technical support, are always included.**
- **Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).**
- **Designed and manufactured under several quality standards.**
- **Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc.**
Apart from monitoring user's knowledge and progress reached.
- **This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.**



For more information about Key Features, click here



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)



Certificate and Worlddidac Member

GENERAL DESCRIPTION

The AEL-SST-02 Switching Substation Protection Trainer has been designed as complement to AEL-SST-01 in order to study the performance of the protection relays most used on these types of electrical substations.

This trainer consists of a series of modules, which allow carrying out three-phase, two-phase and single-phase short circuits to analyze the performance of the time overcurrent protection relay. Besides, the AEL-SST-02 allows to study the response of this relay against these short circuits and the configuration procedure to achieve an optimum behavior and a properly selectivity.

In addition, the AEL-SST-02 has a transmission line optional module that allows studying the interconnection maneuvers between the transmission lines and switching substations.

Required Basic equipment:

- AEL-SST-01. Basic Operations in Switching Transmission Substation Trainer.

The AEL-SST-02 includes the following modules:

- N-TOPR. Time Overcurrent Protection Relay.
- N-BCT. Balancing Transformer Module.
- N-PSM. Power Switch Module.

Optional module:

- N-AE1/1K. 1KVA Transmission Line Simulator Module.

Optional SCADA software:

- PSV-SCADA. Power Systems SCADA Viewer.

Optional learning software:

In addition, Edibon provides optional software (AEL-SST-02/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-SST-02 can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following racks.

- N-RACK-B (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.

Optionally this unit is supplied with the EDIBON Computer Control System (SCADA), and includes: The unit itself + Power Systems SCADA Viewer (PSV-SCADA) + Computer Control, Data Acquisition and Data Management Software Packages, for controlling the process and all parameters involved in the process.

With this unit there are several options and possibilities:

- Main items: 1, 3 and 4.
- Optional items: 2, 5, 6 and 7.

Let us describe first the main items (1 to 4):

① **AEL-SST-02. Unit.**

Required basic equipment of AEL-SST-01:

• **N-VPS01. AC 3PH Variable Power Supply.**

- ON-OFF removable key.
- Input Voltage: 400 VAC, 3PH+N.
- Output Voltage:
 - 0...450 VAC.
 - 0...240 VDC.
- Maximum current: 2 A.
- Frequency: 50/60 Hz.
- Wheel to regulate the voltage.
- Three lamps.
- Measurement commutators:
 - One commutator to measure the voltage:
 - 6 positions: L1-N ; L2-N ; L3-N ; L1-L2 ; L1-L3 ; L2-L3.
 - One commutator to measure the current:
 - 3 positions: L1, L2, L3.
- Three-Phase supply hose with IP44 3PN+E 32A 400V connecting plug.
- Differential magnetothermal, 4 poles, 25A, 300mA AC 6KA.



N-VPS01

• **N-EALD. Network Analyzer Unit with Computer Data Acquisition.**

- ON-OFF switch.
- Supply voltage: 400 VAC.
- Input terminals: Input connection with the measurement point.
- Output terminals: Output connection with the measurement point.
- Digital outputs: Three digital outputs are used for pulses or alarms, or for combining both.
- RS-485 Communication port.
- Fuses: 3x10 A.
- Network Analyzer Display. It shows:
 - Active, reactive and apparent power.
 - Active, reactive and apparent energies.
 - Lines and phase currents.
 - Line and phase voltages.
 - Frequencies.
 - Power Factor.



N-EALD

• **N-BUS08. Distribution Busbar Module (4 units).**

- Supply Voltage: 230 VAC.
- Switch ON/OFF.
- Local/remote control switch.
- Generation double busbar module.
- Four Sliding commutators of disconnectors and circuit breaker.
- State indication lamps:
 - Two yellow lamps to indicate the state of busbars.
 - Three red lamps to indicate the state of the switch and the disconnectors.
- Communication connector SUB-D of 62 pins.



