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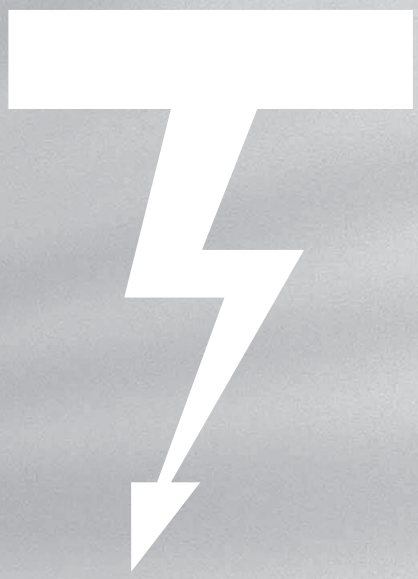

4. Electricity

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4.1- Basic Electricity

-LIELBA **Electrical Installations Integrated Laboratory:** 53-68

APPLICATIONS:

Domestic Electrical Installations

General
- •AD1A **Robbery Alarm Station.**
- •AD3A **Fire Alarm Station.**
- •AD5 **Stair Lights Timing.**
- •AD13 **Audio Door entry System.**
- •AD14 **Audio and Video Door entry System.**

Industrial Control
- •AD6A **Luminosity Control Station.**
- •AD9A **Heating Control Station.**
- •AD15A **Position Control Station.**
- •AD17A **Photoelectric Control Position Station.**
- •AD22 **Flooding Control Station.**
- •AD23 **Wireless Basic Control Station (RF).**
- •AD24 **Position Switch.**
- •AD25A **Control Station for Domestic Electric Services through the Telephone.**
- •AD28A **Integral Control Station of Domestic Electric Systems.**
- •AD30 **Gas Control Station.**

Sound
- •AD19A **Sound Station.**
- •AD31 **Movement and Sound Detection and Control.**

Instruments
- •AD8 **Blinds Activator.**
- •AD11A **Network Analyzer.**
- •AD32 **24 Vac/12 Vdc Circuits Analyzer.**
- •AD33 **Installations Faults Simulator.**

Industrial Electrical Installations

Starters and Motors
- •AI1 **Star-Delta Starter.**
- •AI2 **Starter through Auto-Transformer.**
- •AI4 **Starter-Inverter.**
- •AI5 **AC Wound Rotor Motor Starter.**
- •AI6 **DC Motor Starter.**
- •AI12 **Modular Trainer (AC Motors).**

Speed Control
- •AI3 **Speed Commutator for Dahlander Motor.**
- •AI7 **Automatic Change of Speed of a Dahlander Motor with Change of Direction.**

Electrotecnics
- •AI8 **Reactive Power Compensation (Power Factor Correction).**
- •A13 **Modular Trainer for Electrotecnics.**
- •AI13-A **Modular Trainer for Electrotecnics (RLC Circuits).**
- •AI13-B **Modular Trainer for Electrotecnics (Electrostatic Kit).**
- •AI13-C **Modular Trainer for Electrotecnics (Motors).**
- •AI13-D **Modular Trainer for Electrotecnics (Transformers).**
- •AI13-E **Modular Trainer for Electrotecnics (Lighting).**

Safety
- •AI9 **People Safety Against Indirect Electrical Contacts in TT Neutral Regimen.**
- •AI10 **People Safety Against Indirect Electrical Contacts in TN Neutral Regimen.**
- •AI11 **People Safety Against Indirect Electrical Contacts in IT Neutral Regimen.**

Energy Installations

Protection and Relays
- •AE3 **Test Unit for Magneto-Thermal Automatic Switches.**
- •AE4 **Test Unit for Differential Automatic Switches.**
- •AE5 **Relay Control Station.**
- •AE7 **Multi-Functional Electrical Protection Station.**
- •AE9 **Directional Relay:** Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection.

Measurements and Control
- •AE2 **Reactive Energy Control and Compensation.**
- •AE6 **Energy Counters Control Station.**
- •AE8 **Power & Torque Measurements of Electrical Motors.**

Lines
- •AE1A **Aerial Line Model.**

Software

-CAI **Computer Aided Instruction Software System,** additional and optional to the LIELBA Applications type "A".

-CAL **Computer Aided Learning Software (Results Calculation and Analysis),** additional and optional to the LIELBA Applications type "A".

Data Acquisition

-MUAD **Electric Power Data Acquisition System,** for being used with the LIELBA Applications type "A".

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-ELE-KITS **Electrical Installations Assembly Kits:** 69-78

- •BAS-K **Installation Cubicle.**

KITS:

Domestic Electrical Installations

General
- •KD1A **Robbery Alarm Station Kit.**
- •KD3A **Fire Alarm Station Kit.**
- •KD5 **Stair Lights Timing Kit.**
- •KD13 **Audio Door entry System Kit.**
- •KD14 **Audio and Video Door entry System Kit.**

Industrial Control
- •KD6A **Luminosity Control Station Kit.**
- •KD9A **Heating Control Station Kit.**
- •KD15A **Position Control Station Kit.**
- •KD17A **Photoelectric Control Position Station Kit.**
- •KD22 **Flooding Control Station Kit.**
- •KD23 **Wireless Basic Control Station (RF) Kit.**
- •KD24 **Position Switch Kit.**
- •KD25A **Kit of Control Station for Domestic Electric Services through the Telephone.**
- •KD28A **Kit of Integral Control Station of Domestic Electric Systems.**
- •KD30 **Gas Control Station Kit.**

Sound
- •KD19A **Sound Station Kit.**
- •KD31 **Movement and Sound Detection and Control Kit.**

Instruments
- •KD8 **Blinds Activator Kit.**
- •KD11A **Network Analyzer Kit.**
- •KD32 **24 Vac / 12 Vdc Circuits Analyzer Kit.**
- •KD33 **Installations Faults Simulator Kit.**

Industrial Electrical Installations

Starters and Motors
- •KI1 **Star-Delta Starter Kit.**
- •KI2 **Starter through Auto-Transformer Kit.**
- •KI4 **Starter-Inverter Kit.**
- •KI5 **AC Wound Rotor Motor Starter Kit.**
- •KI6 **DC Motor Starter Kit.**

Speed Control
- •KI3 **Speed Commutator for Dahlander Motor Kit.**
- •KI7 **Kit of Automatic Change of Speed of a Dahlander Motor with Change of Direction.**

Electrotecnics
- •KI8 **Kit of Reactive Power Compensation (Power Factor Correction).**

Safety
- •KI9 **Kit of People Safety Against Indirect Electrical Contacts in TT Neutral Regimen.**
- •KI10 **Kit of People Safety Against Indirect Electrical Contacts in TN Neutral Regimen.**
- •KI11 **Kit of People Safety Against Indirect Electrical Contacts in IT Neutral Regimen.**

Energy Installations

Protection and Relays
- •KE3 **Kit of Test Unit for Magneto-Thermal Automatic Switches.**
- •KE4 **Kit of Test Unit for Differential Automatic Switches.**
- •KE5 **Relay Control Station Kit.**
- •KE7 **Multi-Functional Electrical Protection Station Kit.**
- •KE9 **Kit of Directional Relay:** Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection.

Measurements and Control
- •KE2 **Kit of Reactive Energy Control and Compensation.**
- •KE6 **Energy Counters Control Station Kit.**
- •KE8 **Kit of Power & Torque Measurements of Electrical Motors.**

Lines
- •KE1 **Aerial Line Model Kit.**

Software

-CAI **Computer Aided Instruction Software System,** additional and optional to the Kits type "K".

-CAL **Computer Aided Learning Software (Results Calculation and Analysis),** additional and optional to the Kits type "K".

Data Acquisition

-MUAD **Electric Power Data Acquisition System,** for being used with the Kits type "K".

-EIV2 **Home Automation Installations Trainer.** 79

-EIV6 **Home Automation Installations Trainer.** 79

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4.2- Electricity Demonstration

-PDL **Lamps Demonstration Panel.** 79

-PDCE-P **Electric Cables Demonstration Panel (Power).** 79

-PDCE-S **Electric Cables Demonstration Panel (Signalling).** 79

-PDF **Fuses Demonstration Panel.** 79

4.3- Electrical Installations Workshop

-EIWS **Including furniture, tools, components, etc.**

4.4- Electrical Machines

-LIMEL **Integrated Laboratory for Electrical Machines:** 80-95

Electrical Machines Units

-EME **Electrical Machines Unit** (Advanced option).
-EME/M **Electrical Machines Unit** (Intermediate option).
-EME/B **Electrical Machines Unit** (Basic option).

Measurement Units

-MULT **Digital Multimeter.**
-EAL **Network Analyzer Unit (AC).**
-EALD **Network Analyzer Unit, with Computer Data Acquisition.**
-EALDG **Network Analyzer Unit, with Computer Data Acquisition+Oscilloscope Display.**
-EAL-DC **Network Analyzer Unit (DC).**
-EAM-VA **Analog Measurement Unit.**
-MUAD **Electric Power Data Acquisition System.**

Loads

-RCL3R **Resistive, Inductive and Capacitive Loads Module.**
-Individual elements:
-IND. **Inductance Module.**
-CON. **Capacitors Module.**
-REV. **Variable Resistance Module.**
-REV-T. **Three-phase Variable Resistance Module.**
-REF. **Fixed Resistance Module.**

Motors

Motors (D.C.)
-EMT1 **D.C. Independent excitation motor-generator.**
-EMT2 **D.C. Series excitation motor-generator.**
-EMT3 **D.C. Shunt excitation motor-generator.**
-EMT4 **D.C. Compound excitation motor-generator.**
-EMT5 **D.C. Shunt-series compound excitation motor.**
-EMT12 **Universal motor (single-phase).**
-EMT15 **D.C. Permanent magnet motor.**
-EMT18 **D.C. Brushless motor.**
-EMT19 **Stepper motor.**
Motors (A.C.)
-EMT6 **A.C. Synchronous three-phase motor alternator.**
-EMT6B **Permanent magnets synchronous three-phase generator (24 Vac).**
-EMT7 **Asynchronous three-phase motor of squirrel cage.**
-EMT7B **Asynchronous three-phase motor of squirrel cage (4 poles).**
-EMT7C **Asynchronous three-phase motor of squirrel cage (8 poles).**
-EMT8 **Asynchronous three-phase motor with wound rotor.**
-EMT9 **Dahlander three-phase (two-speeds).**
-EMT10 **Asynchronous three-phase motor of two independent speeds.**
-EMT11 **Asynchronous single-phase motor with starting capacitor.**
-EMT12 **Universal motor (single-phase).**
-EMT14 **Repulsion motor, single-phase with short-circuited brushes.**
-EMT16 **Asynchronous single-phase motor with starting and running capacitor.**
-EMT17 **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.**

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Brakes

-FRE-FE **Electronic Brake.**
-DI-FRE **Pendular Dynamo Brake.**
-EMCC **Load Cell Module.**
-FREND **Dynamo Brake.**
-FRENP **Magnetic Powder Brake.**
-FREPR **Prony Brake.**
-FRECP **Eddy Current Brake.**

Transformers

-ETT **Three-phase and single-phase Transformers Unit.**
-TPPT **Three- phase Power Transformer Unit.**
-EMPTA **Auxiliary Transformer and Protection Module.**
-AUTR **Variable Auto-transformer.**
-Individual elements:
-TRANS **Single-phase Transformer.**
-TRANS/3 **Three-phase Transformer.**

DC Motor Speed Control

-VVCC **DC Motor Speed Controller.**
-VVCC/M **DC Motor Speed Controller** (intermediate option).
-VVPP **Velocity Control for Stepper Motor** (Manual Control and Automatic Control).
-VVPP/B **Velocity Control for Stepper Motor** (Manual Control).
-Individual elements:
-VVCC/B **DC Motor Speed Controller,** with no other elements.

AC Motor Speed Control

-VVCA **AC Motor Speed Controller.**
-VVCA/M **AC Motor Speed Controller** (intermediate option).
-Individual elements:
-VVCA/B **AC Motor Speed Controller,** with no other elements.

PLC (Programmable Logic Controller)

-PLC-PI **PLC Module for the Control of Industrial Processes.**
-Individual elements:
-EDIBON FP-X-CPU **PLC,** with no other elements.

Tachogenerator

-TECNEL/T **Tachogenerator.**
-TECNEL/TM **Hand Tachometer.**

Software

-CAI **Computer Aided Instruction Software System.**
-CAL **Computer Aided Learning Software (Results Calculation and Analysis).**

Data Acquisition

-MUAD **Electric Power Data Acquisition System.**

-EMT-E **Motors** (available different type of motors). 96

-EMT-S **Cut Away Motors** (available different type of motors). 96

-ESAM **Faults Simulation Trainer in Electrical Motors.** 96

-ESAE **Electrical Faults Simulation Trainer.** 97

-EEA **Alternators Study Unit.** 97

-EGMG24 **Motor-Generator Group,** three-phase 24 Vac, no excitation required (permanent magnets). 97

-ERP **Protection Relays Test:** 98-101
• ERP-UB **Protection Relays Test Unit** (common for the relays modules type "ERP").

Relays Modules

• ERP-SFT **Overcurrent and Earth Fault Protection Relay Module.**
• ERP-SDND **Directional/Non Directional Overcurrent Protection Relay Module.**
• ERP-PDF **Differential Protection Relay Module.**
• ERP-MA **Feeders Management Relay Module.**
• ERP-PD **Distance Protection Relay Module.**

4.5- Electrical Machines Kits

-EMT-KIT **Disassembly Machines Kit.** 102

LIELBA. **Electrical Installations Integrated Laboratory:**

Domestic Electrical Installations

➤**General**

AD1A. **Robbery Alarm Station**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24 Vac and 24 Vdc adjustable.
DET27. Glass Break Detector.
INT32. Intrusion Switch/Detector. (2 units)
SEL03. 3 Pilot-Lights.
SEL21. Indoor Siren.
VAR07. Kit: Burglar Alarm Central + infrared ele. + battery.
Two-pole automatic differential switch and two-pole automatic thermal-magnetic switch for the security of the elements.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx. Weight: 25 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD1A.pdf

PRACTICAL POSSIBILITIES

1.- Identification of the elements of the main power supply.
2.- Checking the main power supply.
3.- Checking the auxiliary power supply.
4.- Checking the lamps and the alarm.
5.- Checking the alarm.
6.- Checking the glass break detector.
7.- Checking the infrared sensors.
8.- Checking the Burglar Alarm Central and tests.
9.- Real application, acoustic and luminous signal activation by means of detection the presence.

AD3A. **Fire Alarm Station**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
ALA02. Fire Alarm Station (with battery).
DET06. Smoke Detector for domestic control.
DET21. Fire Detector through Ionization for Central.
SEL21. Indoor Siren.
DET10. Water Electro-valve.
DET22. Fire Thermal Detector.
SEL17. Fire Indicators, Bell type.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD3A.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the station with fire detector, smoke detector and alarm.
2.- Test of the station with fire detector.
3.- Test of the station with smoke detector.
4.- Test of the station with detection of fire by the thermal detector.
5.- Activation of the electro-valve following the detection of the fire.

AD5. **Stair Lights Timing**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
CTI10. Automatic of Stairs.
INT21. Switch+Commutator Group+Bell Push-Button. (2 units)
LAM08. 2 Lamp-holders + Incandescent Lamps 40W. (2 units)
LAM13. 2 Low Consumption Fluorescent Lamps. (2 units)
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD5.pdf

PRACTICAL POSSIBILITIES

1.- Identification of the elements of the main power supply.
2.- Checking the main power supply.
3.- Test of the set from two points with incandescent lamps.
4.- Test of the set from two points with fluorescent lamps.

AD13. **Audio Door entry System**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
POR01. Phones Power Supply.
POR02. Phone.
POR03. Interphone.
POR06. Lock.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the system.
2.- To check the interphone operation.

AD14. **Audio and Video Door entry System**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
POR04. Video Camera.
POR05. Phone/Monitor and POR07.Digital Station.
POR06. Lock.
POR08. Video-Interphone Power Supply.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx. Weight: 25 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD14.pdf

PRACTICAL POSSIBILITIES

1.- Checking the main power supply (ALI02).
2.- Checking the Video-interphone power supply (POR08).
3.- Communication between Video camera (POR04) and Phone/monitor (POR05) / Digital station (POR07).
4.- Real application of an audio and video entry system.

LIELBA. **Electrical Installations Integrated Laboratory:**

Domestic Electrical Installations

➤**Industrial Control**

AD6A. **Luminosity Control Station**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
COM14. 2 Commutators.
LAM08. 2 Lamp-holders + Incandescent Lamps (40W).
REG06. Voltage Electronic Regulator (Switch) 40 to 300W/230Vac.
INT18. 1-pole Switch + 1-pole Switch with Light.
LAM10. 2 Halogen Lamps.
LAM09. Fluorescent Lamp.
SEN26. Presence and Movement Sensor (Wall).
Two-pole automatic differential switch and two-pole automatic thermal-magnetic switch for the security of the elements.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx. Weight: 40 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD6A.pdf

PRACTICAL POSSIBILITIES

1.- Control of luminosity of an halogen lamp.
2.- Control of luminosity of an incandescent lamp.
3.- Light point from a switch.
4.- Light point from two devices.
5.- Fluorescent tube.
6.- Test of the station by movement sensor.
7.- Variation of the luminous intensity.
8.- Control of the lamp using a movement sensor.
9.- Luminosity control.
10.- Station complete control.

AD9A. **Heating Control Station**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
TIM01. 2 Bell 70dB, 230V. (2 units)
SEL09. Double Luminous Signalling red-green 230Vac. (2 units)
MED76. Thermostat for Heating.
MED77. Thermostat for Heating and Refrigeration.
Two-pole automatic differential switch and two-pole automatic thermal-magnetic switch for the security of the elements.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx. Weight: 20 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD9A.pdf

PRACTICAL POSSIBILITIES

1.- Identification of the elements of the main power supply.
2.- Checking the main power supply.
3.- Checking relays.
4.- Checking the thermostat for heating and tests.
5.- Checking the thermostat for heating and refrigeration, and tests.
6.- Test with several temperatures and green light.
7.- Test with several temperatures and red light.
8.- Test with several temperatures and the siren.
9.- Test with several temperatures, red light and the siren.
10.- Test with several temperatures, green light and the siren.

AD15A. **Position Control Station**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24 Vac and 24 Vdc adjustable.
INT14. One-Pole 2 Switches.
SEL01. Light Signalling Beacons (lamps).
SEN04. Inductive Proximity Sensor type PNP.
SEN14. Cylindrical Capacitive Proximity Sensor.
SEN29. Cylindrical Inductive Proximity Sensor.
SEN01. Instantaneous Micro-switch.
SEN26. Presence and Movement Sensor (Wall).
Two-pole automatic differential switch and two-pole automatic thermal-magnetic switch for the security of the elements.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx. Weight: 25 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD15A.pdf

PRACTICAL POSSIBILITIES

1.- Identification of the elements of the main power supply.
2.- Checking the main power supply.
3.- Checking the auxiliary power supply.
4.- Checking the operation of the inductive sensor (DC).
5.- Checking the operation of the capacitive sensor.
6.- Checking the operation of the inductive sensor (AC).
7.- Bodies detection tests with inductive sensors.
8.- Bodies detection tests with capacitive sensor.
9.- Test check the movement detection of a body.
10.- Real application of a detection system.

AD17A. **Photoelectric Control Position Station**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
LAM04. 3 Push-buttons and Lamps (24Vac). (2 units).
SEN18. Cylindrical Photoelectric Sensor.
SEN19. Miniature Photoelectric Sensor.
SEN20. Compact Photoelectric Sensor.
SEN21. Barrier Photoelectric Sensor (Emitter).
SEN22. Barrier Photoelectric Sensor (Receptor).
SEN23. Reflecting Photoelectric Sensor (Emitter).
SEN24. Reflecting Photoelectric Sensor (Receptor).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the control station.
2.- Test of the detection with cylindrical sensor.
3.- Test of the detection with miniature sensor.
4.- Test of the detection with compact sensor.
5.- Assembly of the control station with battery and sensors.
6.- Test of the detection with emitters and receivers.
7.- Test with only emitters and receptors.

LIELBA. **Electrical Installations Integrated Laboratory:**

Domestic Electrical Installations

➤**Industrial Control**

AD22. **Flooding Control Station**

SPECIFICATIONS SUMMARY

The complete application is formed by Unit 1 and Unit 2:
Unit 1, in metallic box, including the following modules:
ALI02. Main Power Supply.
ALI03/B. Auxiliary Power Supply 24 Vac and 24 Vdc adjustable.
DET03. Fitted Power Supply for the flooding detector.
DET04. Flooding Detector.
SEL03. 3 Pilot-Lights.
SEL21. Indoor Siren.
Two-pole automatic differential switch and two-pole automatic thermal-magnetic switch for the security of the elements.
Unit 2, including:
DET10. Water Electro-valve.
Pump and two transparent tanks.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions:
Unit 1: 490 x 450 x 470 mm. approx. Weight: 6 Kg. approx.
Unit 2: 400 x 350 x 370 mm. approx. Weight: 3 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD22.pdf

PRACTICAL POSSIBILITIES

1.- Identification of the elements of the main power supply.
2.- Checking the main power supply.
3.- Checking the auxiliary power supply.
4.- Demonstration of the flooding detector operation.
5.- Assembly of the flooding control with a probe.
6.- Test of the flooding control.
7.- Test of the flooding control acting on the electro-valve.
8.- Test of the control acting on the siren.
9.- Demonstration of the detection system operation in a real application.