N-BUS08



N-BUS09

• **N-BUS09. Coupling busbar Module.**

- Coupling double busbar module.
- Local/remote control switch.
- Sliding commutators of disconnectors and circuit breaker.
- State indication lamp.
- ON-OFF switch.
- Communication connector SUB-D of 62 pins.



N-REVT/1K

• **N-REVT/1K. 1kW Three-Phase Resistors Module.**

- Parallel, series, star and delta connection.
- Resistance: 3 x 750 Ohm.
- Current: 3 x 2 A.

• **N-INDT/1K. 1kVA Three-Phase inductances Module.**

- Parallel, series, star and delta connections..
- Nominal Voltage: 400 VAC.
- Inductances: 1,2H; 1,6H; 2H; 2,4H; 2,8H; 3,2H.
- Currents: 0,65A; 0,5A; 0,45A; 0,35A; 0,30A; 0,25A.



N-INDT/1K

- **N-CON02. 3-Pole Contactor.**

Supply Voltage Coil: 240 VAC.

Power terminals:

3 input power terminals.

3 output power terminals.

Auxiliary contacts:

3 normally open contacts (black).

3 normally closed contacts (red).



N-CON02

- **N-REL09. Time Electronic Relay against Overcurrents (1.2 - 7 A).**

Electronic thermal relay.

Overload protection.

Range 1.2 - 7 A.

Reset and test function.

1 NONC contact.

Temporization.



N-REL09

The AEL-SST-02 includes the following modules:

- **N-TOPR. Time Overcurrent Protection Relay.**

Nominal frequency: 50 to 60 Hz.

Thermal load capacity of current circuit:

Surge current (half-wave) 250x I_N.

for 1s 100x I_N

for 10s 30x I_N

continuous 4x I_N

Output relay:

Switch-on current: 20 A.

Nominal current: 5 A.

Max. contact rating:

1250 VA/DC; 120W/DC, ohmic.

500VA/AC; 75W/DC, inductive.

Trip parameters:

$I > 0.5-2x I_N$

$I > 1-15x I_N$

$tI > 0-100s$

$tI > 0-2.5s$.

RS 485.



N-TOPR

- **N-BCT. Balancing Transformers Module.**

Input current: 1 A.

Output current: 1 A.

Power voltage: 5 VA.



N-BCT

- **N-PSM. Power Switch Module.**

The voltage can be switch on and off manually or automatically.

Nominal voltage: 230/400V.

Frequency: 50/60Hz.

Control voltage: 24V.

Nominal operating current: 15 A.

Functions: 2 pushbutton switches and remote control for switch-off relay.

Contacts:

Three normally open contact.

One auxiliary normally open contact.



N-PSM

Optional module:

- **N-AE1/1K. 1KVA Transmission Line Simulator Module.**

Phase Resistance: 4 Ohm; 8 Ohm.

Phase Inductance: 125 mH 250 mH.

Phase Capacity:

Line-to-line: 2 x 100nF; 175nF.

Line-to-ground: 2 x 0,4μF; 0,8μF.

Maximum power: 1 kVA.

Nominal Voltage: 3 x 400V; 50/60Hz.

Maximum Current: 4,5 A.



N-AE1/1K

• All necessary cables to realize the practical exercises are included.

The complete unit and optional PSV-SCADA includes as well:

Advanced Real-Time PSV-SCADA.

Open Control + Multicontrol + Real-Time Control.

Specialized EDIBON Control Software based on LabVIEW.

Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.

Capable of doing applied research, real industrial simulation, training courses, etc.

Remote operation and control by the user and remote control for EDIBON technical support, are always included.

Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).

Designed and manufactured under several quality standards.

Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc.

Apart from monitoring user's knowledge and progress reached.

This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.

② **PSV-SCADA. Power Systems SCADA Viewer.**

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.

It allows the registration of the alarms state and the graphic representation in real time.

Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

Open software, allowing the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access to different work levels.

This unit allows the 30 students of the classroom to visualize simultaneously all the results and the manipulation of the unit, during the process, by using a projector or an electronic whiteboard.

③ **Cables and Accessories**, for normal operation.

④ **Manuals:**

This unit is **supplied with 7 manuals**: Required Services, Assembly and Installation, Control Software, Starting-up, Safety, Maintenance & Practices Manuals.

*References 1 to 4 are the main items: AEL-SST-02 + PSV-SCADA + Cables and Accessories + Manuals are included in the minimum supply for enabling normal and full operation.



PSV-SCADA

EXERCISES AND PRACTICAL POSSIBILITIES TO BE DONE WITH THE MAIN ITEMS

Some practical exercises possibilities with AEL-SST-01 :

- 1.- Basic wiring with double busbar.
- 2.- Analyzing of double busbar connected to load.
- 3.- Busbar changeover without interruption
- 4.- Busbar operations with circuit breakers and disconnectors.

Some practical exercises possibilities with optional modules:

- 5.- Busbar coupling
- 6.- Voltage increases on open-circuit lines.
- 7.- Voltage drop as a function of line length.
- 8.- Voltage drop as a function of $\cos\phi$.
- 9.- Capacitive and inductive power losses on a line as a function of U and I.
- 10.- Remote control operations in switching substations (with PSV-SCADA).
- 11.- Remote electrical measurements in several points of switching substation (with PSV-SCADA).

Additional practical exercises possibilities with AEL-SST-02:

- 12.- Phase shift on a line.
- 13.- Setting of the overcurrent relay.
- 14.- Double-pole short circuit.

15.- Single-pole short circuit.

16.- Triple-pole short circuit.

Other possibilities to be done with this Unit:

17.- Many students view results simultaneously.

To view all results in real time in the classroom by means of a projector or an electronic whiteboard.

18.- The Computer Control System with PSV-SCADA allows a real industrial simulation.

19.- This unit is totally safe as uses mechanical, electrical and electronic, and software safety devices.

20.- This unit can be used for doing applied research.

21.- This unit can be used for giving training courses to Industries even to other Technical Education Institutions.

- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

AEL-SST-02:

-Dimensions: 2000 x 400 x 2000 mm. approx.
(78.74 x 15.75 x 78.74 inches approx.)

-Weight: 50 Kg. approx.
(110 pounds approx.)

AVAILABLE VERSIONS

Offered in this catalogue:

- AEL-SST-02. Switching Substation Protection Trainer.

Offered in other catalogue:

- AEL-SST-01. Basic Operations in Switching Transmission Substation Trainer.

Additionally to the main items (1, 3, 4) described, we can offer, as optional, other items 2 and from 5 to 7.

All these items try to give more possibilities for:

- a) Technical and Vocational Education configuration. (ICAI)
- b) Multipost Expansions options. (Mini ESN and ESN)

a) Technical and Vocational Education configuration

⑤ AEL-SST-02/ICAI. Interactive Computer Aided Instruction Software System.

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.

This software is optional and can be used additionally to items (1 to 4).

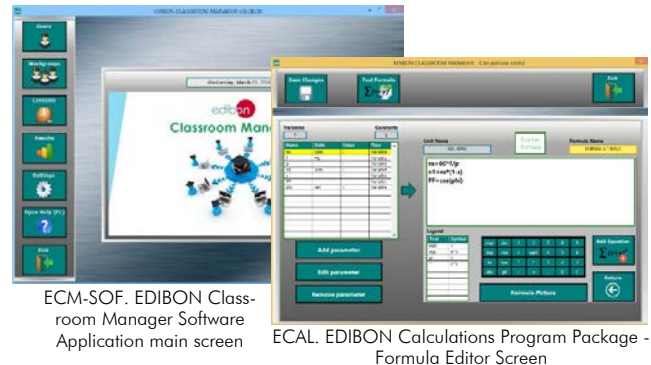
-ECM-SOF. EDIBON Classroom Manager (Instructor Software).