AD23. **Wireless Basic Control Station (RF)**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
DET13. Wireless Intrusion Detector RF.
DET14. Wireless Panic Push-button RF.
DET15. Wireless 1-channel Receptor RF.
DET15. Wireless 1-channel Receptor RF.
SEL01. Light Signalling Beacons.
TIM05. Bell + Buzzer.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Wireless intrusion detection and alarm.
2.- Wireless panic button alarm.

AD24. **Position Switch**

SPECIFICATIONS SUMMARY

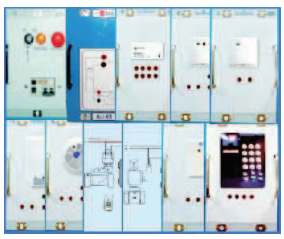
Included modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
LAM03. 3 Push-buttons and Lamps (220Vac).
SEN01. Instantaneous Micro-switch.
SEN02. MBB Micro-switch.
SEN03. BBM Micro-switch.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Instantaneous Micro-switch.
2.- MBB Micro-switch.
3.- BBM Micro-switch.

AD25A. **Control Station for Domestic Electric Services through the Telephone**



SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CTR01. Basic Control Module.
DET01. Flooding Detector.
DET03. Fitted Power Supply (gas and flooding detector). (3units)
DET04. Flooding Detector (with probe).
DET05. Gas Detector for domestic control.
DET06. Smoke Detector for domestic control.
DET10. Water Electro-valve.
DET12. Gas Electro-valve.
DET13. Wireless Intrusion Detector RF.
DET14. Wireless Panic Push-button RF.
DET15. Wireless 1-channel Receptor RF.
VAR05. Tones Dialling Telephone.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Smoke detection.
2.- Gas detection and electro-valve control.
3.- Flooding detection and electro-valve control.
4.- Temperature and Battery.
5.- Intrusion detection.
6.- Wireless detection.
7.- Complete control of home electric services through the telephone.

LIELBA. **Electrical Installations Integrated Laboratory:**

Domestic Electrical Installations

➤**Industrial Control**

AD28A. **Integral Control Station of Domestic Electric Systems**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CTR02. Advanced Control Module.
CTR05. Power Module 72W.
CTR07. Timers Module.
CTR08. Inputs Module 24V.
CTR11. Outputs Module 24V.
CTR17. Infrared Remote Control for Control Modules.
CTR18. Infrared Receptor.
DET04. Flooding Detector (with probe).
DET05. Gas Detector for domestic control.
DET06. Smoke Detector for domestic control.
DET09. Intrusion Detector for domestic control.
DET10. Water Electro-valve.
DET12. Gas Electro-valve.
VAR08. Monitor.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD28A.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the complete system with the smoke, flooding and gas detectors.
2.- Test of the station with smoke, flooding and gas detectors.
3.- To set the temporization and monitoring the results.
4.- Assembly of the complete system with infrared and instrusion detectors.
5.- Test of the station with infrared and instrusion detectors.
6.- Electro-valves activation.
7.- Wireless assembly of the sensor through infrared control

AD30. **Gas Control Station**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
DET02. Gas Detector.
DET03. Fitted Power Supply.
DET12. Gas Electro-valve.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx. Weight: 25 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AD30.pdf

PRACTICAL POSSIBILITIES

1.- Checking the main power supply (ALI02).
2.- Checking the auxiliary power supply (ALI03).
3.- Checking the fitted power supply (DET03).
4.- Gas detection.
5.- Real application of the gas control station.

➤**Sound**

AD19A. **Sound Station**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
AUD01. Analog Sound Regulator.
AUD04. Speaker of 2", 2W, 8 ohm. (3 units)
AUD06. Basic Audio Central.
AUD20. Analog Sound Regulator (mono-stereo).
AUD02. Digital Sound Regulator.
AUD05. Speaker of 4", 7W, 8 ohm. (3 units)
AUD03. Warnings Emitter Module.
AUD08. Background Music Regulator 3W.
AUD10. Double Background Music Regulator.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Mono-stereo system installation.
2.- Mono system with warnings reception.
3.- Mono-stereo system installation with warnings reception.
4.- Stereo system installation with warnings reception.
5.- Background music installation.

AD31. **Movement and Sound Detection and Control**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
INT15. 2 Switches with Light.
LAM08. 2 Lamp-holders + Incandescent Lamps 40W.
INT31. Intrusion Switch/Detector from 40 to 300W.
LAM10. 2 Halogen Lamps.
PUL22. 2 Light Push-Buttons.
TIM05. Bell + Buzzer.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Movement and sound detection controlled by switches.
2.- Movement and sound detection controlled by push-buttons.

LIELBA. **Electrical Installations Integrated Laboratory:**

Domestic Electrical Installations

➤**Instruments**

AD8. **Blinds Activator**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
INT22. 2 Switches for Blinds.
DET19. Twilight Detector.
DET20. Light Detector.
VAR01. Motor for Blinds / Curtains.
PUL29. 2 Push-Buttons Group for Blinds (without Interlock).
PUL30. 2 Push-Buttons Group for Blinds (with Interlock).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the activator (motor, detectors and switches).
2.- Blind activation by push-buttons.
3.- Blind activation by sensors.

AD11A. **Network Analyzer**

SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
MED11. AC Ammeter (0-10A).
MED25. Pointer Frequency Meter(45-65Hz).
MED32. 1-Phase Wattmeter 230V.
MED21. AC Voltmeter (0-250V).
MED30. 1-Phase Phasemeter 230V.
MED38. 1-Phase Varmeter 230V.
MED12. AC Ammeter (custom made). (3 units)
MED22. AC Voltmeter (0-400V). (3 units)
MED31. 3-Phase Phasemeter 400V. (3 units)
MED39. 3-Phase Balanced Varmeter 440V.
MED33. 3-Phase Balanced Wattmeter 440V.
MED63. Synchronoscope.
MED64. Phase Sequence Indicator.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the analyzer to measure current, voltage, frequency, active power, reactive power, sequence of phases of a 220V single-phase circuit.
2.- Assembly of the analyzer to measure current, voltage, frequency, active power, reactive power, sequence of phases of a 380V three-phase circuit.

AD32. **24 Vac/12 Vdc Circuits Analyzer**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
ALI04. DC Auxiliary Power Supply (+12, 0, -12 Vdc).
MED04. DC Milliammeter (0-600 mA).
MED05. DC Ammeter (0-1.5A).
MED08. AC Milliammeter (0-600mA).
MED09. AC Ammeter (0-2.5A).
MED15. DC Voltmeter (0-5V).
MED16. DC Voltmeter (0-50V).
MED19. AC Voltmeter (0-10V).
MED20. AC Voltmeter (0-60V).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- AC circuits analyzer (2 ranges).
2.- DC circuits analyzer (2 ranges).

AD33. **Installations Faults Simulator**

SPECIFICATIONS SUMMARY

Included modules:
ALI02. Main Power Supply.
COM14.2 Commutators. (2 units)
ENC09. 2-pole European Socket with Safety Device. (2 units)
COM21.Inverter + Group of 2 Commutators. (2 units)
LAM01. Lamps.
LAM08. 2 Lamp-holders + Incandescent Lamps 40W. (2 units)
LAM09. Fluorescent Lamp.
MED65. Digital Multimeter.
FUS04. 3 Fuse-holders 10A, 230Vac (include 2, 4,6,10A).
Fault box.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

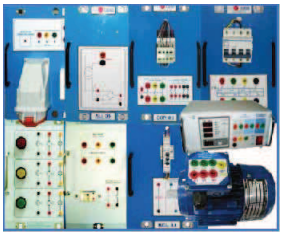
1.- Ground fault simulation of a plug base.
2.- Fault simulation between phases of a plug base.
3.- Ground fault simulation of an incandescent lamp base.
4.- Ground fault simulation of a fluorescent lamp base.
5.- Fault simulation between phases of an incandescent lamp base.
6.- To simulate fault of power-supply contact in the lamp base.
7.- To simulate fault of contact of the switch.
8.- To simulate fault of contact of the fuse.
9.- To simulate fault of contact of the fluorescent base.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤**Starters and Motors**

AI1. **Star-Delta Starter**



SPECIFICATIONS SUMMARY

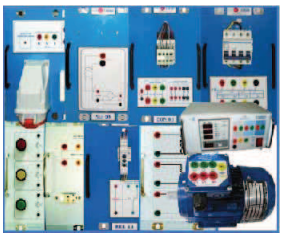
Included modules:
ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON01. 3-pole Contactor (24Vac). (3 units)
IAM20. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
MED60. Network Analyzer.
PUL04. Push-Buttons with Light (24Vac).
REL02. Thermal Relay (1.6-2.5A).
REL11. Time Relay (0.6-60 sec.).
VAR02. Motor (EMT7) (squirrel cage).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- Test of the starter with a squirrel cage motor.
3.- Measurement of the star current and delta current.
4.- Direct start of the motor. Measurement of the starting current.

AI2. **Starter through Auto-Transformer**



SPECIFICATIONS SUMMARY

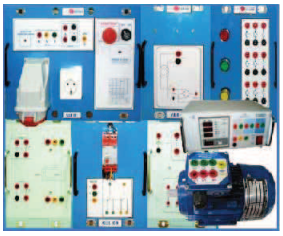
Included modules:
ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON01. 3-pole Contactor (24Vac). (3 units)
IAM20. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
MED60. Network Analyzer.
PUL04. Push-Buttons with Light (24Vac).
REL02. Thermal Relay (1.6-2.5A).
REL11. Time Relay (0.6-60 sec.).
TRA14. 3-Phase Auto-transformer.
VAR02. Motor (EMT7) (squirrel cage).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- Test of the starter with a squirrel cage motor.
3.- Measurement of both the star and delta current.

AI4. **Starter-Inverter**



SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON02. 3-pole Contactor (220Vac).
CON11. 3-pole Contactor- Inverter (220Vac).
MED60. Network Analyzer.
PUL03. Push-Buttons with Light (220Vac). (2 units)
REL05. Thermal Relay/3-pole Phase fault (0.8-1.2A).
VAR02. Motor (EMT7) (squirrel cage).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- To test of the direct start of a squirrel cage motor.
3.- To invert the rotation direction of the motor.

AI5. **AC Wound Rotor Motor Starter**

SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
VAR06. Motor (EMT8) (wound rotor).
CAR22. AC Starting Rheostat.
IAM20. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
CON01. 3-pole Contactor (24Vac).
PUL04. Push-Buttons with Light (24Vac).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

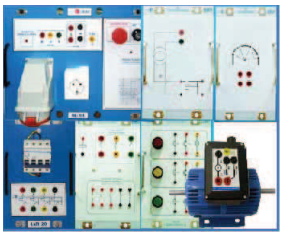
1.- Assembly of the starter.
2.- To test the starter changing the resistances step by step.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤**Starters and Motors**

AI6. **DC Motor Starter**



SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.
ALI04. DC Auxiliary Power Supply (+12, 0, -12 Vdc).
VAR04. Motor (EMT5) (DC motor).
CAR23. DC Starting Rheostat.
IAM20. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
CON03. 3-pole Contactor (12Vdc).
PUL04. Push-Buttons with Light (24Vac).
CAR20. Diodes and Thyristors.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Direct starter.
2.- Starter rheostat.

AI12. **Modular Trainer (AC Motors)**

SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
PUL48. 3 Double Chamber Push-buttons. (2 units)
LAM02. Auxiliary Lamps(3 lamps).
CON01. 3-pole Contactor (24Vac). (4 units)
VAR09. Frequency variator.
REL30. Synchronization Relay (variable delay).
REL47. Thermal Relay Module (2 units)
REL45. Module with disjunctor.
IAM31. 4-pole Magneto-thermal Automatic Switch, 4A, Curve C.
FUS10. Module with 3 Fuse-holders and Power Fuses.
TRA06. 3-Phase Power Transformer (custom made).
CAR10. Capacitive Load (custom made).
VAR02. Motor (EMT7) (squirrel cage).
VAR03. Motor (EMT9) (Dahlander motor).
VAR15. Single-phase Capacitor Motor (EMT16).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI12.pdf

PRACTICAL POSSIBILITIES

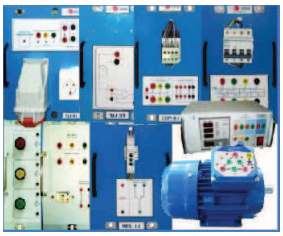
1.- Identification of the main power supply elements.
2.- Study of the elements in the control of AC motors.
3.- Study of the protection elements for AC motors.
4.- Direct starting of a three-phase motor through contactor, with some stop and start push-buttons.
5.- Configuration of a magnetic protection 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.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤Speed Control

AI3. **Speed Commutator for Dahlander Motor**



SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON01. 3-pole Contactor (24Vac). (3 units)
IAM20. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
MED60. Network Analyzer.
PUL04. Push-Buttons with Light (24Vac).
REL02. Thermal Relay (1.6-2.5A).
REL11. Time Relay (0.6-60 sec.).
VAR03. Motor (EMT9) (Dahlander motor).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the commutator.
2.- Test of the commutator changing the speed of a Dahlander motor.
3.- Measurement of the voltage and current.

AI7. **Automatic Change of Speed of a Dahlander Motor with Change of Direction**

SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
IAM24. 3-pole+neutral Magneto-thermal Automatic Switch, 6A, Curve C.
CON01. 3-pole Contactor (24Vac). (5 units)
REL05. Thermal Relay/3-pole Phase fault (0.8-1.2A). (2 units)
PUL16. Push-Button for Industrial use (NC Contacts). (5 units)
PUL16. Push-Button for Industrial use (NO Contacts). (5 units)
VAR03. Motor (EMT9) (Dahlander motor).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set.
2.- Motor starting with right turning direction at high speed. R.p.m and consumption measurements.
3.- Motor stop and change to left the turning direction at high speed.
4.- Change to low speed.
5.- Motor stop and change to right the turning direction.
6.- Change to high speed. R.p.m and consumption measurements.

➤Electrotecnics

AI8. **Reactive Power Compensation (Power Factor Correction)**

SPECIFICATIONS SUMMARY

This application includes:
AI8 unit, in metallic box, including:
Three-phase AC power supply.
Variable resistive load (variable resistance), 500 W, variable up to 150 Ω by a rheostat.
Two coils with inductive loads of 33, 78, 140, 193 and 236 mH, each one.
Three banks of of 4 capacitors of 7 mF, each one.
Ground connection.
Protection fuses (3.15A).
EAL. Network Analyzer Unit.
This unit shows the main electric parameters on the electric network through the interface and an parameter selection.
Metallic box.
3 current inputs, for series intensity.
3 voltage terminals, for each phase (R,S,T) measure and another one for the connection.
Control and visualization digital display.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.):
AI8. Unit: 490 x 330 x 310 mm. Weight: 30 Kg.
EAL. Unit: 300 x 180 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI8.pdf

PRACTICAL POSSIBILITIES

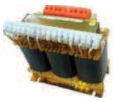
1.- Measurement of active power consumed by a receiver (resistive circuit).
2.- Measurement of the inductance of a coil.
3.- Measurement of the reactance XL considering RL.
4.- Measurement of reactive power consumed by a receiver (inductive circuit).
5.- Measurement of reactive power consumed by a receiver (capacitive circuit).
6.- Measurement of apparent power consumed by a receiver.
7.- Measurement of power factor of a receiver.
8.- Measurement of active energy consumed by a receiver.
9.- Measurement of reactive energy consumed by a receiver.
10.- Compensation of reactive energy (improvement of the power factor).
11.- Comparison of the active energy consumed after the compensation.
12.- Comparison of the reactive energy consumed after the compensation.
13.- Measurement of power factor after the compensation.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤**Electrotecnics**

AI13. **Modular Trainer for Electrotecnics**



SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.
ALI10. Power Supply Module.
CAR30. Inductances Module.
CAR31. Capacitors Module.
CAR32. Rectifier Diodes Module.
CAR33. Resistive Components Module.
LAM26. Lighting Module.
LAM09. Fluorescent Lamp.
MED65. Digital Multimeter.
REL50. Relays Module.
TRA28. Three-phase Transformer.
VAR17. Dismantled Transformer Kit.
VAR15. Single-phase Capacitor Motor (EMT16).
VAR02. Motor (EMT7) (squirrel cage).
VAR25. Open Universal Motor (EMT12).
VAR16. Electromagnetism Kit with Group of Motor/ Generator.
VAR18. Electrostatic Kit.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI13.pdf

PRACTICAL POSSIBILITIES

Static Electricity:
1.-Electrostatic demonstration on several materials.
2.-The Electroscope.
3.-The Acetate.
4.-Sign of the charge.
5.-Static electricity checking, with an electroscope and an electrometer.
6.-Static electricity experiments.

Magnetism, Electromagnetism and Electromagnetic Induction:
7.-Electromagnetic induction.
8.-Electromagnet: Oersted´s experiment.
9.-The electromagnetic field (Electromagnets).

Direct current (DC) and Alternating Current (AC):
10.- Ohm´s law verification.
11.- Resistance measurement.
12.- Resistors in series association.
13.- Resistors in parallel association.
14.- Power measurement of a resistive circuit.
15.- Analysis of the variable resistances response curve.
16.- Voltage divider analysis.
17.- Simplification systems; Application of Kirchhoff´s first law. Application of Kirchhoff´s second law. Thevenin´s and Norton´s Theorem.
18.- Application of the superposition theorem.
19.- Coils in series association.
20.- Coils in parallel association.
21.- Measurement and visualization of the alternating current.
22.- Measurement of the phase angle among voltages (AC).
23.- Resistive circuits in delta.
24.- Resistive circuits in star.
25.- Star/delta transformation.
26.- Delta/star transformation.
27.- Lamp with variable lighting.
28.- Connection of lamps in series.
29.- Connection of lamps in parallel.

Electric capacity:
30.- Capacity measurement of a capacitor.
31.- Capacitors series association.
32.- Capacitors parallel association.
33.- Charge analysis of a capacitor.
34.- Dischange analysis of a capacitor.

Dynamic Electricity:
35.- Identification of the components of the trainer.
36.- Preparation of the power supply and of the measurement instruments.

Motors:
37.- Electric motors.
38.- Generators.
39.- Single-phase motor.
40.- Universal motor.
41.- Squirrel-cage three-phase motor.
42.- Identification, coils measurement and starting-up of a single-phase motor.
43.- Identification, measurement and starting-up of an universal motor.
44.- Identification, coils measurement and starting-up of a three phase motor.
45.- Electric energy into mechanic energy conversion.
46.- Mechanic energy into electric energy conversion.
47.- Electric energy into magnetic energy conversion.
48.- Magnetic induction: Lenz´s Law.

Transformers:
49.- Assembling the transformer.
50.- Back transformer.
51.- Boost transformer.
52.- Auto-transformer.
53.- Experiments and practices with a dismantled transformer.
54.- Identification of the three-phase transformer.
55.- Connection as single-phase transformer.
56.- Star/star three-phase connection.
57.- Reverse star/star three-phase connection.
58.- Direct delta/delta three-phase connection.
59.- Star/delta three-phase connection.
60.- Three-phase/six-phase connection.
61.- Transformer with coils in series in phase.

RL, RC and RCL Circuits:
62.- Time constant.
63.- Analysis of a RL circuit in series.
64.- Analysis of a RL circuit in parallel.
65.- Analysis of a RC circuit in series.
66.- Analysis of a RC circuit in parallel.
67.- Analysis of a RCL circuit in series.
68.- Analysis of a RCL circuit in parallel.

Rectification and filtrate:
69.- Low-pass filter.
70.- High-pass filter.
71.- Analysis of the rectifier diode response curve.
72.- Half wave rectification.
73.- Full wave rectification.
74.- Rectification to feed the universal motor.
75.- Double wave rectification with two windings.
76.- Double wave rectification with a Graezt's bridge.
77.- Half wave three-phase rectification.
78.- Three-phase rectification in bridge.

Electric circuits of application:
79.- Basic electric installation with lamps.
80.- Lamps controlled by a switch or a push button.
81.- Lamps controlled from two points
82.- Lamps controlled from three points.
83.- Lamps control by a switch relay.
84.- Lamps control by a commutator relay.
85.- Acoustic circuit.
86.- Fluorescent tube.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤**Electrotecnics**

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

SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.

ALI10. Power Pupply Module.

CAR30. Inductances Module.

CAR31. Capacitors Module.

CAR32. Rectifier Diodes Module.

CAR33. Resistive Components Module.

MED65. Digital Multimeter.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions: 490 x 450 x 470 mm. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI13-A.pdf

PRACTICAL POSSIBILITIES

Direct current (DC) and Alternating Current (AC):

1.- Ohm´s law verification.
2.- Resistance measurement.
3.- Resistors in series association.
4.- Resistors in parallel association.
5.- Power measurement of a resistive circuit.
6.- Analysis of the variable resistances response curve.
7.- Voltage divider analysis.
8.- Simplification systems: Application of Kirchhoff´s first law. Application of Kirchhoff´s second law. Thevenin´s and Norton´s Theorem.
9.- Application of the superposition theorem.
10.- Coils in series association.
11.- Coils in parallel association.
12.- Measurement and visualization of the alternating current.
13.- Measurement of the phase angle among voltages (AC).
14.- Resistive circuits in delta.
15.- Resistive circuits in star.
16.- Star/delta transformation.
17.- Delta/star transformation.