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

Innovative features:

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

EDIBON Classroom Manager



ECM-SOF. EDIBON Classroom Manager Software Application main screen

ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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

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

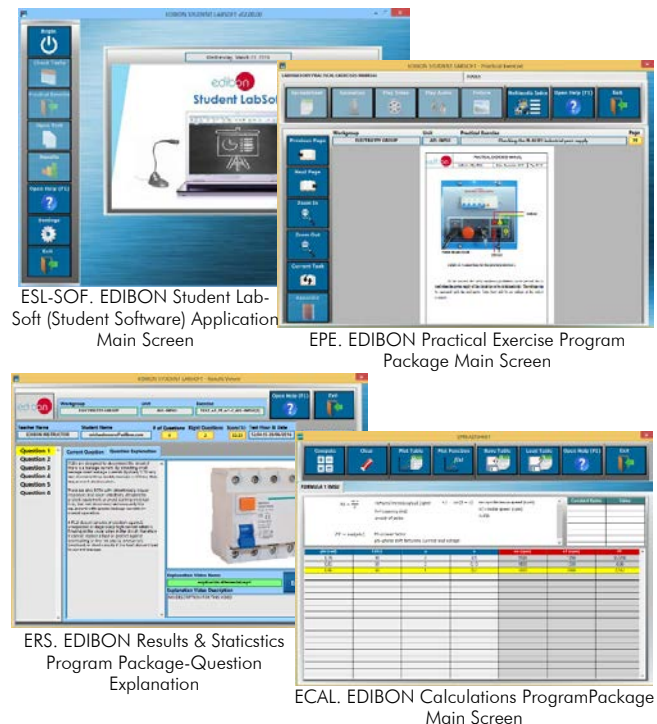
-ESL-SOF. EDIBON Student Labsoft (Student Software).

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.**

EDIBON Student LabSoft



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

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

www.edibon.com/products/catalogues/en/units/electricity/ICAI-Electricity/ICAI-Electricity.pdf

⑥ **Mini ESN. EDIBON Mini Scada-Net System.**

Mini ESN. EDIBON Mini Scada-Net System allows up to 30 students to work with a Teaching Unit in any laboratory, simultaneously.

It is useful for both, Higher Education and/or Technical and Vocational Education.

The Mini ESN system consists of the adaptation of any EDIBON computer controlled unit with SCADA integrated in a local network.

This system allows to view/control the unit remotely, from any computer integrated in the local net (in the classroom), through the main computer connected to the unit. Then, the number of possible users who can work with the same unit is higher than in an usual way of working (usually only one).

Main characteristics:

- It allows up to 30 students to work simultaneously with the EDIBON Computer Controlled Unit with SCADA, connected in a local net.
- Open Control + Multicontrol + Real Time Control + Multi Student Post.
- Instructor controls and explains to all students at the same time.
- Any user/student can work doing "real time" control/multicontrol and visualisation.
- Instructor can see in the computer what any user/student is doing in the unit.
- Continuous communication between the instructor and all the users/students connected.

Main advantages:

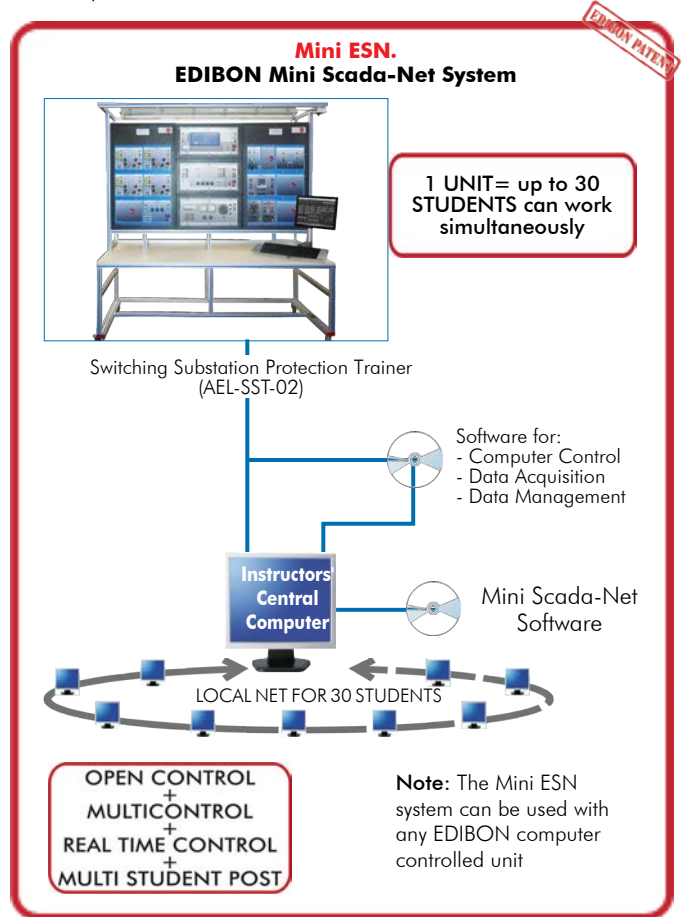
- It allows an easier and quicker understanding.
- This system allows you can save time and cost.
- Future expansions with more EDIBON Units.

For more information see Mini ESN catalogue. Click on the following link:

www.edibon.com/products/catalogues/en/Mini-ESN.pdf

⑦ **ESN. EDIBON Scada-Net System.**

This unit can be integrated, in the future, into a Complete Laboratory with many Units and many Students.



ORDER INFORMATION

Main items (always included in the supply)

Minimum supply always includes:

- ① **Unit: AEL-SST-02. Switching Substation Protection Trainer.**
- ③ **Cables and Accessories**, for normal operation.
- ④ **Manuals.**

***IMPORTANT:** Under AEL-SST-02 we always supply all the elements for immediate running as 1, 2, 3 and 4.

Optional items (supplied under specific order)

- ② PSV-SCADA. Power Systems SCADA Viewer.
 - a) Technical and Vocational configuration
- ⑤ AEL-SST-02/ICAL. Interactive Computer Aided Instruction Software System.
 - b) Multipost Expansions options
- ⑥ Mini ESN. EDIBON Mini Scada-Net System.
- ⑦ ESN. EDIBON Scada-Net System.

① AEL-SST-02. Unit.

Required basic equipment of AEL-SST-01:

- N-VPS01. AC 3PH Variable Power Supply.
 - ON-OFF removable key.
 - Input Voltage: 400 VAC, 3PH+N.
 - Output Voltage:
 - 0...450 VAC.
 - 0...240 VDC.
 - Maximum current: 2 A.
 - Frequency: 50/60 Hz.
 - Wheel to regulate the voltage.
 - Three lamps.
 - Measurement commutators:
 - One commutator to measure the voltage:
 - 6 positions: L1-N ; L2-N ; L3-N ; L1-L2 ; L1-L3 ; L2-L3.
 - One commutator to measure the current:
 - 3 positions: L1, L2, L3.
 - Three-Phase supply hose with IP44 3PN+E 32A 400V connecting plug.
 - Differential magnetothermal, 4 poles, 25A, 300mA AC 6KA.
- N-EALD. Network Analyzer Unit with Computer Data Acquisition.
 - ON-OFF switch.
 - Supply voltage: 400 VAC.
 - Input terminals: Input connection with the measurement point.
 - Output terminals: Output connection with the measurement point.
 - Digital outputs: Three digital outputs are used for pulses or alarms, or for combining both.
 - RS-485 Communication port.
 - Fuses: 3x10 A.
 - Network Analyzer Display. It shows:
 - Active, reactive and apparent power.
 - Active, reactive and apparent energies.
 - Lines and phase currents.
 - Line and phase voltages.
 - Frequencies.
 - Power Factor.
- N-BUS08. Distribution Busbar Module (4 units).
 - Supply Voltage: 230 VAC.
 - Switch ON/OFF.
 - Local/remote control switch.
 - Generation double busbar module.
 - Four Sliding commutators of disconnectors and circuit breaker.
 - State indication lamps:
 - Two yellow lamps to indicate the state of busbars.
 - Three red lamps to indicate the state of the switch and the disconnectors.
 - Communication connector SUB-D of 62 pins.
- N-BUS09. Coupling busbar Module.
 - Coupling double busbar module.
 - Local/remote control switch.
 - Sliding commutators of disconnectors and circuit breaker.
 - State indication lamp.
 - ON-OFF switch.
 - Communication connector SUB-D of 62 pins.
- N-REVT/1K. 1kW Three-Phase Resistors Module.
 - Parallel, series, star and delta connection.
 - Resistance: 3 x 750 Ohm.
 - Current: 3 x 2 A.
- N-INDT/1K. 1kVA Three-Phase inductances Module.
 - Parallel, series, star and delta connections..
 - Nominal Voltage: 400 VAC.
 - Inductances: 1,2H; 1,6H; 2H; 2,4H; 2,8H; 3,2H.
 - Currents: 0,65A; 0,5A; 0,45A; 0,35A; 0,30A; 0,25A.
- N-CON02. 3-Pole Contactor.
 - Supply Voltage Coil: 240 VAC.
 - Power terminals:
 - 3 input power terminals.
 - 3 output power terminals.
 - Auxiliary contacts:
 - 3 normally open contacts (black).
 - 3 normally closed contacts (red).
- N-RELO9. Time Electronic Relay against Overcurrents (1.2 - 7 A).
 - Electronic thermal relay.
 - Overload protection.
 - Range 1.2 - 7 A.
 - Reset and test function.
 - 1 NONC contact.
 - Temporization.

The AEL-SST-02 includes the following modules:

- N-TOPR. Time Overcurrent Protection Relay.
 - Nominal frequency: 50 to 60 Hz.
 - Thermal load capacity of current circuit:
 - Surge current (half-wave) 250x I_N.
 - For 1s 100x I_N
 - For 10s 30x I_N
 - Continuous 4x I_N
 - Output relay:
 - Switch-on current: 20 A.
 - Nominal current: 5 A.
 - Max. contact rating:
 - 1250 VA/DC; 120W/DC, ohmic.
 - 500VA/AC; 75W/DC, inductive.
 - Trip parameters:
 - I > 0.5-2x I_N
 - I > 1-15x I_N
 - tI > 0-100s
 - tI > 0-2.5s.
 - RS 485.
- N-BCT. Balancing Transformers Module.
 - Input current: 1 A.
 - Output current: 1 A.
 - Power voltage: 5 VA.
- N-PSM. Power Switch Module.
 - The voltage can be switch on and off manually or automatically.
 - Nominal voltage: 230/400V.
 - Frequency: 50/60Hz.
 - Control voltage: 24V.
 - Nominal operating current: 15 A.
 - Functions: 2 pushbutton switches and remote control for switch-off relay.
 - Contacts:
 - Three normally open contact.
 - One auxiliary normally open contact.

Optional module:

- N-AE1/1K. 1KVA Transmission Line Simulator Module.
 - Phase Resistance: 4 Ohm; 8 Ohm.
 - Phase Inductance: 125 mH 250 mH.
 - Phase Capacity:
 - Line-to-line: 2 x 100nF; 175nF.
 - Line-to-ground: 2 x 0,4μF; 0,8μF.
 - Maximum power: 1 kVA.
 - Nominal Voltage: 3 x 400V; 50/60Hz.
 - Maximum Current: 4,5 A.

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

The complete unit and optional PSV-SCADA includes as well:

Advanced Real-Time PSV-SCADA.

Open Control + Multicontrol + Real-Time Control.

Specialized EDIBON Control Software based on LabVIEW.

National Instruments Data Acquisition board (250 KS/s, kilo samples per second).

Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.

Capable of doing applied research, real industrial simulation, training courses, etc.