Electric capacity:

18.- Capacity measurement of a capacitor.
19.- Capacitors series association.
20.- Capacitors parallel association.
21.- Charge analysis of a capacitor.
22.- Discharge analysis of a capacitor.

RL, RC and RCL Circuits:

23.- Time constant.
24.- Analysis of a RL circuit in series.
25.- Analysis of a RL circuit in parallel.
26.- Analysis of a RC circuit in series.
27.- Analysis of a RC circuit in parallel.
28.- Analysis of a RLC circuit in series.
29.- Analysis of a RLC circuit in parallel.

Rectification and filtrate:

30.- Low-pass filter.
31.- High-pass filter.
32.- Analysis of the rectifier diode response curve.
33.- Half wave rectification.
34.- Full wave rectification.
35.- Rectification to feed the universal motor.
36.- Double wave rectification with two windings.
37.- Double wave rectification with a Graezt's bridge.
38.- Half wave three-phase rectification.
39.- Three-phase rectification in bridge.

AI13-B. **Modular Trainer for Electrotecnics (Electrostatic Kit)**

SPECIFICATIONS SUMMARY

VAR18. Electrostatic Kit:

Case containing:

- PVC bar.
- PVC tube.
- Nylon bar.
- Aluminium bar.
- Acetate sheets. (2 units)
- Electroscope (vertical base and hook, aluminium sheets, aluminium ball).
- Rabbit skin.

Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI13-B.pdf

PRACTICAL POSSIBILITIES

1.- Electrostatic demonstration on several materials.
2.- The Electroscope.
3.- The Acetate.
4.- Sign of the charge.
5.- Static electricity checking, with an electroscope and an electrometer.
6.- Static electricity experiments.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤**Electrotecnics**

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

SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.
ALI10. Power Supply Module.
VAR15. Single-phase Capacitor Motor (EMT16).
VAR25. Open Universal Motor (EMT12).
VAR02. Motor (EMT17) (squirrel cage).
VAR16. Electromagnetism Kit with Group of Motor/Generator.
MED65. Digital Multimeter.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI13-C.pdf

PRACTICAL POSSIBILITIES

1.- Electric motors.
2.- Generators.
3.- Single-phase motor.
4.- Universal motor.
5.- Squirrel-cage three-phase motor.
6.- Identification, coils measurement and starting-up of a single-phase motor.
7.- Identification, measurement and starting-up of an universal motor.
8.- Identification, coils measuremt and starting-up of a three-phase motor.
9.- Electric energy into mechanic energy conversion.
10.- Mechanic energy into electric energy conversion.
11.- Electric energy into magnetic energy conversion.
12.- Magnetic induction: Lenz´s Law.
13.- Electromagnetic induction.
14.- Electromagnet: Oersted's experiment.
15.- The electromagnetic field (Electromagnets).

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

SPECIFICATIONS SUMMARY

Included modules:

EME/B. Electrical Machines Unit.
VAR17. Dismantled Transformer Kit.
TRA28. Three-phase Transformer.
MED65. Digital Multimeter.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI13-D.pdf

PRACTICAL POSSIBILITIES

1.- Assembling the transformer.
2.- Back transformer.
3.- Boost transformer.
4.- Auto-transformer.
5.- Experiments and practices with a dismantled transformer.
6.- Identification of the three-phase transformer.
7.- Connection as single-phase transformer.
8.- Star/star three-phase connection.
9.- Reverse star/star three-phase connection.
10.- Direct delta/delta three-phase connection.
11.- Star/delta three-phase connection.
12.- Three-phase/six-phase connection.
13.- Transformer with coils in series in phase.

AI13-E. **Modular Trainer for Electrotecnics (Lighting)**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:

ALI02. Main Power Supply.
ALI10. Power Supply Module.
LAM09. Fluorescent Lamp.
MED65. Digital Multimeter.
REL50. Relays Module.
LAM26. Lighting Module.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 450 x 470 mm. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AI13-E.pdf

PRACTICAL POSSIBILITIES

1.- Connection of lamps in series.
2.- Connection of lamps in parallel.
3.- Lamp with variable lighting.
4.- Basic electric installation with lamps.
5.- Lamps controlled by a switch or a push button.
6.- Lamps controlled from two points.
7.- Lamps controlled from three points.
8.- Lamps control by a switch relay.
9.- Lamps control by a commutator relay.
10.- Acoustic circuit.
11.- Fluorescent tube.

LIELBA. **Electrical Installations Integrated Laboratory:**

Industrial Electrical Installations

➤**Safety**

AI9. **People Safety Against Indirect Electrical Contacts in TT Neutral Regimen**

SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.

CAR05. Double Variable Resistive Load, 150 ohm, 500 W. Resistance 1600 Ω.

COM12. Commutator/Switch.

PUL11. 2 Double Push-Buttons (230Vac).

TRA12. 3-Phase Current Transformer.

IAD13. 3-pole + neutral Differential Automatic Switch, 25A, 300mA, class AC, instantaneous.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Study of an isolation fault in TT neutral regimen.

2.- Structure of a differential switch. Necessity to use a differential switch.

3.- Study of the selectivity among differential switches.

AI10. **People Safety Against Indirect Electrical Contacts in TN Neutral Regimen**

SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.

COM12. Commutator/Switch. (2 units).

TRA12. 3-Phase Current Transformer.

IAD01. 1-pole+neutral Differential Automatic Switch, 6A, 30mA, class A.

Resistance 200 W.

Resistance 100 Ω, 72W.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Study of an isolation fault in TN neutral regimen.

2.- Measurement of the ground loop impedances.

3.- Indirect contact with defect mass.

4.- The case in which the automatic switches are not suitable in TN-C conditions.

5.- The case in which the automatic switches are not suitable in TN-S conditions.

AI11. **People Safety Against Indirect Electrical Contacts in IT Neutral Regimen**

SPECIFICATIONS SUMMARY

Included modules:

ALI01. Industrial Main Power Supply.

INT01. 1-pole Load Switch. (2 units)

INT02. 2-pole Load Switch. (2 units)

CPA. Isolation Permanent Controller.

Capacitor 300V. 200 nF .(2 units)

Resistance 100 Ω.

Resistance 10 Ω.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Study of an isolation simple fault.

2.- Study of an isolation double fault (only with one mass).

3.- Study with several masses.

4.- Operation of the isolation controller.

5.- Study of the ground loop impedance.

LIELBA. **Electrical Installations Integrated Laboratory:**

Energy Installations

➤**Protection and Relays**

AE3. **Test Unit for Magneto-Thermal Automatic Switches**

SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
CAR04. Variable Resistive Load.
IAM13. 2-pole Magneto-thermal Automatic Switch, 1A, Curve C.
TRA19. Transformer for Experiments (custom made).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- To connect the set.
2.- To simulate a high current (thermal) and to test if the automatic switch breaks.
3.- To measure the current and to check the tripping.

AE4. **Test Unit for Differential Automatic Switches**

SPECIFICATIONS SUMMARY

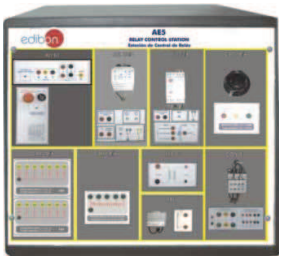
Application, in metallic box, including the following modules:
ALI02. Main Power Supply.
IAD01. 1-pole+neutral Differential Automatic Switch, 6A, 30mA, class A.
CAR04. Variable Resistive Load.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 490 x 330 x 310 mm. approx. Weight: 5 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AE4.pdf

PRACTICAL POSSIBILITIES

1.- To simulate a fault to earth and to test if the differential breaks.
2.- To calculate the current earth fault.
3.- Study of fault circuit.

AE5. **Relay Control Station**



SPECIFICATIONS SUMMARY

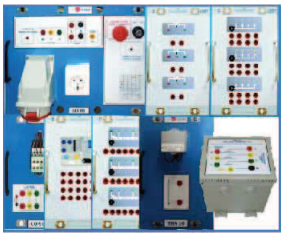
Application, in metallic box, including the following modules:
ALI01. Industrial Main Power Supply.
REL23/A. Earth Leakage Relay.
REL23/B. Over Current Relay.
CON01. 3-pole Contactor (24 Vac).
TRA03. Single-phase Voltage Transformer 220 Vac/24 Vac.
TRA10. Current Transformer 25/5A.
CAR18/A. Rheostat for Equivalent Circuit of an Electric Line.
CAR18/B. Inductance for Equivalent Circuit of an Electric Line.
CAR18/C. Capacitor for Equivalent Circuit of an Electric Line.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AE5.pdf

PRACTICAL POSSIBILITIES

1.- To connect the transformers to a line.
2.- To connect the protection relay.
3.- To simulate a line fault and the relay will trip the circuit breaker.
4.- Start up of a three-phase contactor.
5.- Calculation of the transformation ratio of a toroid.
6.- Calculation of the parameters of a line.
7.- Start up of an over current relay.
8.- Start up of an earth leakage relay.

AE7. **Multi-Functional Electrical Protection Station**



SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
CAR08. 3-phase Variable Resistive Load (custom made).
CAR11. 3-phase Capacitive Load.
CON01. 3-pole Contactor (24Vac).
REL22. Multi-function Protection Relay (software included).
TRA04. 3-Phase Power Transformer 380/220V, 630VA.
CAR14. 3-Phase Inductive Load.
TRA10. Current Transformer 25/5A.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the station with the relay.
2.- To simulate faults in the line.
3.- To simulate under and/or overvoltage, changing the line parameters.
4.- To check if the relay trips the contactor.

AE9. **Directional Relay:** Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection

SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
CAR08. 3-Phase Variable Resistive Load (custom made).
CON01. 3-Pole Contactor (24Vac).
CAR11. 3-Phase Capacitive Load.
TRA04. 3-Phase Power Transformer 380/220V, 630VA.
REL20. 1-Phase Directional Relay.
CAR14. 3-Phase Inductive Load.
TRA10. Current Transformer 25/5A.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set.
2.- Directional relay tripping test, in a case of an earth fault.
3.- To test the tripping when power flows in the opposite direction.
4.- To test the tripping when the reactive power is over or under certain limit.

LIELBA. **Electrical Installations Integrated Laboratory:**

Energy Installations

➤Measurements and Control

AE2. **Reactive Energy Control and Compensation**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI01. Industrial Main Power Supply.
CAR08. 3-phase Variable Resistive Load (custom made).
CAR11. 3-phase Capacitive Load.
CAR14. 3-phase Inductive Load.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AE2.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set with inductive load.
2.- Power Factor (cos φ) measurement.
3.- To calculate the necessary capacitors to get cos φ= 1.
4.- Capacitors connection and power factor measurement.

AE6. **Energy Counters Control Station**

SPECIFICATIONS SUMMARY

This complete application includes:
Unit, in a metallic box, including the following modules:
ALI01. Industrial Main Power Supply.
CAR01. Fixed Resistive Load, 150 ohms, 500 W.
MED72. Energy Counter.
TRA04. Three-phase Power Transformer: 1 KVA. 380/220 Vac.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.):
AE6. Unit: 490 x 330 x 310 mm. Weight: 15 Kg.
Transformer TRA04: 195 x 152 x 215 mm. Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AE6.pdf

PRACTICAL POSSIBILITIES

1.- Indentification of the elements of the main power supply.
2.- Checking the main power supply.
3.- To measure the energy consumed by the load with the energy counter.
4.- Checking the three-phase power transformer.

AE8. **Power & Torque Measurements of Electrical Motors**

SPECIFICATIONS SUMMARY

Included modules:
ALI01. Industrial Main Power Supply.
ALI03. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON02. 3-pole Contactor (220Vac).
PUL11. 2 Double Push-Buttons (230Vac).
REL08. Time Electronic Relay against Overcurrents (0.3-1.5A).
MED60. Network Analyzer.
VAR02. Motor (EMT7) (squirrel cage).
FREND. Dynamo Brake.
TECNEL/T. Tachodynamo.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set and to start the motor and dynamo.
2.- To change the dynamo current and to measure both the power and the torque of the motor.
3.- To obtain the efficiency curve.

➤Lines

AE1A **Aerial Line Model**

SPECIFICATIONS SUMMARY

Application, in metallic box, including the following modules:
ALI01. Industrial Main Power Supply.
CAR08. 3-phase Variable Resistive Load (custom made).
CAR11. 3-phase Capacitive Load.
CAR14. 3-phase Inductive Load.
TRA05. 3-Phase Power Transformer 220/127V, 1000VA.
CAR18. Aerial Line Model.
TRA18. Petersen Coil.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

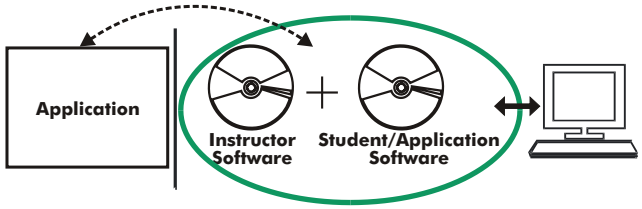
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/AE1.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set.
2.- Measurement of the voltage without loads.
3.- Measurement of the voltage with loads.
4.- Power Factor (cos φ) measurement.
5.- Fault to earth and measurement of the current through the Petersen coil.

LIELBA. **Electrical Installations Integrated Laboratory:**

CAI. Computer Aided Instruction Software System



With no physical connection between application and computer (PC), this complete package consists on an Instructor Software (INS/SOF) totally integrated with the Student/Application Software (A.../SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students. These, on the other hand, get a virtual instructor who helps them to deal with all the information on the subject of study.

- INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- Organize Students by Classes and Groups.
- Create easily new entries or delete them.
- Create data bases with student information.
- Analyze results and make statistical comparisons.
- Print reports.
- Develop own examinations.
- Detect student's progress and difficulties.

...and many other facilities.

The Instructor Software is the same for all the applications, and working in network configuration allows controlling all the students in the classroom.

Instructor Software

- A.../SOF. Computer Aided Instruction Softwares (Student/Application Software):

It explains how to use the application, run the experiments and what to do at any moment. Each application has its own Student Software.

- The options are presented by pull-down menus and pop-up windows.
- Each Software contains:

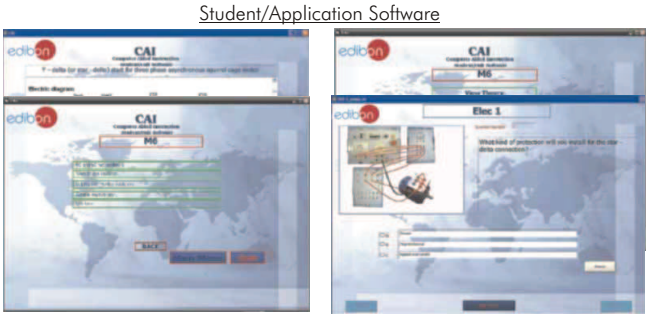
  Theory: that gives the student the theoretical background for a total understanding of the studied subject.

  Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

  Guided Practices: presents several practices to be done with the application, showing how to complete the circuits and get the right information from them.

  Exams: set of questions presented to test the obtained knowledge.

Student/Application Software



Available Student/Application Softwares:

Domestic Electrical Installations

➤General

AD1A/SOF. Robbery Alarm Station.
AD3A/SOF. Fire Alarm Station.
AD5/SOF. Stair Lights Timing.
AD13/SOF. Audio Door entry System.
AD14/SOF. Audio and Video Door entry System.

➤Industrial Control

AD6A/SOF. Luminosity Control Station.
AD9A/SOF. Heating Control Station.
AD15A/SOF. Position Control Station.
AD17A/SOF. Photoelectric Control Position Station.
AD22/SOF. Flooding Control Station.
AD23/SOF. Wireless Basic Control Station (RF).
AD24/SOF. Position Switch.
AD25A/SOF. Control Station for Domestic Electric Services through the Telephone.
AD28A/SOF. Integral Control Station of Domestic Electric Systems.
AD30/SOF. Gas Control Station.

➤Sound

AD19A/SOF. Sound Station.
AD31/SOF. Movement and Sound Detection and Control.

➤Instruments

AD8/SOF. Blinds Activator.
AD11A/SOF. Network Analyzer.
AD32/SOF. 24 Vac /12 Vdc Circuits Analyzer.
AD33/SOF. Installations Faults Simulator.

Industrial Electrical Installations:

➤Starter and Motors

AI1/SOF. Star-Delta Starter.
AI2/SOF. Starter through Auto-Transformer.
AI4/SOF. Starter-Inverter.
AI5/SOF. AC Wound Rotor Motor Starter.
AI6/SOF. DC Motor Starter.
AI12/SOF. Modular Trainer (AC Motors).

➤Speed Control

AI3/SOF. Speed Commutator for Dahlander Motor.
AI7/SOF. Automatic Change of Speed of a Dahlander Motor with Change of Direction.

➤Electrotecnins

AI8/SOF. Reactive Power Compensation (Power Factor Correction).
AI13/SOF. Modular Trainer for Electrotecnics.
AI13-A/SOF. Modular Trainer for Electrotecnics (RLC circuits).
AI13-B/SOF. Modular Trainer for Electrotecnics (Electrostatic Kit).
AI13-C/SOF. Modular Trainer for Electrotecnics (Motors).
AI13-D/SOF. Modular Trainer for Electrotecnics (Transformers).
AI13-E/SOF. Modular Trainer for Electrotecnics (Lighting).

➤Safety

AI9/SOF. People Safety Against Indirect Electrical Contacts in TT Neutral Regimen.
AI10/SOF. People Safety Against Indirect Electrical Contacts in TN Neutral Regimen.
AI11/SOF. People Safety Against Indirect Electrical Contacts in IT Neutral Regimen.

Energy Installations:

➤Protection and Relays

AE3/SOF. Test Unit for Magneto-Thermal Automatic Switches.
AE4/SOF. Test Unit for Differential Automatic Switches.
AE5/SOF. Relay Control Station.
AE7/SOF. Multi-Functional Electrical Protection Station.
AE9/SOF. Directional Relay: Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection.

➤Measurements and Control

AE2/SOF. Reactive Energy Control and Compensation.
AE6/SOF. Energy Counters Control Station.
AE8/SOF. Power & Torque Measurements of Electrical Motors.

➤Lines

AE1/SOF. Aerial Line Model.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

LIELBA. **Electrical Installations Integrated Laboratory:**

CAL. Computer Aided Learning Software (Results Calculation and Analysis)

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use, specifically developed by EDIBON.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

CAL will perform the calculations.

CAL computes the value of all the variables involved.

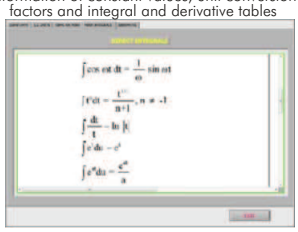
It allows to plot and print the results. Between the plotting options, any variable can be represented against any other.

Different plotting displays.

It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

Calculations

Information of constant values, unit conversion factors and integral and derivative tables



Plotting options

Available Softwares:

Domestic Electrical Installations

➤General

AD1A/CAL. Robbery Alarm Station.
AD3A/CAL. Fire Alarm Station.
AD5/CAL. Stair Lights Timing.
AD13/CAL. Audio Door entry System.
AD14/CAL. Audio and Video Door entry System.

➤Industrial Control

AD6A/CAL. Luminosity Control Station.
AD9A/CAL. Heating Control Station.
AD15A/CAL. Position Control Station.
AD17A/CAL. Photoelectric Control Position Station.
AD22/CAL. Flooding Control Station.
AD23/CAL. Wireless Basic Control Station (RF).
AD24/CAL. Position Switch.
AD25A/CAL. Control Station for Domestic Electric Services through the Telephone.
AD28A/CAL. Integral Control Station of Domestic Electric Systems.
AD30/CAL. Gas Control Station.

➤Sound

AD19A/CAL. Sound Station.
AD31/CAL. Movement and Sound Detection and Control.

➤Instruments

AD8/CAL. Blinds Activator.
AD11A/CAL. Network Analyzer.
AD32/CAL. 24 Vac /12 Vdc Circuits Analyzer.
AD33/CAL. Installations Faults Simulator.

Industrial Electrical Installations:

➤Starter and Motors

AI1/CAL. Star-Delta Starter.
AI2/CAL. Starter through Auto-Transformer.
AI4/CAL. Starter-Inverter.
AI5/CAL. AC Wound Rotor Motor Starter.
AI6/CAL. DC Motor Starter.
AI12/CAL. Modular Trainer (AC Motors).

➤Speed Control

AI3/CAL. Speed Commutator for Dahlander Motor.
AI7/CAL. Automatic Change of Speed of a Dahlander Motor with Change of Direction.

➤Electrotecnins

AI8/CAL. Reactive Power Compensation (Power Factor Correction).
AI13/CAL. Modular Trainer for Electrotecnics.
AI13-A/CAL. Modular Trainer for Electrotecnics (RLC circuits).
AI13-B/CAL. Modular Trainer for Electrotecnics (Electrostatic Kit).
AI13-C/CAL. Modular Trainer for Electrotecnics (Motors).
AI13-D/CAL. Modular Trainer for Electrotecnics (Transformers).
AI13-E/CAL. Modular Trainer for Electrotecnics (Lighting).

➤Safety

AI9/CAL. People Safety Against Indirect Electrical Contacts in TT Neutral Regimen.
AI10/CAL. People Safety Against Indirect Electrical Contacts in TN Neutral Regimen.
AI11/CAL. People Safety Against Indirect Electrical Contacts in IT Neutral Regimen.

Energy Installations:

➤Protection and Relays

AE3/CAL. Test Unit for Magneto-Thermal Automatic Switches.
AE4/CAL. Test Unit for Differential Automatic Switches.
AE5/CAL. Relay Control Station.
AE7/CAL. Multi-Functional Electrical Protection Station.
AE9/CAL. Directional Relay: Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection.

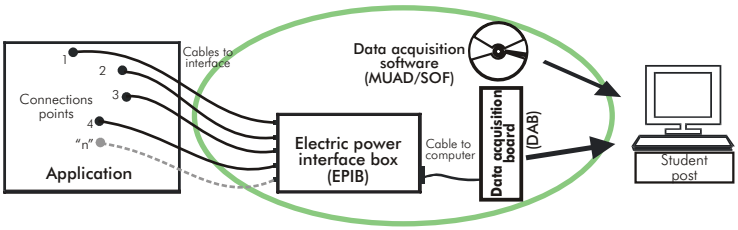
➤Measurements and Control

AE2/CAL. Reactive Energy Control and Compensation.
AE6/CAL. Energy Counters Control Station.
AE8/CAL. Power & Torque Measurements of Electrical Motors.

➤Lines

AE1/CAL. Aerial Line Model.

MUAD. Electric Power Data Acquisition System



MUAD is the perfect link between the application and the PC. MUAD is a continuous data acquisition system with virtual instrumentation, that measures, analyzes and represents the parameters involved in the process.
MUAD allows voltage and current acquisition and measurement, data processing, frequency spectrum and all the functions of a digital oscilloscope.
We easily connect the Electric Power Interface Box (EPIB) to the application with the supplied cables (there are several connection points placed for it). The EPIB is connected to the PC through the Data Acquisition Board (DAB), and by using the Data Acquisition with Virtual Instrumentation Software, the student can get results from the undertaken experiment/practice, see them on the screen and work with them.

This MUAD System includes EPIB + DAB + MUAD/SOF:

1) EPIB. **Electric Power Interface Box** (dimensions: 300 x 120 x 180 mm. approx.):
Interface that carries out the conditioning of the diverse signals that can be acquired in a process, for their later treatment and visualisation.
In the front panel, the elements are separated in two parts: left-hand part to VOLTAGE sensors, and right-hand part corresponds with CURRENT sensors.
Analog Input Channels:
8 analog input channels. Sampling range: 250 KSPS (Kilo samples per second).
4 Tension sensors AC/DC, 400V. 4 Current sensors.

EPIB

+

DAB

+

2) DAB. **Data Acquisition Board** :
PCI Data acquisition board (National Instruments) to be placed in a computer slot.
Analog input:
Number of channels= 16 single-ended or 8 differential.
Resolution=16 bits, 1 in 65536.
Sampling rate up to: 250 KSPS (Kilo samples per second).
Analog output:
Number of channels=2.
Resolution=16 bits, 1 in 65536.
Digital Input/Output:
Number channels=24inputs/outputs.
Timing: Counter/timers=2.

3) MUAD/SOF. **Data Acquisition Software** :
Data Acquisition Software with Graphic Representation:
Friendly graphical frame.
Compatible with actual Windows operating systems.
Configurable software allowing the representation of temporal evolution of the different signals.
Visualization of a tension of the circuits on the computer screen.
Sampling velocity up to 250 KSPS. (Kilo samples per second).

MUAD/SOF

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/LIELBA.pdf

ELE-KITS. **Electrical Installations Assembly Kits:**

BAS-K. **Installation Cubicle**

SPECIFICATIONS SUMMARY

All sides panel with rear and side walls and roof.
Standard dimensions: 1200 x 1000 x 2000 mm.
Other dimensions available on request.

Domestic Electrical Installations

➤**General**

KD1A. **Robbery Alarm Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
DET27-K. Glass Break Detector.
INT32-K. Intrusion Switch/Detector. (2 units)
SEL03-K. 3 Pilot-Lights.
SEL21-K. Indoor Siren.
VAR07-K. Kit: Burglar Alarm Central + infrared ele. + battery.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the station with intrusion detector and alarm.
2.- Assembly of the station with glass breaking detector and alarm.
3.- Assembly of the station with both types of detectors and alarm.
4.- Assembly of the station with infrared detectors.

KD3A. **Fire Alarm Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
ALA02-K. Fire Alarm Station (with battery).
DET06-K. Smoke Detector for domestic control.
DET21-K. Fire Detector through Ionization for Central.
SEL21-K. Indoor Siren.
DET10-K. Water Electro-valve.
DET22-K. Fire Thermal Detector.
SEL17-K. Fire Indicators, Bell type.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the station with fire detector, smoke detector and alarm.
2.- Test of the station with fire detector.
3.- Test of the station with smoke detector.
4.- Test of the station with detection of fire by the thermal detector.
5.- Activation of the electro-valve following the detection of the fire.

KD5. **Stair Lights Timing Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
CTI10-K. Automatic of Stairs.
INT21-K. Switch+Commutator Group+Bell Push-Button. (2 units)
LAM08-K. 2 Lamp-holders + Incandescent Lamps 40W.(2 units)
LAM13-K. 2 Low Consumption Fluorescent Lamps.(2 units)
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the basic set of temporization.
2.- Test of the set from two points with incandescent lamps.
3.- Test of the set from two points with fluorescent lamps.

KD13. **Audio Door entry System Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
POR01-K. Phones Power Supply.
POR02-K. Phone.
POR03-K. Interphone.
POR06-K. Lock.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the system.
2.- To check the interphone operation.

KD14. **Audio and Video Door entry System Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
POR04-K. Video Camera.
POR05-K. Phone/Monitor.
POR06-K. Lock.
POR07-K. Digital Station.
POR08. Video-Interphone Power Supply.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the system.
2.- To check of the video and audio operation.

ELE-KITS. **Electrical Installations Assembly Kits:**

Domestic Electrical Installations

➤**Industrial Control**

KD6A. **Luminosity Control Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
COM14-K. 2 Commutators.
LAM08-K. 2 Lamp-holders + Incandescent Lamps 40W.
REG06-K. Voltage Electronic Regulator (Switch) 40 to 300W/ 230Vac.
INT18-K. 1-pole Switch + 1-pole Switch with Light.
LAM10-K. 2 Halogen Lamps.
LAM09-K. Fluorescent Lamp.
SEN26-K. Presence and Movement Sensor (Wall).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the control station.
2.- Control of luminosity of an halogen lamp.
3.- Control of luminosity of an incandescent lamp.
4.- Test of the station by movement sensor.
5.- Luminosity control.
6.- Complete control.

KD9A. **Heating Control Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
TIM01-K. 2 Bell 70dB, 230V. (2 units)
SEL09-K. Double Luminous Signalling red-green 230Vac. (2 units)
MED76-K. Thermostat for Heating.
MED77-K. Thermostat for Heating and Refrigeration.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the heating control station.
2.- Assembly of the heating and refrigeration control.
3.- Test with several temperatures.

KD15A. **Position Control Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
INT14-K. One-pole 2 Switches.
SEL01-K. Light Signalling Beacons (lamps).
SEN04-K. Inductive Proximity Sensor type PNP.
SEN14-K. Cylindrical Capacitive Proximity Sensor.
SEN29-K. Cylindrical Inductive Proximity Sensor.
SEN01-K. Instantaneous Micro-Switch.
SEN26-K. Presence and Movement Sensor (Wall).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the station with sensors.
2.- Test of the capacitive detection of a body.
3.- Test of the inductive position detection of a body.
4.- Assembly of the station with presence and movement wall sensor.
5.- To check the movement detection of a body.

KD17A. **Photoelectric Control Position Station Kit**

SPECIFICATIONS SUMMARY

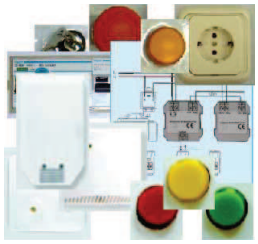
Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
LAM04-K. 3 Push-buttons and Lamps (24Vac). (2 units)
SEN18-K. Cylindrical Photoelectric Sensor.
SEN19-K. Miniature Photoelectric Sensor.
SEN20-K. Compact Photoelectric Sensor.
SEN21-K. Barrier Photoelectric Sensor (Emitter).
SEN22-K. Barrier Photoelectric Sensor (Receptor).
SEN23-K. Reflecting Photoelectric Sensor (Emitter).
SEN24-K. Reflecting Photoelectric Sensor (Receptor).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the control station.
2.- Test of the detection with cylindrical sensor.
3.- Test of the detection with miniature sensor.
4.- Test of the detection with compact sensor.
5.- Assembly of the control station with battery and sensors.
6.- Test of the detection with emitters and receivers.
7.- Test with only emitters and receptors.

KD22. **Flooding Control Station Kit**



SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
DET03-K. Fitted Power Supply for the flooding detector.
DET04-K. Flooding Detector.
SEL03-K. 3 Pilot-Lights.
SEL21-K. Indoor Siren.
DET10-K. Water Electro-valve.
DET11-K. Probe for Water Electro-valve. (2 units)
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the flooding control with a probe.
2.- Test of the flooding control.
3.- Test of the flooding control acting on an eletro-valve.

ELE-KITS. **Electrical Installations Assembly Kits:**

Domestic Electrical Installations

➤ **Industrial Control**

KD23. **Wireless Basic Control Station (RF) Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
DET13-K. Wireless Intrusion Detector RF.
DET14-K. Wireless Panic Push- button RF.
DET15-K. Wireless 1-channel Receptor RF.
SEL01-K. Light Signalling Beacons.
TIM05-K. Bell + Buzzer.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Wireless intrusion detection and alarm.
2.- Wireless panic button alarm.

KD24. **Position Switch Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
LAM03-K. 3 Push-buttons and Lamps (220Vac).
SEN01-K. Instantaneous Micro- switch.
SEN02-K. MBB Micro-switch.
SEN03-K. BBM Micro-switch.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Instantaneous Micro-switch.
2.- MBB Micro-switch.
3.- BBM Micro-switch.

KD25A. **Kit of Control Station for Domestic Electric Services through the Telephone**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CTR01-K. Basic Control Element.
DET01-K. Flooding Detector.
DET03-K. Fitted Power Supply (gas and flooding detector). (3units)
DET04-K. Flooding Detector (with probe).
DET05-K. Gas Detector for domestic control.
DET06-K. Smoke Detector for domestic control.
DET10-K. Water Electro-valve.
DET12-K. Gas Electro-valve.
DET13-K. Wireless Intrusion Detector RF.
DET14-K. Wireless Panic Push- button RF.
DET15-K. Wireless 1-channel Receptor RF.
VAR05-K. Tones Dialling Telephone.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Smoke detection.
2.- Gas detection and electro-valve control.
3.- Flooding detection and electro-valve control.
4.- Temperature and Battery.
5.- Intrusion detection.
6.- Wireless detection.
7.- Complete control of home electric services through the telephone.

KD28A. **Kit of Integral Control Station of Domestic Electric Systems**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CTR02-K. Advanced Control Element.
CTR05-K. Power Element 72W.
CTR07-K. Timers Element.
CTR08-K. Inputs Element 24V.
CTR11-K. Outputs Element 24V.
CTR17-K. Infrared Remote Control for Control Elements.
CTR18-K. Infrared Receptor.
DET04-K. Flooding Detector (with probe).
DET05-K. Gas Detector for domestic control.
DET06-K. Smoke Detector for domestic control.
DET09-K. Intrusion Detector for domestic control.
DET10-K. Water Electro-valve.
DET12-K. Gas Electro-valve.
VAR08-K. Monitor.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the complete system with the smoke, flooding and gas detectors.
2.- Test of the station with smoke, flooding and gas detectors.
3.- To set the temporization and monitoring the results.
4.- Assembly of the complete system with infrared and instrusion detectors.
5.- Test of the station with infrared and instrusion detectors.
6.- Electro-valves activation.
7.- Wireless assembly of the sensor through infrared control.

KD30. **Gas Control Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
DET12-K. Gas Electro-valve.
DET03-K. Fitted Power Supply (gas and flooding detector).
DET02-K. Gas Detector.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Gas detection.
2.- Electro-valve activation.

ELE-KITS. **Electrical Installations Assembly Kits:**

Domestic Electrical Installations

➤Sound

KD19A. **Sound Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
AUD01-K. Analog Sound Regulator.
AUD04-K. Speaker of 2", 2W, 8 ohm. (3 units)
AUD06-K. Basic Audio Central.
AUD20-K. Analog Sound Regulator (mono-stereo).
AUD02-K. Digital Sound Regulator.
AUD05-K. Speaker of 4", 7W, 8 ohm. (3 units)
AUD03-K. Warnings Emitter Module.
AUD08-K. Background Music Regulator 3W.
AUD10-K. Double Background Music Regulator.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Mono-stereo system installation.
2.- Mono system with warnings reception.
3.- Mono-stereo system installation with warnings reception.
4.- Stereo system installation with warnings reception.
5.- Background music installation.

KD31. **Movement and Sound Detection and Control Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
INT15-K. 2 Switches with Light.
LAM08-K. 2 Lamp-holders + Incandescent Lamps 40W.
INT31-K. Intrusion Switch/Detector from 40 to 300W.
LAM10-K. 2 Halogen Lamps.
PUL22-K 2 Light Push-Buttons.
TIM05-K. Bell + Buzzer.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Movement and sound detection controlled by switches.
2.- Movement and sound detection controlled by push-buttons.

➤Instruments

KD8. **Blinds Activator Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
INT22-K. 2 Switches for Blinds.
DET19-K. Twilight Detector.
DET20-K. Light Detector.
VAR01-K. Motor for Blinds/Curtains.
PUL29-K. 2 Push-Buttons Group for Blinds (without Interlock).
PUL30-K. 2 Push-Buttons Group for Blinds (with Interlock).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the activator (motor, detectors and switches).
2.- Blind activation by push-buttons.
3.- Blind activation by sensors.

KD11A. **Network Analyzer Kit**

SPECIFICATIONS SUMMARY

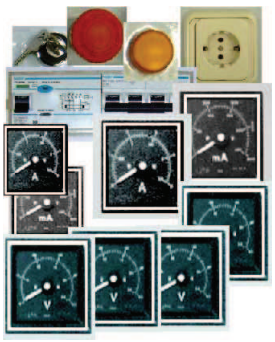
Included elements:
ALI01-K. Industrial Main Power Supply.
MED11-K. AC Ammeter (0-10A).
MED25-K. Pointer Frequency Meter (45-65Hz).
MED32-K. 1-Phase Wattmeter 230V.
MED21-K. AC Voltmeter (0-250V).
MED30-K. 1-Phase Phasemeter 230V.
MED38-K. 1-Phase Varmeter 230V.
MED12-K. AC Ammeter (custom made). (3 units)
MED22-K. AC Voltmeter (0-400V). (3 units)
MED31-K. 3-Phase Phasemeter 400V. (3 units)
MED39-K. 3-Phase Balanced Varmeter 440V.
MED33-K. 3-Phase Balanced Wattmeter 440V.
MED63-K. Synchronoscope.
MED64-K. Phase Sequence Indicator.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the analyzer to measure current, voltage, frequency, active power, reactive power, sequence of phases of a 220V single-phase circuit.
2.- Assembly of the analyzer to measure current, voltage, frequency, active power, reactive power, sequence of phases of a 380V three-phase circuit.

KD32. **24 Vac/12 Vdc Circuits Analyzer Kit**



SPECIFICATIONS SUMMARY

Included elements
ALI02-K. Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
ALI04-K. DC Auxiliary Power Supply (+12, 0, -12 Vdc).
MED04-K. DC Milliammeter (0-600 mA).
MED05-K. DC Ammeter (0-1.5A).
MED08-K. AC Milliammeter (0-600mA).
MED09-K. AC Ammeter (0-2.5A).
MED15-K. DC Voltmeter (0-5V).
MED16-K. DC Voltmeter (0-50V).
MED19-K. AC Voltmeter (0-10V).
MED20-K. AC Voltmeter (0-60V).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- AC circuits analyzer (2 ranges).
2.- DC circuits analyzer (2 ranges).

ELE-KITS. **Electrical Installations Assembly Kits:**

Domestic Electrical Installations

➤**Instruments**

KD33. **Installations Faults Simulator Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
COM14-K. 2 Commutators. (2 units)
ENC09-K. 2-pole European Socket with Safety Device. (2 units)
COM21-K. Inverter + Group of 2 Commutators. (2 units)
LAM01-K. Lamps.
LAM08-K. 2 Lamp-holders + Incandescent Lamps 40W. (2 units)
LAM09-K. Fluorescent Lamp.
MED65-K. Digital Multimeter.
FUS04-K. 3 Fuse-holders 10A, 230Vac (include 2, 4,6,10A).
Faults Box.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Ground fault simulation of a plug base.
2.- Fault simulation between phases of a plug base.
3.- Ground fault simulation of an incandescent lamp base.
4.- Ground fault simulation of a fluorescent lamp base.
5.- Fault simulation between phases of an incandescent lamp base.
6.- To simulate fault of power-supply contact in the lamp base.
7.- To simulate fault of contact of the switch.
8.- To simulate fault of contact of the fuse.
9.- To simulate fault of contact of the fluorescent base.

Industrial Electrical Installations

➤**Starters and Motors**

KI1. **Star-Delta Starter Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON01-K. 3-pole Contactor (24Vac). (3 units)
IAM20-K. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
MED60-K. Network Analyzer.
PUL04-K. Push-Buttons with Light (24Vac).
REL02-K. Thermal Relay (1.6-2.5A).
REL11-K. Time Relay (0.6-60 sec.).
VAR02-K. Motor (EMT7) (squirrel cage).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- Test of the starter with a squirrel cage motor.
3.- Measurement of the star current and delta current.
4.- Direct start of the motor. Measurement of the starting current.

KI2. **Starter through Auto-Transformer Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON01-K. 3-pole Contactor (24Vac). (3 units).
IAM20-K. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
MED60-K. Network Analyzer.
PUL04-K. Push-Buttons with Light (24Vac).
REL02-K. Thermal Relay (1.6-2.5A).
REL11-K. Time Relay (0.6-60 sec.).
TRA14-K. 3-Phase Auto-transformer.
VAR02-K. Motor (EMT7) (squirrel cage).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- Test of the starter with a squirrel cage motor.
3.- Measurement of both the star and delta current.

KI4. **Starter-Inverter Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON02-K. 3-pole Contactor (220Vac).
CON11-K. 3-pole Contactor- Inverter (220Vac).
MED60-K. Network Analyzer.
PUL03-K. Push-Buttons with Light (220Vac). (2 units)
REL05-K. Thermal Relay/3-pole Phase fault (0.8-1.2A).
VAR02-K. Motor (EMT7) (squirrel cage).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- To test of the direct start of a squirrel cage motor.
3.- To invert the rotation direction of the motor.

KI5. **AC Wound Rotor Motor Starter Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
VAR06-K. Motor (EMT8) (wound rotor).
CAR22-K. AC Starting Rheostat.
IAM20-K. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
CON01-K. 3-pole Contactor (24Vac).
PUL04-K. Push-Buttons with Light (24Vac).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the starter.
2.- To test the starter changing the resistances step by step.

ELE-KITS. **Electrical Installations Assembly Kits:**

Industrial Electrical Installations

➤Starters and Motors

KI6. **DC Motor Starter Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI04-K. DC Auxiliary Power Supply (+12, 0, -12 Vdc).
VAR04-K. Motor (EMT5) (DC motor).
CAR23-K. DC Starting Rheostat.
IAM20-K. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
CON03-K. 3-pole Contactor (12Vdc).
PUL04-K. Push-Buttons with Light (24Vac).
CAR20-K. Diodes and Thyristors.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Direct starter.
2.- Starter rheostat.

➤Speed Control

KI3. **Speed Commutator for Dahlander Motor Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON01-K. 3-pole Contactor (24Vac). (3 units)
IAM20-K. 3-pole Magneto-thermal Automatic Switch, 4A, Curve C.
MED60-K. Network Analyzer.
PUL04-K. Push-Buttons with Light (24Vac).
REL02-K. Thermal Relay (1.6-2.5A).
REL11-K. Time Relay (0.6-60 sec.).
VAR03-K. Motor (EMT9) (Dahlander motor).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the commutator.
2.- Test of the commutator changing the speed of a Dahlander motor.
3.- Measurement of the voltage and current.

KI7. **Kit of Automatic Change of Speed of a Dahlander Motor with Change of Direction**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
IAM24-K. 3-pole+neutral Magneto- thermal Automatic Switch, 6A, Curve C.
CON01-K. 3-pole Contactor (24Vac). (5 units)
REL05-K. Thermal Relay/3-pole Phase fault (0.8-1.2A). (2 units)
PUL16-K. Push-Button for Industrial use (NC Contacts). (5 units)
PUL16-K. Push-Button for Industrial use (NO Contacts). (5 units)
VAR03-K. Motor (EMT9) (Dahlander motor).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set.
2.- Motor starting with right turning direction at high speed. R.p.m and consumption measurements.
3.- Motor stop and change to left the turning direction at high speed.
4.- Change to low speed.
5.- Motor stop and change to right the turning direction.
6.- Change to high speed. R.p.m and consumption measurements.