Remote operation and control by the user and remote control for EDIBON technical support, are always included.

Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).

Designed and manufactured under several quality standards.

Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc.

Apart from monitoring user's knowledge and progress reached.

This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.

② PSV-SCADA. Power Systems SCADA Viewer.

Compatible with the industry standards.

Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.

Management, processing, comparison and storage of data.

It allows the registration of the alarms state and the graphic representation in real time.

Open software, allowing the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access to different work levels.

This unit allows the 30 students of the classroom to visualize simultaneously all the results and the manipulation of the unit, during the process, by using a projector or an electronic whiteboard.

③ Cables and Accessories, for normal operation.

④ Manuals:

This unit is supplied with 7 manuals: Required Services, Assembly and Installation, Control Software, Starting-up, Safety, Maintenance & Practices Manuals.

Exercises and Practical Possibilities to be done with the Main Items

Some practical exercises possibilities with AEL-SST-01 :

- 1.- Basic wiring with double busbar.
- 2.- Analyzing of double busbar connected to load.
- 3.- Busbar changeover without interruption
- 4.- Busbar operations with circuit breakers and disconnectors.

Some practical exercises possibilities with optional modules:

- 5.- Busbar coupling
- 6.- Voltage increases on open-circuit lines.
- 7.- Voltage drop as a function of line length.
- 8.- Voltage drop as a function of $\cos\phi$.
- 9.- Capacitive and inductive power losses on a line as a function of U and I.
- 10.- Remote control operations in switching substations (with PSV-SCADA).
- 11.- Remote electrical measurements in several points of switching substation (with PSV-SCADA).

Additional practical exercises possibilities with AEL-SST-02:

- 12.- Phase shift on a line.
- 13.- Setting of the overcurrent relay.
- 14.- Double-pole short circuit.
- 15.- Single-pole short circuit.
- 16.- Triple-pole short circuit.

Other possibilities to be done with this Unit:

- 17.- Many students view results simultaneously.
To view all results in real time in the classroom by means of a projector or an electronic whiteboard.
 - 18.- The Computer Control System with PSV-SCADA allows a real industrial simulation.
 - 19.- This unit is totally safe as uses mechanical, electrical and electronic, and software safety devices.
 - 20.- This unit can be used for doing applied research.
 - 21.- This unit can be used for giving training courses to Industries even to other Technical Education Institutions.
- Several other exercises can be done and designed by the user.

a) Technical and Vocational Education configuration

⑤ AEL-SST-02/ICAI. Interactive Computer Aided Instruction Software System.

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.

-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.

-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.

b) Multipost Expansions options

⑥ Mini ESN. EDIBON Mini Scada-Net System.

EDIBON Mini Scada-Net System allows up to 30 students to work with a Teaching Unit in any laboratory, simultaneously.

The Mini ESN system consists of the adaptation of any EDIBON Computer Controlled Unit with SCADA integrated in a local network.

This system allows to view/control the unit remotely, from any computer integrated in the local net (in the classroom), through the main computer connected to the unit.

Main characteristics:

- It allows up to 30 students to work simultaneously with the EDIBON Computer Controlled Unit with SCADA, connected in a local net.
- Open Control + Multicontrol + Real Time Control + Multi Student Post.
- Instructor controls and explains to all students at the same time.
- Any user/student can work doing "real time" control/multicontrol and visualisation.
- Instructor can see in the computer what any user/student is doing in the unit.
- Continuous communication between the instructor and all the users/students connected.

Main advantages:

- It allows an easier and quicker understanding.
- This system allows you can save time and cost.
- Future expansions with more EDIBON Units.

The system basically will consist of:

This system is used with a Computer Controlled Unit.

- Instructor's computer.
- Students' computers.
- Local Network.
- Unit-Control Interface adaptation.
- Unit Software adaptation.
- Webcam.
- Mini ESN Software to control the whole system.
- Cables and accessories required for a normal operation.

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

REPRESENTATIVE



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