➤Electrotecnics

KI8. **Kit of Reactive Power Compensation (Power Factor Correction)**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
CAR04-K. Variable Resistive Load, 150 ohm, 500W.
CAR09-K. Capacitive Load 4 x 7 µF.
CAR12-K. Inductive Load 0-33-78- 140-193-236 mH. (2 units)
MED60B-K. Network Analyzer with active and reactive energy counters.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Measurement of active power consumed by a receiver.
2.- Measurement of reactive power consumed by a receiver.
3.- Measurement of apparent power consumed by a receiver.
4.- Measurement of power factor of a receiver.
5.- Measurement of active energy consumed by a receiver.
6.- Measurement of reactive energy consumed by a receiver.
7.- Compensation of reactive energy (improvement of the power factor).
8.- Comparison of the active energy consumed after the compensation.
9.- Comparison of the reactive energy consumed after the compensation.
10.- Measurement of power factor after the compensation.

➤Safety

KI9. **Kit of People Safety Against Indirect Electrical Contacts in TT Neutral Regimen**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR05-K. Double Variable Resistive Load , 150 ohm, 500 W . Resistance 1600 Ω.
COM12-K. Commutator/Switch.
PUL11-K. 2 Double Push-Buttons (230Vac).
TRA12-K. 3-Phase Current Transformer.
AD13-K. 3-pole + neutral Differential Automatic Switch, 25A, 300mA, class AC, instantaneous.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Study of an isolation fault in TT neutral regimen.
2.- Structure of a differential switch. Necessity to use a differential switch.
3.- Study of the selectivity among differential switches.

ELE-KITS. **Electrical Installations Assembly Kits:**

Industrial Electrical Installations

➤**Safety**

KI10. **Kit of People Safety Against Indirect Electrical Contacts in TN Neutral Regimen**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
COM12-K. Commutator/Switch. (2 units)
TRA12-K. 3-Phase Current Transformer.
IAD01-K. 1-pole+neutral Differential Automatic Switch, 6A, 30mA, class A.
Resistance 200 W.
Resistance 100 Ω, 72W.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Study of an isolation fault in TN neutral regimen.
2.- Measurement of the ground loop impedances.
3.- Indirect contact with defect mass.
4.- The case in which the automatic switches are not suitable in TN-C conditions.
5.- The case in which the automatic switches are not suitable in TN-S conditions.

KI11. **Kit of People Safety Against Indirect Electrical Contacts in IT Neutral Regimen**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
INT01-K. 1-pole Load Switch. (2 units)
INT02-K. 2-pole Load Switch .(2 units)
CPA-K. Isolation Permanent Controller.
Capacitor 300V. 200 nF. (2 units)
Resistance 100 Ω.
Resistance 10 Ω.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Study of an isolation simple fault.
2.- Study of an isolation double fault (only with one mass).
3.- Study with several masses.
4.- Operation of the isolation controller.
5.- Study of the ground loop impedance.

Energy Installations

➤**Protection and Relays**

KE3. **Kit of Test Unit for Magneto-Thermal Automatic Switches**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR04-K. Variable Resistive Load.
IAM13-K. 2-pole Magneto-thermal Automatic Switch, 1A, Curve C.
TRA19-K. Transformer for Experiments (custom made).
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- To connect the set.
2.- To simulate a high current (thermal) and to test if the automatic switch breaks.
3.- To measure the current and to check the tripping.

KE4. **Kit of Test Unit for Differential Automatic Switches**

SPECIFICATIONS SUMMARY

Included elements:
ALI02-K. Main Power Supply.
IAD01-K. 1-pole+neutral Differential Automatic Switch, 6A, 30mA, class A.
CAR04-K. Variable Resistive Load.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- To simulate a fault to earth and to test if the differential breaks.
2.- To calculate the current earth fault.
3.- Study of fault circuit.

KE5. **Relay Control Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
REL23-K. Overcurrent Relay and Fault to Earth.
CON01-K. 3-pole Contactor (24Vac).
TRA10-K. Current Transformer 25/5A.
CAR18-K. Aerial Line Model.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- To connect the transformers to line.
2.- To connect the protection relay.
3.- To simulate a line fault and the relay will trip the circuit breaker.

KE7. **Multi-Functional Electrical Protection Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR08-K. 3-phase Variable Resistive Load (custom made).
CAR11-K. 3-phase Capacitive Load.
CON01-K. 3-pole Contactor (24Vac).
REL22-K. Multi-function Protection Relay (software included).
TRA04-K. 3-Phase Power Transformer 380/220V, 630VA.
CAR14-K. 3-phase Inductive Load.
TRA10-K. Current Transformer 25/5A.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the station with the relay.
2.- To simulate faults in the line.
3.- To simulate under and/or overvoltage, changing the line parameters.
4.- To check if the relay trips the contactor.

ELE-KITS. **Electrical Installations Assembly Kits:**

Energy Installations

➤Protection and Relays

KE9. **Kit of Directional Relay:** Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR08-K. 3-phase Variable Resistive Load (custom made).
CON01-K. 3-pole Contactor (24Vac).
CAR11-K. 3-phase Capacitive Load.
TRA04-K. 3-Phase Power Transformer 380/220V, 630VA.
REL20-K. 1-Phase Directional Relay.
CAR14-K. 3-phase Inductive Load.
TRA10-K. Current Transformer 25/5A.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set.
2.- Directional relay tripping test, in a case of an earth fault.
3.- To test the tripping when power flows in the opposite direction.
4.- To test the tripping when the reactive power is over or under certain limit.

➤Measurements and Control

KE2. **Kit of Reactive Energy Control and Compensation**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR08-K. 3-phase Variable Resistive Load (custom made).
CAR11-K. 3-phase Capacitive Load.
CAR14-K. 3-phase Inductive Load.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set with inductive load.
2.- Power Factor (cos φ) measurement.
3.- To calculate the necessary capacitors to get cos φ = 1.
4.- Capacitors connection and power factor measurement.

KE6. **Energy Counters Control Station Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR01-K. Fixed Resistive Load, 150 ohm, 500 W.
MED72-K. Energy Counter.
TRA04-K. Three-Phase Power Transformer.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- To measure the energy consumed by the load with the energy counter.
2.- Checking the three-phase power transformer.

KE8. **Kit of Power & Torque Measurements of Electrical Motors**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
ALI03-K. Auxiliary Power Supply 24Vac and 24Vdc adjustable.
CON02-K. 3-pole Contactor (220Vac).
PUL11-K. 2 Double Push-Buttons (230Vac).
REL08-K. Time Electronic Relay against Overcurrents 0.3-1.5A).
MED60-K. Network Analyzer.
VAR02-K. Motor (EMT7) (squirrel cage).
FREND. Dynamo Brake.
TECNEL/T. Tachodynamo.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set and to start the motor and dynamo.
2.- To change the dynamo current and to measure both the power and the torque of the motor.
3.- To obtain the efficiency curve.

➤Lines

KE1. **Aerial Line Model Kit**

SPECIFICATIONS SUMMARY

Included elements:
ALI01-K. Industrial Main Power Supply.
CAR08-K. 3-phase Variable Resistive Load (custom made).
CAR11-K. 3-phase Capacitive Load.
CAR14-K. 3-phase Inductive Load.
TRA05-K. 3-Phase Power Transformer 220/127V, 1000VA.
CAR18-K. Aerial Line Model.
TRA18-K. Petersen Coil.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

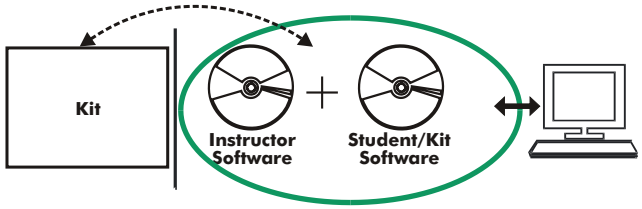
More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

PRACTICAL POSSIBILITIES

1.- Assembly of the set.
2.- Measurement of the voltage without loads.
3.- Measurement of the voltage with loads.
4.- Power Factor (cos φ) measurement.
5.- Fault to earth and measurement of the current through the Petersen coil.

ELE-KITS. **Electrical Installations Assembly Kits:**

CAI. Computer Aided Instruction Software System



With no physical connection between Kit and computer (PC), this complete package consists on an Instructor Software (INS/SOF) totally integrated with the Student/Kit Software (K.../SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students. These, on the other hand, get a virtual instructor who helps them to deal with all the information on the subject of study.

- INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- Organize Students by Classes and Groups.
- Create easily new entries or delete them.
- Create data bases with student information.
- Analyze results and make statistical comparisons.
- Print reports.
- Develop own examinations.
- Detect student's progress and difficulties.

...and many other facilities.

The Instructor Software is the same for all the kits, and working in network configuration allows controlling all the students in the classroom.

Instructor Software

- K.../SOF. Computer Aided Instruction Softwares (Student/Kit Software):

It explains how to use the kit, run the experiments and what to do at any moment. Each kit has its own Student Software.

- The options are presented by pull-down menus and pop-up windows.
- Each Software contains:

  Theory: that gives the student the theoretical background for a total understanding of the studied subject.

  Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

  Guided Practices: presents several practices to be done with the kit, showing how to complete the circuits and get the right information from them.

  Exams: set of questions presented to test the obtained knowledge.

Student/Kit Software

Available Student/Kit Softwares:

Domestic Electrical Installations

➤General

KD1A/SOF. Robbery Alarm Station Kit.
KD3A/SOF. Fire Alarm Station Kit.
KD5/SOF. Stair Lights Timing Kit.
KD13/SOF. Audio Door entry System Kit.
KD14/SOF. Audio and Video Door entry System Kit.

➤Industrial Control

KD6A/SOF. Luminosity Control Station Kit.
KD9A/SOF. Heating Control Station Kit.
KD15A/SOF. Position Control Station Kit.
KD17A/SOF. Photoelectric Control Position Station Kit.
KD22/SOF. Flooding Control Station Kit.
KD23/SOF. Wireless Basic Control Station (RF) Kit.
KD24/SOF. Position Switch Kit.
KD25A/SOF. Control Station for Domestic Electric Services through the Telephone Kit.
KD28A/SOF. Integral Control Station of Domestic Electric Systems Kit.
KD30/SOF. Gas Control Station Kit.

➤Sound

KD19A/SOF. Sound Station Kit.
KD31/SOF. Movement and Sound Detection and Control Kit.

➤Instruments

KD8/SOF. Blinds Activator Kit.
KD11A/SOF. Network Analyzer Kit.
KD32/SOF. 24 Vac / 12 Vdc Circuits Analyzer Kit.
KD33/SOF. Installations Faults Simulator Kit.

Industrial Electrical Installations:

➤Starter and Motors

KI1/SOF. Star-Delta Starter Kit.
KI2/SOF. Starter through Auto-Transformer Kit.
KI4/SOF. Starter-Inverter Kit.
KI5/SOF. AC Wound Rotor Motor Starter Kit.
KI6/SOF. DC Motor Starter Kit.

➤Speed Control

KI3/SOF. Speed Commutator for Dahlander Motor Kit.
KI7/SOF. Automatic Change of Speed of a Dahlander Motor with Change of Direction Kit.

➤Electrotecnins

KI8/SOF. Reactive Power Compensation (Power Factor Correction) Kit.

➤Safety

KI9/SOF. People Safety Against Indirect Electrical Contacts in TT Neutral Regimen Kit.
KI10/SOF. People Safety Against Indirect Electrical Contacts in TN Neutral Regimen Kit.
KI11/SOF. People Safety Against Indirect Electrical Contacts in IT Neutral Regimen Kit.

Energy Installations:

➤Protection and Relays

KE3/SOF. Test Unit for Magneto-Thermal Automatic Switches Kit.
KE4/SOF. Test Unit for Differential Automatic Switches Kit.
KE5/SOF. Relay Control Station Kit.
KE7/SOF. Multi-Functional Electrical Protection Station Kit.
KE9/SOF. Directional Relay: Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection Kit.

➤Measurements and Control

KE2/SOF. Reactive Energy Control and Compensation Kit.
KE6/SOF. Energy Counters Control Station Kit.
KE8/SOF. Power & Torque Measurements of Electrical Motors Kit.

➤Lines

KE1/SOF. Aerial Line Model Kit.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

ELE-KITS. **Electrical Installations Assembly Kits:**

CAL. Computer Aided Learning Software (Results Calculation and Analysis)

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use, specifically developed by EDIBON.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

CAL will perform the calculations.

CAL computes the value of all the variables involved.

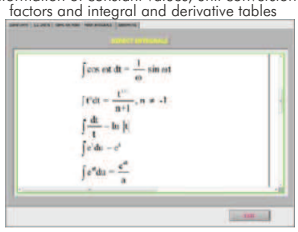
It allows to plot and print the results. Between the plotting options, any variable can be represented against any other.

Different plotting displays.

It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

Calculations

Information of constant values, unit conversion factors and integral and derivative tables



Plotting options

Available Softwares:

Domestic Electrical Installations

➤General

KD1A/CAL. Robbery Alarm Station Kit.
KD3A/CAL. Fire Alarm Station Kit.
KD5/CAL. Stair Lights Timing Kit.
KD13/CAL. Audio Door entry System Kit.
KD14/CAL. Audio and Video Door entry System Kit.

➤Industrial Control

KD6A/CAL. Luminosity Control Station Kit.
KD9A/CAL. Heating Control Station Kit.
KD15A/CAL. Position Control Station Kit.
KD17A/CAL. Photoelectric Control Position Station Kit.
KD22/CAL. Flooding Control Station Kit.
KD23/CAL. Wireless Basic Control Station (RF) Kit.
KD24/CAL. Position Switch Kit.
KD25A/CAL. Control Station for Domestic Electric Services through the Telephone Kit.
KD28A/CAL. Integral Control Station of Domestic Electric Systems Kit.
KD30/CAL. Gas Control Station Kit.

➤Sound

KD19A/CAL. Sound Station Kit.
KD31/CAL . Movement and Sound Detection and Control Kit.

➤Instruments

KD8/CAL. Blinds Activator Kit.
KD11A/CAL. Network Analyzer Kit.
KD32/CAL. 24 Vac / 12 Vdc Circuits Analyzer Kit.
KD33/CAL. Installations Faults Simulator Kit.

Industrial Electrical Installations:

➤Starter and Motors

KI1/CAL. Star-Delta Starter Kit.
KI2/CAL. Starter through Auto-Transformer Kit.
KI4/CAL. Starter-Inverter Kit.
KI5/CAL. AC Wound Rotor Motor Starter Kit.
KI6/CAL. DC Motor Starter Kit.

➤Speed Control

KI3/CAL. Speed Commutator for Dahlander Motor Kit.
KI7/CAL. Automatic Change of Speed of a Dahlander Motor with Change of Direction Kit.

➤Electrotecnins

KI8/CAL. Reactive Power Compensation (Power Factor Correction) Kit.

➤Safety

KI9/CAL. People Safety Against Indirect Electrical Contacts in TT Neutral Regimen Kit.
KI10/CAL. People Safety Against Indirect Electrical Contacts in TN Neutral Regimen Kit.
KI11/CAL. People Safety Against Indirect Electrical Contacts in IT Neutral Regimen Kit.

Energy Installations:

➤Protection and Relays

KE3/CAL. Test Unit for Magneto-Thermal Automatic Switches Kit.
KE4/CAL. Test Unit for Differential Automatic Switches Kit.
KE5/CAL. Relay Control Station Kit.
KE7/CAL. Multi-Functional Electrical Protection Station Kit.
KE9/CAL. Directional Relay: Earth Fault Detection. Directional Power Flow Detection. Reactive Power Flow Detection Kit.

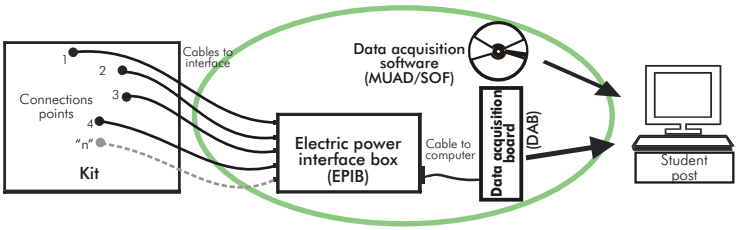
➤Measurements and Control

KE2/CAL. Reactive Energy Control and Compensation Kit.
KE6/CAL. Energy Counters Control Station Kit.
KE8/CAL. Power & Torque Measurements of Electrical Motors Kit.

➤Lines

KE1/CAL. Aerial Line Model Kit.

MUAD. Electric Power Data Acquisition System



MUAD is the perfect link between the kit/application and the PC. MUAD is a continuous data acquisition system with virtual instrumentation, that measures, analyzes and represents the parameters involved in the process.
MUAD allows voltage and current acquisition and measurement, data processing, frequency spectrum and all the functions of a digital oscilloscope.
We easily connect the Electric Power Interface Box (EPIB) to the kit/application with the supplied cables (there are several connection points placed for it). The EPIB is connected to the PC through the Data Acquisition Board (DAB), and by using the Data Acquisition with Virtual Instrumentation Software, the student can get results from the undertaken experiment/practice, see them on the screen and work with them.

This MUAD System includes EPIB + DAB + MUAD/SOF:

1) EPIB. **Electric Power Interface Box** (dimensions: 300 x 120 x 180 mm. approx.):
Interface that carries out the conditioning of the diverse signals that can be acquired in a process, for their later treatment and visualisation.
In the front panel, the elements are separated in two parts: left-hand part to VOLTAGE sensors, and right-hand part corresponds with CURRENT sensors.
Analog Input Channels:
8 analog input channels. Sampling range: 250 KSPS (Kilo samples per second).
4 Tension sensors AC/DC, 400V. 4 Current sensors.

EPIB

+

DAB

+

2) DAB. **Data Acquisition Board :**
PCI Data acquisition board (National Instruments) to be placed in a computer slot.
Analog input:
Number of channels= 16 single-ended or 8 differential.
Resolution=16 bits, 1 in 65536.
Sampling rate up to: 250 KSPS (Kilo samples per second).
Analog output:
Number of channels=2.
Resolution=16 bits, 1 in 65536.
Digital Input/Output:
Number channels=24inputs/outputs.
Timing: Counter/timers=2.

3) MUAD/SOF. **Data Acquisition Software** :
Data Acquisition Software with Graphic Representation:
Friendly graphical frame.
Compatible with actual Windows operating systems.
Configurable software allowing the representation of temporal evolution of the different signals.
Visualization of a tension of the circuits on the computer screen.
Sampling velocity up to 250 KSPS. (Kilo samples per second).

MUAD/SOF

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/ELE-KITS.pdf

4.1- Basic Electricity

EIV2. **Home Automation Installations Trainer**

SPECIFICATIONS SUMMARY

Trainer designed for the study of automation electrical installations in home and buildings. It allows the study of the security, the energy management, the comfort, the communications, etc.
Frame with anodized aluminium structure, on which the modules of domotic elements have to be fitted.
Modules allowing a quick, easy and secure installation of the domotic elements , without having electric risks.
Use of the EIB (european bus " instabus") installation system.
If foresees the use of a programmable logical controller, integrable on the EIB bus.
Connection between the different modules through some connections ready for such purpose.
Programming software for the programmable logical controller, and instabus.
Modules included:

- Power supply module, coil and data interface.
- Lamp-holder module. (2 units).
- Binary entry module.
- Binary output module.
- Switch-pushbutton module.
- Dimmer module.
- Module: thermostat, quadruple push-button and presence detector. (Multifunction module).
- Logical module and scenes.
- Blind module.
- Tactile vision module.
- Telecontrol module.
- Programmable logical controller module and EIB module.
- Double push-button module, infrared detector and display/actuator.

Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/EIV2.pdf

EIV6. **Home Automation Installations Trainer**

SPECIFICATIONS SUMMARY

Trainer designed for the study of automation electrical installations in home and buildings. It allows the study of the security, the energy management, the comfort, the communications, etc.
Frame with anodized aluminium structure, on which the modules of domotic elements have to be fitted.
Modules allowing a quick, easy and secure installation of the domotic elements, without electric risks.
Use of the EIB (european bus "instabus") installation system.
Connection between the different modules through connections ready for such purpose.
Modules included:

- Power supply module, coil and data interface.
- Lamp-holder module. (2 units).
- Binary entry module.
- Binary output module.
- Switch-pushbutton module.
- Dimmer module.
- Module: thermostat, quadruple push-button and presence detector. (Multifunction module).
- Logical module and scenes.

Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/basic/EIV6.pdf

4.2- Electricity Demonstration

PDL. **Lamps Demonstration Panel**

PDCE-P. **Electric Cables Demonstration Panel (Power)**

PDCE-S. **Electric Cables Demonstration Panel (Signalling)**

PDF. **Fuses Demonstration Panel**

4.3- Electrical Installations Workshop

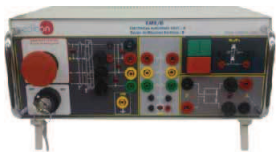
LIMEL. **Integrated Laboratory for Electrical Machines:**

Laboratory structure

① Electrical Machines Units

EME. Electrical Machines Unit
(Advanced option)

EME/M. Electrical Machines Unit
(Intermediate option)



EME/B. Electrical Machines Unit
(Basic option)

② Measurement Units

MULT. Digital Multimeter

EAL. Network Analyzer Unit (AC)

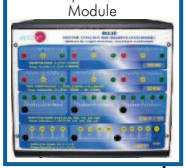
or

Other Network Analyzers:
-EALD. with Computer Data Acquisition.
-EALDG. with Computer Data Acquisition + Oscilloscope Display.
-EAL-DC. Network Analyzer Unit (DC).

-EAM-VA. Analog Measurement Unit.
-MUAD. Electric Power Data Acquisition System.

③ Loads:

RCL3R. Resistive, Inductive and Capacitive Loads Module



or

Individual elements:
-IND. Inductance Module.
-CON. Capacitors Module.
-REV. Variable Resistance Module.
-REV-T. Three-phase Variable Resistance Module.
-REF. Fixed Resistance Module.

④ Motors:

⑤ Brakes:

FRE-FE. Electronic Brake

or

-DI-FRE. Pendular Dynamo Brake.
-FREND. Dynamo Brake.
-FRENP. Magnetic Powder Brake.
-FREPR. Prony Brake.
-FRECP. Eddy Current Brake.

⑪ CAI. Computer Aided Instruction Software System

Teaching Technique used

INS/SOF. Instructor Software
+
EMT../SOF. Student/Motor Software

⑫ CAL. Computer Aided Learning Software (Results Calculation and Analysis)

Teaching Technique used

PC

⑬ MUAD. Electric Power Data Acquisition System

Teaching Technique used

EPIB. Electric Power Interface Box
+
DAB. Data Acquisition Board
+
MUAD/SOF. Data Acquisition Software

⑥ Transformers:

ETT. Three-phase and single-phase Transformers Unit

or

-TPPT. Three-phase Power Transformer Unit.
-EMPTA. Auxiliary Transformer and Protection Module.
-AUTR. Variable Auto-Transformer.
Individual elements:
-TRANS. Single-phase Transformer.
-TRANS/3. Three-phase Transformer.

⑦ DC Motor Speed Control

WCC. DC Motor Speed Controller

or

- WCC/M. DC Motor Speed Controller (intermediate option).
Individual elements:
- WCC/B. DC Motor Speed Controller, with no other elements.

⑧ AC Motor Speed Control

WCA. AC Motor Speed Controller

or

- WCA/M. AC Motor Speed Controller (intermediate option).
Individual elements:
- WCA/B. AC Motor Speed Controller, with no other elements.

⑨ PLC

PLC-PI. PLC Module for the Control of Industrial Processes

or

Individual elements:
- EDIBON FP-X-CPU. PLC, with no other elements.

⑩ Tachogenerator

TECNEL/T. Tachogenerator

or

- TECNEL/TM. Hand Tachometer.

Complete configuration

Main units:
① Electrical Machines Units.
② Measurement Units.
③ Loads.
④ Motors.
⑤ Brakes.

Additional possibilities:
⑪ CAI. Computer Aided Instruction Software System.
⑫ CAL. Computer Aided Learning Software (Results Calculation and Analysis).
⑬ MUAD. Electric Power Data Acquisition System.

* MINIMUM CONFIGURATION: ① + ②

Additional elements:
⑥ Transformers.
⑦ DC Motor Speed Control.
⑧ AC Motor Speed Control.
⑨ PLC (Programmable Logic Contoller).
⑩ Tachogenerator.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

① Electrical Machines Units

EDIBON presents three alternatives with increasing complexity and practical possibilities.
- EME. Electrical Machines Unit. It is a compact unit including the main electrical functions. It is EDIBON's most advanced option.
- EME/M. Electrical Machines Unit (intermediate option). Students can get a good grasp on the subject.
- EME/B. Electrical Machines Unit (basic option). It includes the most basic functions.

EME. **Electrical Machines Unit** (Advanced option)

SPECIFICATIONS SUMMARY

The Electrical Machines Unit (EME) is a compact and robust box for the study of the main electrical functions. In its front side, you find standard electrical functions, divided in sections, for a better visualization of the different applications. In EME, you have all the main panels you need for analyzing an electrical machine, as measuring devices, supply systems, management systems, protection systems, synchronism and rectification systems, etc.

This unit is prepared for working to a maximum power of 1 KW and all the components are located within a compact box.

Metallic box. Diagram in the front panel.

Different modules included in the EME unit:

-Connection terminals module:

Connection terminals of three-phase: R, S and T and supply neutral with the corresponding signaling lamps which indicate the voltage. There are 4 terminals in each phase.

Signaling lamp which will light up when the three-phase sequence is correct.

This module also has a signaling lamp and fuse, corresponding to the internal supply of the unit.

Two 24 Vac terminals.

-Operation module:

3 Running switches.

3 Stop switches.

3 Three-pole contactors, power A, B and C, with control circuit in alternating current. Each contactor has 2 auxiliary terminals (NC) and 3 auxiliary terminals (NO).

3 Lamps that will light when the contactors are started.

2 Timing realys.

Indicating lamps.

-Protection module:

Thermal Magnetic Circuit Breaker.

Thermal relay.

3 Power contacts.

2 Auxiliary contacts (NO and NC).

Signaling lamp.

-Synchronizing and rectification module:

3 lamps, as well as the inlet terminals for the three-phases with signaling for indicating its correct sequence.

Single-phase bridge rectifier, with 2 fuses with their corresponding fusion lamps.

-Contactors module:

3 Power takes, and the selected position closes the corresponding contact in the three phases.

-Possibility of assemblies of control circuits with delay.

* Minimum recommended measurement units:

2 Digital multimeters.

Recommended measurement unit:

EAL. Network Analyzer Unit.

Electrical supply required: Three-phase with neutral and ground, 380V.

Dimensions (approx.): 490 x 450 x 470 mm.

Weight: 50 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

The D.C.Machine (with motors EMT1/2/3/4/5/15)

1.- Preparation, regulation and inversion in a dynamo with independent excitation.
2.- The dynamo characteristic curve without load.
3.- Dynamos with series and shunt excitation.
4.- Dynamo external characteristic curve.
5.- Dynamo characteristic regulation curve.
6.- Speed variation, inversion and stop of D.C. motor with independent excitation.
7.- Speed-armature current characteristic curves in a D.C. motor with shunt or independent excitation.
8.- Torque-current characteristic curve in a D.C. motor with shunt or independent excitation.
9.- Torque-speed characteristic curve in a D.C. motor with shunt or independent excitation.
10.- Speed-excitation current characteristic curves in a D.C. motor with independent or shunt excitation. Operation in constant power.
11.- Speed control at constant torque.
12.- Series D.C. motor: starting, speed variation, inversion and braking.
13.- Speed-intensity characteristic curve in a D.C. motor with series excitation.
14.- Torque-current characteristic curve in a D.C. motor with series excitation.
15.- The D.C. motor with series excitation as universal motor.

The Synchronous Machine (with motor EMT6)

16.- Starting, voltage and frequency regulation in a three-phase alternator.
17.- Net coupling of a three-phase alternator.
18.- Characteristic curve of an alternator without load.
19.- Characteristic curve of an alternator in short circuit.
20.- Characteristic curve of an alternator with load.
21.- Synchronous motor starting.

The Asynchronous Machine (with motors EMT7/8/9/10/11/16/17)

22.- Mordey's diagrams.
23.- Starting process of a three-phase asynchronous motor with rotor in short circuit.
24.- Test without load of an asynchronous motor with rotor in short circuit.
25.- Test with load of a three-phase asynchronous motor with rotor in short circuit.
26.- Starting of a three-phase asynchronous motor with the wound rotor.
27.- Test without load of a three-phase asynchronous motor with the wound rotor.
28.- Test with load of a three-phase asynchronous motor with wound rotor.
29.- Starting of a single-phase motor with capacitor.
30.- Test without load of a single-phase asynchronous motor.
31.- Test in load of the single-phase motor.

The Universal motor (with motor EMT12)

32.- The Universal motor with D.C. supply.
33.- Speed-current characteristic of an Universal motor with D.C. supply.
34.- Torque-intensity characteristic in the D.C. Universal motor.
35.- The universal motor with A.C. supply.

The Repulsion motor (with motor EMT14)

36.- Starting and inversion of a single-phase repulsion motor.
37.- Test of a single-phase repulsion motor without load.
38.- Test of a single-phase asynchronous repulsion motor in A.C.

The Brushless motor (with motor EMT18)

39.- Brushless motor starting.
40.- Speed control and change of the turn sense.

The Dahlander motor (with motor EMT9)

41.- Dahlander motor starting.
42.- Different working speeds.
43.- Changing the different speeds of Dahlander motor while working.

The Stepper motor (with motor EMT19)

44.- Stepper motor starting.
45.- Steps control.
46.- Rotation sense change.

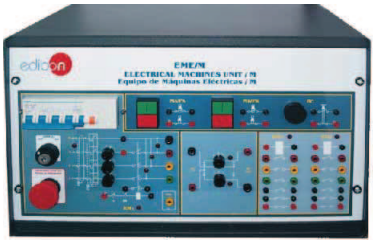
The Reluctance motor (with motor EMT21)

47.- Star connection of the reluctance motor.
48.- Delta connection of the reluctance motor.
49.- Revolution sense and inversion of rotation.

LIMEL. **Integrated Laboratory for Electrical Machines:**

① Electrical Machines Units

EME/M. **Electrical Machines Unit** (Intermediate option)



SPECIFICATIONS SUMMARY

Metallic box.

Diagram in the front panel.

Thermal Magnetic Circuit Breaker.

Two double switches (1 NO + 1 NC in each one)

Push Button (1 NC + 1 NO).

Three contactors with 2 NO and 1 NC.

DC supply 200 V dc with fuses.

Connection Key

Emergency stop push button.

* Minimum recommended measurement units:

2 Digital multimeters.

Recommended measurement unit:

EAL. Network Analyzer Unit.

Electrical supply required: Three-phase with neutral and ground, 380V.

Dimensions (approx.): 490 x 330 x 310 mm.

Weight: 25 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

The D.C.Machine:

1.- Preparation, regulation and inversion in a dynamo with independent excitation.
2.- The dynamo characteristic curve without load.
3.- Dynamos with series and shunt excitation.
4.- Dynamo external characteristics curve.
5.- Characteristic regulation curve of a dynamo.
6.- Speed control at constant torque.
7.- Series D.C. motor: starting, speed variation, inversion and braking.

The Synchronous Machine:

8.- Starting, voltage and frequency regulation in a three-phase alternator.
9.- Characteristic curve of an alternator without load.
10.- Characteristic curve of an alternator in short circuit.
11.- Characteristic curve of an alternator with load.
12.- Synchronous motor starting.

The Asynchronous Machine:

13.- Mordey's diagrams.
14.- Starting process of a three-phase asynchronous motor with rotor in short circuit.
15.- Test without load of an asynchronous motor with rotor in short circuit.
16.- Test with load of a three-phase asynchronous motor with rotor in short circuit.
17.- Starting and turn sense inversion of a three-phase motor.
18.- Test without load of a single-phase motor.
19.- Test in load of the single-phase motor.

The Universal motor:

20.- The universal motor with D.C. supply.
21.- Speed-current characteristic of an Universal motor with D.C. supply.
22.- Torque-intensity characteristic in the D.C. Universal motor.
23.- The Universal motor with A.C. supply.

The Repulsion motor:

24.- Starting and inversion of a single-phase repulsion motor.
25.- Test of a single-phase repulsion motor without load.
26.- Test of a single-phase asynchronous repulsion motor in A.C.

The Brushless motor:

27.- Brushless motor starting.
28.- Speed control and change of the turn sense.

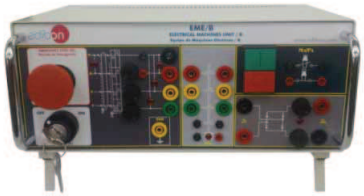
The Dahlander motor:

29.- Dahlander motor starting.
30.- Different working speeds.

The Reluctance motor:

31.- Star connection of the reluctance motor.
32.- Delta connection of the reluctance motor.
33.- Revolution sense and inversion of rotation.

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



SPECIFICATIONS SUMMARY

Metallic box.
Diagram in the front panel.
Thermal Magnetic Circuit Breaker.
DC supply 200 Vdc with fuses.
Connection Key.
Emergency stop push button.
Two push buttons (1NO + 1NC).
One contactor, with three power connections, one control connection and supply control.
* Minimum recommended measurement units:
2 Digital Multimeters.
Recommended measurement unit:
EAL. Network Analyzer Unit.
Electrical supply required: Three-phase with neutral and ground, 380V.
Dimensions (approx.): 300 x 190 x 120 mm.
Weight: 5 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

The D.C.Machine:

1.- Preparation, regulation in a dynamo with independent excitation.
2.- Dynamos with series and shunt excitation.
3.- Speed control at constant torque.
4.- Series D.C. Motor: starting, speed variation, inversion and braking.

The Asynchronous Machine:

5.- Starting process of a three-phase asynchronous motor with rotor in short circuit.
6.- Test without load of an asynchronous motor with rotor in short circuit.

The Universal motor:

7.- The Universal motor with D.C. supply.

LIMEL. **Integrated Laboratory for Electrical Machines:**

② Measurement Units

The measurement units let us extract information from the experimental units (EMEs), thus allowing further process of the data. We can get values of currents, voltages, resistance, etc. for further analysis.

MULT. **Digital Multimeter**

SPECIFICATIONS SUMMARY

Digital multimeter.
Voltage and current meter.
Resistances and capacitors.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

EAL. **Network Analyzer Unit (AC)**

SPECIFICATIONS SUMMARY

This unit shows the main electric parameters on the electric network through the interface and an easy parameter selection.
Metallic box. Diagram in the front panel.
Measurements of current, voltage, power, power factor, frequency, energy, TRMS measurement of distorted waves (voltage, current) for each phase and average.
Display for instantaneous variables: 3 x 3 digits.
Display for energies: 8+1 digits.
Voltage: V_{L-N} = 185 V to 460 V. V_{L-L} = 320 V to 800 V.
Current: Phase current : 0.03 to 5A.
Frequency: 48 to 62 Hz ± 0.1 Hz.
Power: Active, Reactive and Apparent.
Power Factor: Power factor for resistive, inductive and capacitive load types.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

EALD. **Network Analyzer Unit, with Computer Data Acquisition**

SPECIFICATIONS SUMMARY

This unit shows the main electric parameters on the electric network through the interface and an easy parameter selection.
Metallic box. Diagram in the front panel.
Measurements of current, voltage, power, power factor, frequency, energy, TRMS measurement of distorted waves (voltage, current) for each phase and average.
Display for instantaneous variables: 3 x 3 digits.
Voltage: V_{L-N} = 185 V to 460 V. V_{L-L} = 320 V to 800 V.
Current: Phase current : 0.03 to 5A.
Frequency: 48 to 62 Hz ± 0.1 Hz.
Power: Active, Reactive and Apparent.
Power Factor: Power factor for resistive, inductive and capacitive load types.
Connection RS232 to computer (PC) and Data Acquisition Software.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

EALDG. **Network Analyzer Unit, with Computer Data Acquisition + Oscilloscope Display**

SPECIFICATIONS SUMMARY

This unit shows the main electric parameters on the electric network through the interface and a parameter selection.
Metallic box. Diagram in the front panel.
3 Current inputs, for series intensity.
3 Voltage terminals for each phase measure (R, S, T) and another one for the neutral connection.
Control and visualization digital display and oscilloscope display.
Voltage: Range 0 - 750 Vrms. Prec.: ±0.5%. Phase to phase - Phase to neutral.
Current: Range 0.01 - 5 Arms. Prec.: ±0.5%.
Frequency: Range 48 to 62 Hz. ±0.1Hz.
Power: Active, Reactive and Apparent. Range 0.01 to 9900 kW. Prec.: ±1%.
Power Factor: Power Factor for each phase and average. Range -0.5 to + 0.5. Prec.: ±1%.
Operating temperature 0 to +50°C.
Connection RS232 to computer (PC).
Data Acquisition Software.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

②Measurement Units

EAL-DC. **Network Analyzer Unit (DC)**

SPECIFICATIONS SUMMARY

This unit shows the main electric parameters on the electric loads throught the interface and a parameters selection.
Metallic box. Diagram in the front panel.
1 Current input.
1 Terminal voltage.
Visualization digital display:
Voltage: Range 0 - 450 Vdc without transformer.
Current: Range 0 - 5 A.
Power.
Power supply connection: 38 - 265 Vac/dc.
Resolution: 0.1 V; 0.01 A; 0.01 KW.
Energy total: 6 DGT (0.1 KWh).
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

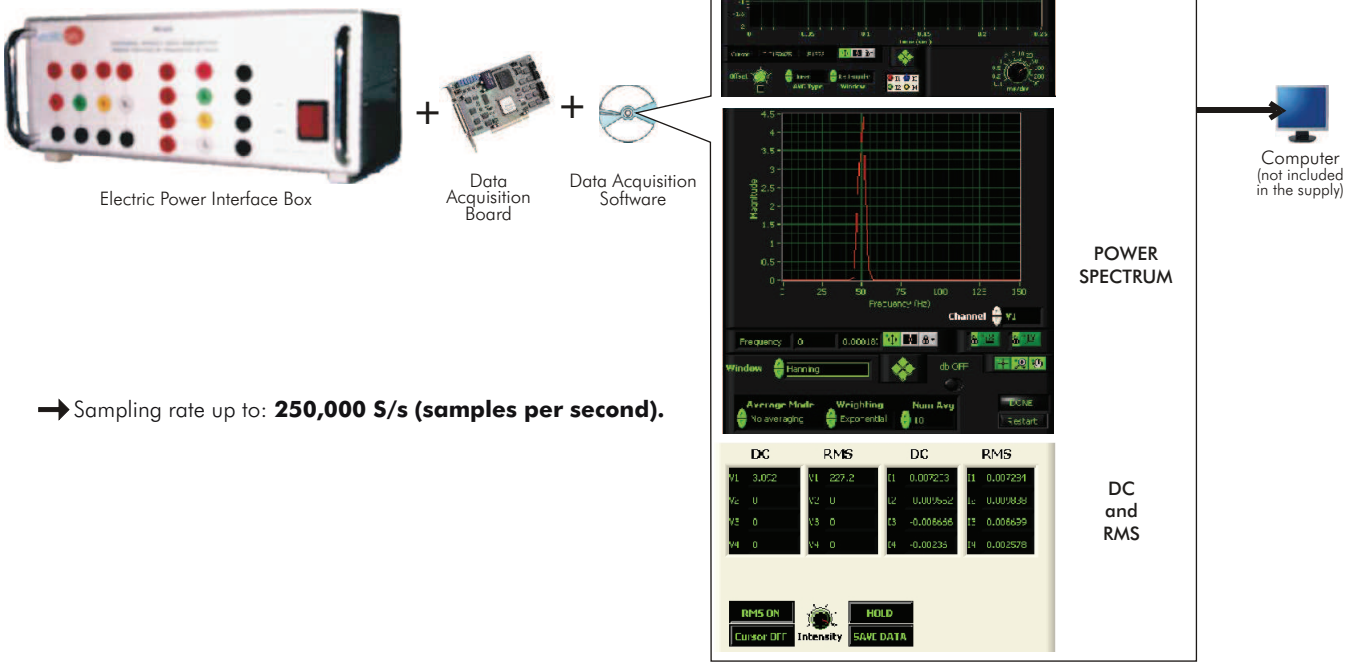
EAM-VA. **Analog Measurement Unit**

SPECIFICATIONS SUMMARY

This unit allows to analyze the different voltages and currents involved in a circuit through a simple frontal panel that includes analog measurement instruments.
Metallic box.
4 Voltmeters.
A.C. Measuring Instruments with moving iron.
Voltmeter with measuring range from 0 to 500Vac.
Horizontal scale with precision grade of 1.5.
2 Ammeters.
A.C. Measuring Instruments with moving iron.
Ammeter with measuring range of 0 to 5A.
Horizontal scale with precision grade of 1.5.
2 Analog inputs for each meter.
Dimensions (approx.): 490 x 330 x 310 mm. Weight: 40 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

MUAD. **Electric Power Data Acquisition System** (see "Section 13" in page 91)



→ Sampling rate up to: **250,000 S/s (samples per second).**

LIMEL. **Integrated Laboratory for Electrical Machines:**

③ Loads

RLC3R. **Resistive, Inductive and Capacitive Loads Module**

SPECIFICATIONS SUMMARY

When you brake an electrical machine, the electrical energy has to be dissipated. Loads provide this function, the dissipation of energy. Depending on the experiment, the dissipating load has to be resistive, inductive or capacitive. EDIBON recommends having the three kinds, if a good understanding on the subject is pursued.

Our Resistive, Capacitive and Inductive Loads Module (RCL3R) offers:

- Single and Three-phase fixed resistances.
- Single and Three-phase variable resistances.
- Single and Three-phase inductances.
- Single and Three-phase capacitors.

Metallic box. Diagram in the front panel.

Variable resistive loads: 3 x [150 Ω (500 W)].

Fixed resistive loads: 3 x [150 Ω (500 W) + 150 Ω (500 W)].

Inductive loads: 3 x [0, 33, 78, 140, 193, 236 mH].(230V /2 A)

Capacitive loads: 3 x [4 x 7 μF]. (400V)

Dimensions (approx.): 490 x 450 x 470 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

Individual Elements

SPECIFICATIONS SUMMARY

When a simpler and cheaper option is preferred when studying the use of loads in electrical machines, EDIBON gives the choice of acquiring single modules.

IND

IND. **Inductance Module**

Metallic box. Diagram in the front panel.

Inductance load: [0, 33, 78, 140, 193, 236 mH].

Dimensions (approx.): 300 x 190 x 120 mm.

CON

CON. **Capacitors Module**

Metallic box. Diagram in the front panel.

Capacitive load: [4 x 7 μF].

Dimensions (approx.): 300 x 190 x 120 mm.

REV

REV. **Variable Resistance Module**

Metallic box. Diagram in the front panel.

Variable resistive load of 0-150Ω (500W).

Dimensions (approx.): 300 x 190 x 120 mm.

REV-T

REV-T. **Three-phase Variable Resistance Module**

Metallic box. Diagram in the front panel.

3 Variable resistive loads of 150Ω (500W).

Dimensions (approx.): 490 x 330 x 310 mm.

REF

REF. **Fixed Resistance Module**

Metallic box. Diagram in the front panel.

Resistive load of 150Ω (500W).

Dimensions (approx.): 300 x 190 x 120 mm.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

④ Motors

EDIBON has a wide range of electric motors. The motors supplied include connectors, couplings and motor support.

➤Motors (D.C.)


EMT1

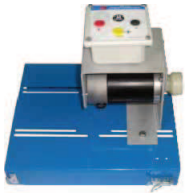

EMT2


EMT3

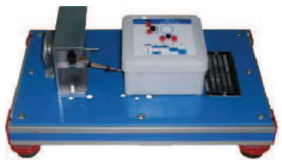

EMT4


EMT5


EMT12


EMT15


EMT18


EMT19


VVPP


VVPP/B

SPECIFICATIONS SUMMARY

EMT1. **D.C. Independent excitation motor-generator.**
Power: 250W. Speed: 3400 r.p.m. V.excitation: 200 V.D.C. I.Excitation: 0.3A. V.Armature.: 200V D.C. I.Armature: 1.5A.

EMT2. **D.C. Series excitation motor-generator.**
Power: 250W. Speed: 7500 r.p.m. V.Armature: 200V.D.C. I.Armature: 1.5A.

EMT3. **D.C. Shunt excitation motor-generator.**
Power: 250W. Speed: 3400 r.p.m. V.Armature: 200V.D.C. I.Armature: 1.5A.

EMT4. **D.C. Compound excitation motor-generator.**
Power: 250W. Speed: 3400 r.p.m. I.Excitation:0.4A. V.Armature: 200V. I.Armature: 1.5A.

EMT5. **D.C. Shunt-series compound excitation motor.**
Power: 250W. Speed: 3400/7500 r.p.m. V.excitation: 230 V.D.C. I.Excitation: 0.4A. V.Armature.: 200V. D.C. I.Armature: 1.5A.

EMT12. **Universal motor (single-phase).**
Power: 230W. Speed: 9000 r.p.m. Frequency: 50/60Hz. V.Armature.: 230V. I.Armature: 1A.

EMT15. **D.C. Permanent magnet motor.**
Power: 100W. Speed: 3000 r.p.m. V.Armature: 200V. I.Armature: 0.5A.

EMT18. **D.C. Brushless motor.**
Power: 80W. Speed: 3250 r.p.m. V.Armature: 24V.D.C. I.Armature:3.3 A.

EMT19. **Stepper motor.**
Power: 2W. V.Armature: 12V. I.Armature: 0.16 A.

OPTIONAL for working with EMT19. Stepper motor:

VVPP. **Velocity Control for Stepper Motor** (Manual Control and Automatic Control).

VVPP/B. **Velocity Control for Stepper Motor** (Manual Control).

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

The D.C. Machine (with motors EMT1/2/3/4/5/15)

1.- Preparation, regulation and inversion in a dynamo with independent excitation.
2.- The dynamo characteristic curve without load.
3.- Dynamos with series and shunt excitation.
4.- Dynamo external characteristic curve.
5.- Dynamo characteristic regulation curve.
6.- Speed variation, inversion and stop of D.C. motor with independent excitation.
7.- Speed-armature current characteristic curve in a D.C. motor with shunt or independent excitation.
8.- Torque-current characteristic curve in a D.C. motor with shunt or independent excitation.
9.- Torque-speed characteristic curve in a D.C. motor with shunt or independent excitation.
10.- Speed-excitation current characteristic curve in a D.C. motor with independent or shunt excitation. Operation in constant power.
11.- Speed control at constant torque.
12.- Series D.C. motor: starting, speed variation, inversion and braking.
13.- Speed-intensity characteristic curve in a D.C. motor with series excitation.
14.- Torque-current characteristic curve in a D.C. motor with series excitation.
15.- The D.C. motor with series excitation as universal motor.

The Synchronous Machine (with motor EMT6)

16.- Starting, voltage and frequency regulation in a three-phase alternator.
17.- Net coupling of a three-phase alternator.
18.- Characteristic curve of an alternator without load.
19.- Characteristic curve of an alternator in short circuit.
20.- Characteristic curve of an alternator with load.
21.- Synchronous motor starting.

The Asynchronous Machine (with motors EMT7/8/9/10/11/16/17)

22.- Mordey's diagrams.
23.- Starting process of a three-phase asynchronous motor with rotor in short circuit.
24.- Test without load of an asynchronous motor with rotor in short circuit.
25.- Test with load of a three-phase asynchronous motor with rotor in short circuit.

Continue...

➤Motors (A.C.)


EMT6


EMT6B


EMT7


EMT7B

SPECIFICATIONS SUMMARY

EMT6. **A.C. Synchronous three-phase motor alternator.**
Power: 200W. Speed: 3000 r.p.m. Frequency: 50Hz. V.excitation: 200V. I.Excitation: 0.7A. V.Armature: 220V. I.Armature: 1A.

EMT6B. **Permanent magnets synchronous three-phase generator (24 Vac).**
Power: 450W. Speed: 750 r.p.m. Frequency: 50Hz. V.Armature: 3 x 24 (Vac). I.Armature: 11A.

EMT7. **Asynchronous three-phase motor of squirrel cage.**
Power: 370W. Speed: 2730 r.p.m. Frequency: 50/60Hz. V.Armature: 230/400V. I.Armature: 1.67/0.97A. Connections: Star/triangle.

EMT7B. **Asynchronous three-phase motor of squirrel cage (4 poles).**
Power: 370W. Speed: 1370 r.p.m. V.Armature: 230/400V. I.Armature: 1.92/1.11A. Frequency: 50/60Hz. Connections: Star/triangle.

Continue...

LIMEL. **Integrated Laboratory for Electrical Machines:**

④Motors

➤**Motors (A.C.)**


EMT7C


EMT8


EMT9


EMT10


EMT11


EMT12

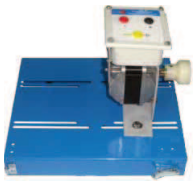

EMT14


EMT16


EMT17


EMT20


EMT21


EMT22

SPECIFICATIONS SUMMARY

EMT7C. **Asynchronous three-phase motor of squirrel cage (8 poles).**
Power: 550W. Speed: 750 r.p.m. V.Armature: 230/400V. I.Armature: 3.6/2A. Frequency: 50/60Hz. Connections: Star/triangle.

EMT8. **Asynchronous three-phase motor with wound rotor.**
Power: 200W. Speed: 3000 r.p.m. Frequency: 50Hz. V.Armature: 230/400V. I.Armature: 1/0.5 A. Connections: Star/triangle.

EMT9. **Dahlander three-phase (two-speeds).**
Power: 250/500W. Speed: 1400/2800 r.p.m. Frequency: 50/60Hz. V.Armature: 400V. I.Armature: 1.20/1.55 A.

EMT10. **Asynchronous three-phase motor of two independent speeds.**
Power: 240/370W. Speed: 900/1420 r.p.m. Frequency: 50/60Hz. V.Armature: 400V. I.Armature: 1/1.2 A.

EMT11. **Asynchronous single-phase motor with starting capacitor.**
Power: 370W. Speed: 2780 r.p.m. Frequency: 50/60Hz. V.Armature: 230V. I.Armature: 2.53A.

EMT12. **Universal motor (single-phase).**
Power: 230W. Speed: 9000 r.p.m. Frequency: 50/60Hz. V.Armature.: 230V. I.Armature: 1A.

EMT14. **Repulsion motor, single-phase with short-circuited brushes.**
Power: 350W. Speed: 1500 r.p.m. Frequency: 50/60Hz. V.Excitation: 230V. I.Excitation: 1.5 A.

EMT16. **Asynchronous single-phase motor with starting and running capacitor.**
Power: 370W. Speed: 2780 r.p.m. Frequency: 50/60Hz. V.Armature: 230V. I.Armature: 2.53 A.

EMT17. **Three-phase motor of squirrel cage with "Y" connection.**
Power: 370W. Speed: 2730 r.p.m. Frequency: 50/60 Hz. V.Armature: 400 V. I.Armature nominal: 0.97A.

EMT20. **Asynchronous single-phase motor with split phase.**
Power: 370W. Speed: 2780 r.p.m. Frequency: 50/60 Hz. V.Armature: 230V. I.Armature: 2.53 A.

EMT21. **Three-phase reluctance motor.**
Power: 300W. Speed: 3000 r.p.m. Frequency: 50/60 Hz. V.Armature: 400V. I.Armature: 1.4 A.

EMT22. **Single-phase shaded pole motor.**
Power: 16W. Speed: 1550 r.p.m. Frequency: 50/60Hz. V. Armature: 230/240V. I.Armature: 0.42 A.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

26.- Starting of a three-phase asynchronous motor with the wound rotor.
27.- Test without load of a three-phase asynchronous motor with the wound rotor.
28.- Test with load of a three-phase asynchronous motor with wound rotor.
29.- Starting and turn sense inversion of a single-phase motor with capacitor.
30.- Test without load of a single-phase motor.
31.- Test in load of the single-phase motor.

The Universal motor (with motor EMT12)

32.- The universal motor with D.C. supply.
33.- Speed-current characteristic of an Universal motor with D.C. supply.
34.- Torque-intensity characteristic in the D.C. Universal motor.
35.- The universal motor with A.C. supply.

The repulsion motor (with motor EMT14)

36.- Starting and inversion of a single-phase repulsion motor.
37.- Test of a single-phase repulsion without load.
38.- Test of a single-phase asynchronous repulsion motor with A.C.

The Brushless motor (with motor EMT18)

39.- Brushless motor starting.
40.- Speed control and change of the turn sense.

The Dahlander motor (with motor EMT9)

41.- Dahlander motor starting.
42.- Different working speeds.
43.- Changing the different speeds of Dahlander motor while working.

The Stepper motor (with motor EMT19)

44.- Stepper motor starting.
45.- Steps control.
46.- Rotation sense change.

The Reluctance motor (with motor EMT21)

47.- Star connection of the reluctance motor.
48.- Delta connection of the reluctance motor.
49.- Revolution sense and inversion of rotation.

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑤ Brakes

The importance of Brakes comes when we want to adjust the motor speed, measure the torque given, or stop the motor.

FRE-FE. **Electronic Brake**

SPECIFICATIONS SUMMARY

The electronic brake FRE-FE is an unit that allows to regulate the braking torque of a motor.
The FRE-FE is constituted as a set of two elements:
- Control module:
  - Front panel:
    - Braking torque control.
    - ON/OFF switch.
    - Electrical parameters indicator.
    - Display manipulation: Key "FUNC/DATA". Keys "RUN" / "STOP".
    - Forward / Reverse switch.
- Braking motor mounted on a bench-support.

Cable to connect the two elements.
Power: 370W. V. Armature: 220/240V.
The control of the braking torque is carried out by means of a control potentiometer placed on the front side of the control module.
The direction of the braking motor is controlled by a switch placed on the front panel of the control module.
Furthermore, the user will be able to visualize in a display different electrical parameters (as for example: current, frequency, active power...), as well as checking the voltage in the resistor that is used to produce the braking of the motor.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

DI-FRE. **Pendular Dynamo Brake**

SPECIFICATIONS SUMMARY

Power: 300W.
Speed: 3000 rpm.
V.Excitation: 190 V.D.C. I.Excitation: 0.3A.
V.Armature: 200 V.D.C. I.Armature: 1.5A.
Torque measured with lever and weights, by combining the mechanical torque and electrical torque.
Security connectors.
Bench-support.
Variable power resistance (REV) required.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

EMCC. **Load Cell Module**

SPECIFICATIONS SUMMARY

Accessory for DI-FRE. Pendular Dynamo Brake.
Metallic box.
Front panel:
- Connector for cable to the load cell.
- ON/OFF switch.
- Digital display/Force N.

Load cell.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 2 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

FREND. **Dynamo Brake**

SPECIFICATIONS SUMMARY

Power: 300W.
Speed: 3400 rpm.
I.Excitation: 0.4A.
V.Armature: 200 V.D.C. I.Armature: 1.5A.
Connectors.
Bench - support.
Variable power resistance (REV) required.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑤ Brakes

FRENP. **Magnetic Powder Brake**

SPECIFICATIONS SUMMARY

The FRENP is a unit designed for the study of a magnetic powder brake.
The unit consists of a magnetic powder brake and a control module.
The control module allows setting the nominal torque of the brake through a potentiometer. It has two terminals to measure a voltage in direct proportion to the current supplied to the brake, therefore, to the exerted torque.
The unit also includes a fuse and a thermal relay to avoid eventual damages due to a over-intensity and/or to a over-temperature.
Power: 400 W.
V.Armature: 110/220V.
It is equipped with temperature probe to stop the braking action (the motor would stay free).
Bench-support.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

FREPR. **Prony Brake**

SPECIFICATIONS SUMMARY

Prony brake with resistant ribbon.
Mechanical braking action and dynamometer.
Power: 500 W.
Speed.: 3000 rpm.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

FRECP. **Eddy Current Brake**

SPECIFICATIONS SUMMARY

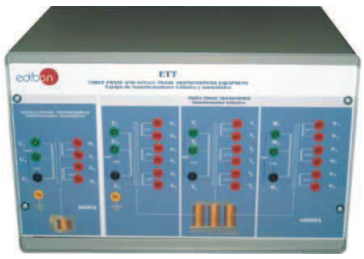
FRECP is an unit designed to work as a magnetic brake by means of the induction of Foucault's parasitic currents.
The FRECP is similar to an electrical motor, since it has a stator winding, the inductor, that we will feed with a DC voltage. We will change the braking torque by means of this direct voltage.
The braking torque is proportional to the current injected.
Nominal current: 1.67 A.
Maximum current: 1.8 A.
Maximum braking torque: 1.4 Nm.
Bench - support.
DC power supply.
Required service: WCC/M. DC Motor Speed Controller (intermediate option).

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑥ Transformers

ETT. Three-phase and single-phase Transformers Unit



SPECIFICATIONS SUMMARY

Metallic box. Diagram in the front panel.
Single-phase transformer:
Nominal power: 500 VA. Transformation ratio: 400 / 230 V.
Inlets: 400 V and 230 V (in the primary). Number of secondary coils: 2.
Output voltage in the secondary: 115 (each one).
Maximum current in the primary: 1.5 A (for each voltage of 400 V). 3 A (for each voltage of 230 V).
Three-phase transformer in pillars:
Nominal power: 1000 VA. Transformation ratio: 380/3 x 127 V.
Inlets: 220 V and 380 V (in the primary).
Outlet voltage in the secondary: 3 x 127 V (each phase).
Maximum current in the primary: 2 A (for a voltage of 380 V). 2 A (for a voltage of 220 V).
Connection modes: Primary: Star, triangle. Secondary: Star, triangle, zig-zag, six-phase and triple star.
Electrical supply:
For single-phase transformer: 400-230 V / 50 Hz. or 60 Hz.
For three-phase transformer: 380-220 V / 50 Hz. or 60 Hz.
Dimensions (approx.): 490 x 330 x 310 mm. Weight: 40 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

1.- Measurement of the transformation ratio.
2.- Rehearsal of a single-phase transformer in open circuit.
3.- Rehearsal of a single-phase transformer in short circuit.
4.- Rehearsal of a single-phase transformer in load.
5.- Rehearsal of a three-phase transformer in open circuit.
6.- Rehearsal of a three-phase transformer in short circuit.
7.- Autotransformer tests.
8.- Connection modes tests: Start/delta/Zig-Zag/6-phase/triple star.
9.- Transformer ratio variation tests.

TPPT. Three-phase Power Transformer Unit

SPECIFICATIONS SUMMARY

The "TPPT" unit is formed by a metallic box, which contains a three-phase power transformer. In the front panel of the box are located the terminals for both primary and secondary terminals for different power supply inputs and outputs. In the backside are located the fuses to protect the transformer.
Power: 1000 VA.
Module 1: Primary winding
It includes a three-phase winding which can be connected externally in either star or triangle, each phase winding has a neutral terminal, a 146V a.c. intermediate terminal and 220V a.c. terminal.
Module 2: Secondary winding
It includes a three-phase winding which can be connected externally in either star of triangle. Each phase winding has a neutral terminal, a 127V a.c. intermediate terminal and a 220V a.c. terminal.
This unit can be used to make 6 different a.c. connection types:

-Star (380V). - Triangle (380V).	-Triangle (220V). - Triangle (380V).
-Star (380V). - Star (220V).	-Triangle (220V). - Star (220V).
-Star (380V). - Triangle (127V).	-Triangle (220V). - Triangle (127V).

Electrical supply: 380-220 V.
Dimensions (approx.): 490 x 330 x 310 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

EMPTA. Auxiliary Transformer and Protection Module

SPECIFICATIONS SUMMARY

Metallic Box.
Input and output connectors.
Thermal magnetic unit 16 A., 2 poles.
Differential 25 A., 30 mV., 230 V.
Reversible auto-transformer 125-220 (1000 VA).
Conversion from 127V. 60Hz to 220V. 50Hz.
Conversion from 220V. 50Hz to 127V. 60Hz.
Differential electrical protection.
Thermal magnetic protection.
Required services: Input: 220Vac - 127Vac.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

1.- Conversion from 127V/60Hz to 220V/50Hz.
2.- Conversion from 220V/50Hz to 127V/60Hz.
3.- Differential electrical protection.
4.- Thermal magnetic protection.

AUTR. Variable Auto-transformer

SPECIFICATIONS SUMMARY

This unit enables to carry out different practices related with variable auto-transformers.
The objective of the AUTR unit is to show techniques to measure the variable output and how the auto-transformer can be used with a load.
Metallic box. Diagram in the front panel.
It has two protection fuses in back part for controlling the output current is lower than 2A.
Input voltage: 240Vac, 50/60 Hz.
Output voltage: 0-240Vac, 50/60 Hz.
Maximum output current: 2 A.
Dimensions (approx.): 300 x 190 x 120 mm.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

Individual Elements:

TRANS

TRANS/3

SPECIFICATIONS SUMMARY

TRANS. **Single-phase Transformer**
Input and output connectors.
Single phase transformer, 400 V a.c. - 230 V a.c., 400 VA.
Ground connector.
TRANS/3. **Three-phase Transformer**
Input and output connectors.
Three phase transformer, 400 V a.c. - 230 V a.c., 1000 VA

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑦ DC Motor Speed Control

VVCC. **DC Motor Speed Controller**

SPECIFICATIONS SUMMARY

Metallic box.
Front panel including:
- Excitation terminals:
  - Connection with the excitation of the DC Motor.
  - Red Terminal / Positive Polarity. Black Terminal / Negative Polarity.
- Rotor terminals:
  - Connection with the rotor of the DC Motor.
  - Red Terminal / Positive Polarity. Black Terminal / Negative Polarity.
- Tachodynamo terminals:
  - Connection with an external DC Tachogenerator.
  - Red Terminal / Positive Polarity. Black Terminal / Negative Polarity.
- Torque control: Control of the mechanical torque of the motor.
- Speed control: Control of the speed of the motor.
- Start/Stop switch to run or stop the motor. On/Off switch to turn the unit on.
- Feedback switch: switch to control the feedback source (tachodynamo or internal).
- LED indicators of the status of the unit.

Maximum power: 550W. Maximum torque: 2.6 Nm. Speed range: 130-2000 r.p.m.
Besides the motor speed controller, all the indicators, connecting cables and additional components are included.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

1.- Motor parameters adjustment
2.- Working at a certain frequency.
3.- Starting carrying out by defined ramp.
4.- Braking possibility until a certain speed and recovery.

VVCC/M. **DC Motor Speed Controller** (intermediate option)

SPECIFICATIONS SUMMARY

This unit consists in a variable transformer followed by a rectifier bridge and an anti-ripple capacitor with a resistor to get discharged.
Metallic box.
Adjustable voltage: up to 320 Vdc. Maximum current: 2 A.
At the top of the unit there is a knob to adjust the DC voltage.
Front panel including:
- Positive, negative and ground connections. ON/OFF switch.

Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

VVPP. **Velocity Control for Stepper Motor** (Manual Control and Automatic Control)

SPECIFICATIONS SUMMARY

The VVPP is the stepper motor controller training module designed by EDIBON.
It has a PLC which programmed for controlling the stepper motor and includes a software to program the PLC.
Technical data:
- Number of inputs: 8.
- Voltage: 230 Vac.
- Number outputs: 4.
- Output type: Relay.
- Output capacity: 2 A.
- Single-phase: 220 V; 6.3 VA.

Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

VVPP/B. **Velocity Control for Stepper Motor** (Manual Control)

SPECIFICATIONS SUMMARY

Front panel:
- DC input + ground connection. ON/OFF switch.
- A, A', B, B' connections with 4 fuses.
- Direction: clockwise/anticlockwise.
- Manual control with 4 switches.

Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

Individual Elements:

SPECIFICATIONS SUMMARY

VVCC/B. **DC Motor Speed Controller**, with no other elements
- Maximum power: 550W.
- Maximum torque: 2.6 N.m.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑧ AC Motor Speed Control

VVCA. **AC Motor Speed Controller**

SPECIFICATIONS SUMMARY

This is a unit for varying the speed of an AC motor for control applications.
This unit enables to change the speed of an asynchronous motor, obtaining features which characterize a direct current motor. It consists basically on a rectifying phase coupled to another inverter phase, with a capacitor in parallel between them. By varying the shooting frequency of the IGBT, we obtain an alternating output at a variable frequency which is applied to the asynchronous motor.
Metallic box.
Circuit diagram in front panel.
It has a control panel in order to introduce the parameters of the motor that is going to be used and the output frequency. In addition, through it, we can carry out several programming. The unit also has a series of terminals where we connect the digital and analog inputs and the relay and transistor outputs.
Maximum power: 750 W.
Parameter self adjustment.
Analog/digital parameter inlets through panel.
Turn inversion while running.
Analog parameter visualization.
Voltage Input:
Frequency set according to external command: up to 50Hz. Reversible operation using +/- signal: 0 to +/-10 V. PID control. Input resistance: 22 KΩ.
Current input:
Frequency set according to the analog input current command: up to 50 Hz. Reversible operation: 20 to 4mA. PID control. Input resistance: 250 Ohms.
5 Digital inputs that can be configured by the user.
1 Outlet to alarm relay.
2 Transistor internal outlets:
Maximum load current: 50 mA. Leak current at OFF: 0.1 mA
Speed range: 130-2000 r.p.m.
Besides the motor speed controller, all the indicators, connecting cables and additional components are included.
Dimensions (approx.): 400 x 600 x 500 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

1.- Motor parameters adjustment.
2.- Working at a frequency given by the panel.
3.- Working at a frequency given by an analog input (potentiometer).
4.- Turn inversion.
5.- Display of analog output.
6.- Digital inputs configuration.
7.- Outputs from alarm to relay.
8.- Outputs from alarm to transistor.

VVCA/M. **AC Motor Speed Controller** (intermediate option)

SPECIFICATIONS SUMMARY

This unit consist in a simple AC motor speed controller.
Metallic box.
Power: 3kVA.
Frequency: 1-50 Hz.
Phase voltage: 230 Vac.
Maximum current: 8A.
Overcurrent thermal protection.
ON/OFF switch.
It has two blocks in the front panel:
Speed control: Start/Stop switch and speed control potenciometer.
Connections to motor: Three-phase connection to AC motor and ground connection.
Dimensions (approx.): 300 x 190 x 120 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

Individual Elemenents:

SPECIFICATIONS SUMMARY

VVCA/B. **AC Motor Speed Controller**, with no other elements
Frequency from 0 to 60Hz.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑨ PLC (Programmable Logic Controller)

The Programmable Logic Controller is a device designed for real time control of sequential processes in an industrial environment. In this case, EDIBON has developed this PLC module for controlling the Electrical Machines Units.

PLC-PI. **PLC Module for the Control of Industrial Processes**

PLC-PI

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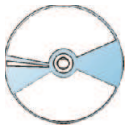


PLC-SOF

SPECIFICATIONS SUMMARY

This module has been designed for the Control of Industrial Processes. The application has been developed to be used with any individual electric machine.

PLC-PI. PLC Module:
- Metallic box. Circuit diagram in the front panel.
- Front panel:
  - Digital inputs(X) and Digital outputs (Y) block:
    - 16 Digital inputs.
    - 14 Digital outputs.
  - Analog inputs block:
    - 16 Analog inputs.
  - Analog outputs block:
    - 4 Analog outputs.
  - Touch screen.
- Back panel:
  - Power supply connector. 2 A Fuse. RS-232 connector to PC. USB 2.0 connector to PC.
- Inside:
  - Power supply outputs: 24 Vdc, 12 Vdc, -12 Vdc, 12 Vdc variable.
  - Panasonic PLC:
    - High-speed scan of 0.32 µsec. for a basic instruction.
    - Program capacity of 32 Ksteps, with a sufficient comment area.
    - High-speed counter.
    - Multi-point PID control.
  - Digital inputs/outputs and analog inputs/outputs Panasonic modules.
- RS232 Communication wire to computer (PC).

PLC-SOF. PLC Control Software:
- The software package is always included with the PLC-PI module.

Electrical supply required: single-phase, 220 V. - 110 V.
Dimensions (approx.): 490 x 330 x 310 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

PRACTICAL POSSIBILITIES

1.- Control of the particular unit process through the control interface box without the computer (PC).
2.- PID control.
3.- Visualization of all the sensors values used in the particular unit process.
4.- Calibration of all sensors included in the particular unit process.
5.- Hand on of all the actuators involved in the particular unit process.
6.- Realization of different experiments, in automatic way, without having in front the particular unit. (This experiment can be decided previously).
7.- Simulation of outside actions, in the cases hardware elements do no exit.
8.- PLC hardware general use and manipulation.
9.- PLC process application for the particular unit.
10.- PLC structure.
11.- PLC inputs and outputs configuration.
12.- PLC configuration possibilities.
13.- PLC program languages.
14.- PLC different programming standard languages.
15.- New configuration and development of new process.
16.- Hand on an established process.
17.- Visualization and see the results and to make comparisons with the particular unit process.
18.- Possibility of creating new process in relation with the particular unit process.
19.- PLC Programming exercises.
20.- Own PLC applications in accordance with teacher and student requirements.

EDIBON FP-X/CPU. **PLC**, with no other elements

SPECIFICATIONS SUMMARY

Inputs: 8.
Output: 6. Output type: Relay 2A.
Data memory: 12285.
Bit memory: 4096.
High Speed Counter.
Number of interruption programs: 15 programs (14 external, 1 internal).
Dimension (w, d, h): 60 x 79 x 90 mm.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

⑩ Tachogenerator

TECNEL/T. **Tachogenerator**

SPECIFICATIONS SUMMARY

The Tachogenerator, as a speed transducer, provides a means of converting the rotational speed into an analog voltage signal. Thus, it is mainly used for measuring the motor speed.
TECNEL/T is an automatic unit, that could be permanently connected to the motor.
Output voltage gradient: 60 +/- 5% V/1000 r.p.m.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

TECNEL/TM. **Hand Tachometer**

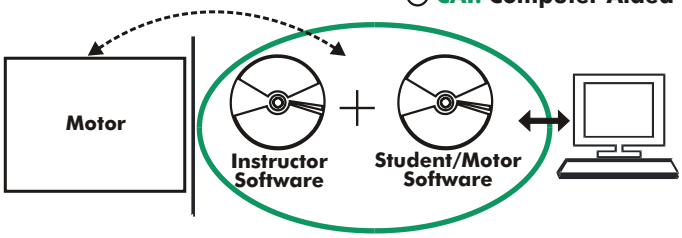
SPECIFICATIONS SUMMARY

This is a hand optical tachometer. It cannot be attached to the motor, what implies that the measurements have to be taken manually.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑪ CAI. Computer Aided Instruction Software System



With no physical connection between motor and computer, this complete package consists on an Instructor Software (INS/SOF) totally integrated with the Student Software (EMT../SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students. These, on the other hand, get a virtual instructor who helps them to deal with all the information on the subject of study.

- INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- Organize Students by Classes and Groups.
- Create easily new entries or delete them.
- Create data bases with student information.
- Analyze results and make statistical comparisons.
- Print reports.
- Develop own examinations.
- Detect student's progress and difficulties.

...and many other facilities.

The Instructor Software is the same for all the motors, and working in network configuration allows controlling all the students in the classroom.

Instructor Software

- EMT../SOF. Computer Aided Instruction Softwares (Student Software):

It explains how to use the motor, run the experiments and what to do at any moment. Each motor has its own Student Software.

- The options are presented by pull-down menus and pop-up windows.
- Each Software contains:

  Theory: that gives the student the theoretical background for a total understanding of the studied subject.

  Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

  Guided Practices: presents several practices to be done with the motor, showing how to complete the circuits and get the right information from them.

  Exams: set of questions presented to test the obtained knowledge.

Student Software

Available Student Softwares:

➤Motors (D.C.)

-EMT1/SOF. D.C. Independent excitation motor-generator.
-EMT2/SOF. D.C. Series excitation motor-generator.
-EMT3/SOF. D.C. Shunt excitation motor-generator.
-EMT4/SOF. D.C. Compound excitation motor-generator.
-EMT5/SOF. D.C. Shunt-series compound excitation motor.
-EMT12/SOF. Universal motor (single-phase).
-EMT15/SOF. D.C. Permanent magnet motor.
-EMT18/SOF. D.C. Brushless motor.
-EMT19/SOF. Stepper motor.

➤Motors (A.C.)

-EMT6/SOF. A.C. Synchronous three-phase motor alternator.
-EMT6B/SOF. Permanent magnets synchronous three-phase generator (24 Vac).
-EMT7/SOF. Asynchronous three-phase motor of squirrel cage.
-EMT7B/SOF. Asynchronous three-phase motor of squirrel cage (4 poles).
-EMT7C/SOF. Asynchronous three-phase motor of squirrel cage (8 poles).
-EMT8/SOF. Asynchronous three-phase motor with wound rotor.
-EMT9/SOF. Dahlander three-phase (two-speeds).
-EMT10/SOF. Asynchronous three-phase motor of two independent speeds.
-EMT11/SOF. Asynchronous single-phase motor with starting capacitor.
-EMT12/SOF. Universal motor (single-phase).
-EMT14/SOF. Repulsion motor, single-phase with short-circuited brushes.
-EMT16/SOF. Asynchronous single-phase motor with starting and running capacitor.
-EMT17/SOF. Three-phase motor of squirrel cage with "Y" connection.
-EMT20/SOF. Asynchronous single-phase motor with split phase.
-EMT21/SOF. Three-phase reluctance motor.
-EMT22/SOF. Single-phase shaded pole motor.

⑫ CAL. Computer Aided Learning Software (Results Calculation and Analysis)

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use, specifically developed by EDIBON.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

CAL will perform the calculations.

CAL computes the value of all the variables involved.

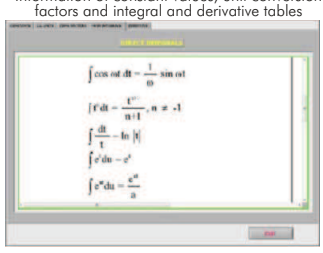
It allows to plot and print the results. Between the plotting options, any variable can be represented against any other.

Different plotting displays.

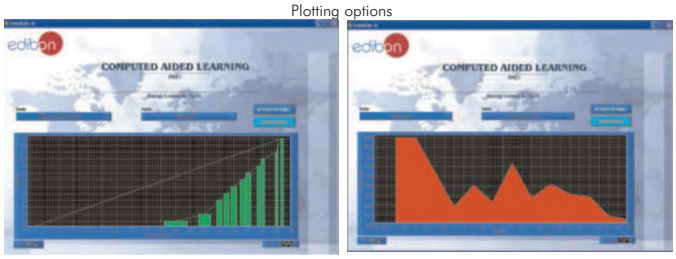
It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

Calculations

Information of constant values, unit conversion factors and integral and derivative tables



Plotting options



Available Softwares:

➤Motors (D.C.)

-EMT1/CAL. D.C. Independent excitation motor-generator.
-EMT2/CAL. D.C. Series excitation motor-generator.
-EMT3/CAL. D.C. Shunt excitation motor-generator.
-EMT4/CAL. D.C. Compound excitation motor-generator.
-EMT5/CAL. D.C. Shunt-series compound excitation motor.
-EMT12/CAL. Universal motor (single-phase).
-EMT15/CAL. D.C. Permanent magnet motor.
-EMT18/CAL. D.C. Brushless motor.
-EMT19/CAL. Stepper motor.

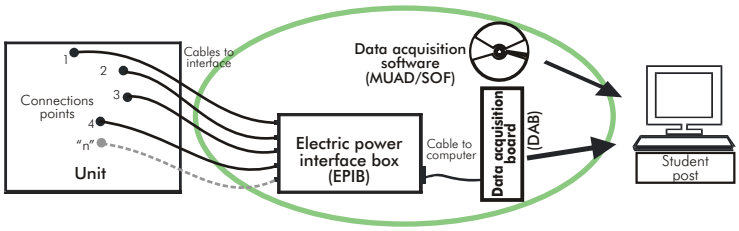
➤Motors (A.C.)

-EMT6/CAL. A.C. Synchronous three-phase motor alternator.
-EMT6B/CAL. Permanent magnets synchronous three-phase generator (24 Vac).
-EMT7/CAL. Asynchronous three-phase motor of squirrel cage.
-EMT7B/CAL. Asynchronous three-phase motor of squirrel cage (4 poles).
-EMT7C/CAL. Asynchronous three-phase motor of squirrel cage (8 poles).
-EMT8/CAL. Asynchronous three-phase motor with wound rotor.
-EMT9/CAL. Dahlander three-phase (two-speeds).
-EMT10/CAL. Asynchronous three-phase motor of two independent speeds.
-EMT11/CAL. Asynchronous single-phase motor with starting capacitor.
-EMT12/CAL. Universal motor (single-phase).
-EMT14/CAL. Repulsion motor, single-phase with short-circuited brushes.
-EMT16/CAL. Asynchronous single-phase motor with starting and running capacitor.
-EMT17/CAL. Three-phase motor of squirrel cage with "Y" connection.
-EMT20/CAL. Asynchronous single-phase motor with split phase.
-EMT21/CAL. Three-phase reluctance motor.
-EMT22/CAL. Single-phase shaded pole motor.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

LIMEL. **Integrated Laboratory for Electrical Machines:**

⑬ MUAD. Electric Power Data Acquisition System



MUAD is the perfect link between the unit and the PC. MUAD is a continuous data acquisition system with virtual instrumentation, that measures, analyzes and represents the parameters involved in the process.

MUAD allows voltage and current acquisition and measurement, data processing, frequency spectrum and all the functions of a digital oscilloscope.

We easily connect the Electric Power Interface Box (EPIB) to the unit with the supplied cables (there are several connection points placed for it). The EPIB is connected to the PC through the Data Acquisition Board (DAB), and by using the Data Acquisition with Virtual Instrumentation Software the student can get results from the undertaken experiment/practice, see them on the screen and work with them.

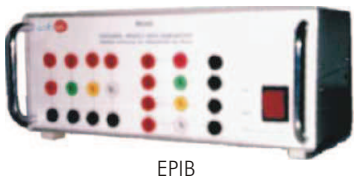
This MUAD System includes EPIB + DAB + MUAD/SOF:

1) EPIB. **Electric Power Interface Box** (dimensions: 300 x 180 x 120 mm. approx.):

Interface that carries out the conditioning of the diverse signals that can be acquired in a process, for their later treatment and visualisation.

In the front panel, the elements are separated in two parts: left-hand part to VOLTAGE sensors, and right-hand part corresponds with CURRENT sensors.

- 8 analog input channels.
- Sampling range: 250 KSPS (Kilo samples per second).
- 4 Tension sensors AC/DC, 400V.
- 4 Current sensors.



EPIB

+

2) DAB. **Data Acquisition Board :**

PCI Data acquisition board (National Instruments) to be placed in a computer slot.

Analog input:

- Number of channels= 16 single-ended or 8 differential.
- Resolution=16 bits, 1 in 65536.
- Sampling rate up to: 250 KS/s (Kilo samples per second).

Analog output:

- Number of channels=2.
- Resolution=16 bits, 1 in 65536.

Digital Input/Output:

- Number channels=24inputs/outputs.

Timing: Counter/timers=2.

DAB

+

3) MUAD/SOF. **Data Acquisition Software** :

Data Acquisition Software with Graphic Representation:

- Friendly graphical frame.
- Compatible with actual Windows operating systems.
- Configurable software allowing the representation of temporal evolution of the different signals.
- Visualization of a tension of the circuits on the computer screen.
- Sampling velocity up to 250 KS/s. (Kilo samples per second).

MUAD/SOF

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/LIMEL.pdf

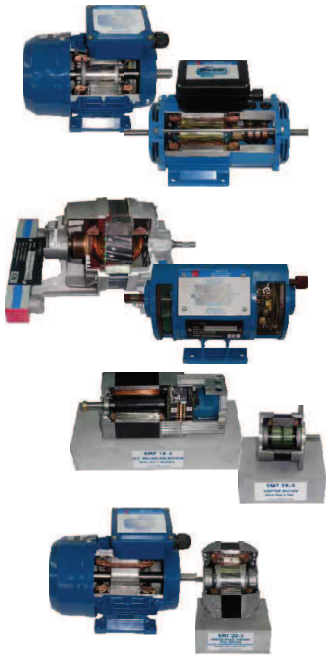
EMT-E. **Motors**

Available motors:

➤Motors (D.C.)
-EMT1-E. D.C. Independent excitation motor-generator.
-EMT2-E. D.C. Series excitation motor-generator.
-EMT3-E. D.C. Shunt excitation motor-generator.
-EMT4-E. D.C. Compound excitation motor-generator.
-EMT5-E. D.C. Shunt-series compound excitation motor.
-EMT12-E. Universal motor (single-phase).
-EMT15-E. D.C. Permanent magnet motor.
-EMT18-E. D.C. Brushless motor.
-EMT19-E. Stepper motor.

➤Motors (A.C.)
-EMT6-E. A.C. Synchronous three-phase motor alternator.
-EMT6B-E. Permanent magnets synchronous three-phase generator (24 Vac).
-EMT7-E. Asynchronous three-phase motor of squirrel cage.
-EMT7B-E. Asynchronous three-phase motor of squirrel cage (4 poles).
-EMT7C-E. Asynchronous three-phase motor of squirrel cage (8 poles).
-EMT8-E. Asynchronous three-phase motor with wound rotor.
-EMT9-E. Dahlander three-phase (two-speeds).
-EMT10-E. Asynchronous three-phase motor of two independent speeds.
-EMT11-E. Asynchronous single-phase motor with starting capacitor.
-EMT12-E. Universal motor (single-phase).
-EMT14-E. Repulsion motor, single-phase with short-circuited brushes.
-EMT16-E. Asynchronous single-phase motor with starting and running capacitor.
-EMT17-E. Three-phase motor of squirrel cage with "Y" connection.
-EMT20-E. Asynchronous single-phase motor with split phase.
-EMT21-E. Three-phase reluctance motor.
-EMT22-E. Single-phase shaded pole motor.

EMT-S. **Cut Away Motors**

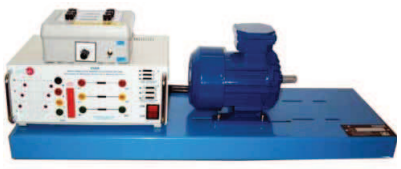


Available cut away motors:

➤Motors (D.C.)
-EMT1-S. D.C. Independent excitation motor-generator.
-EMT2-S. D.C. Series excitation motor-generator.
-EMT3-S. D.C. Shunt excitation motor-generator.
-EMT4-S. D.C. Compound excitation motor-generator.
-EMT5-S. D.C. Shunt-series compound excitation motor.
-EMT12-S. Universal motor (single-phase).
-EMT15-S. D.C. Permanent magnet motor.
-EMT18-S. D.C. Brushless motor.
-EMT19-S. Stepper motor.

➤Motors (A.C.)
-EMT6-S. A.C. Synchronous three-phase motor alternator.
-EMT6B-S. Permanent magnets synchronous three-phase generator (24 Vac).
-EMT7-S. Asynchronous three-phase motor of squirrel cage.
-EMT7B-S. Asynchronous three-phase motor of squirrel cage (4 poles).
-EMT7C-S. Asynchronous three-phase motor of squirrel cage (8 poles).
-EMT8-S. Asynchronous three-phase motor with wound rotor.
-EMT9-S. Dahlander three-phase (two-speeds).
-EMT10-S. Asynchronous three-phase motor of two independent speeds.
-EMT11-S. Asynchronous single-phase motor with starting capacitor.
-EMT12-S. Universal motor (single-phase).
-EMT14-S. Repulsion motor, single-phase with short-circuited brushes.
-EMT16-S. Asynchronous single-phase motor with starting and running capacitor.
-EMT17-S. Three-phase motor of squirrel cage with "Y" connection.
-EMT20-S. Asynchronous single-phase motor with split phase.
-EMT21-S. Three-phase reluctance motor.
-EMT22-S. Single-phase shaded pole motor.

ESAM. **Faults Simulation Trainer in Electrical Motors**



SPECIFICATIONS SUMMARY

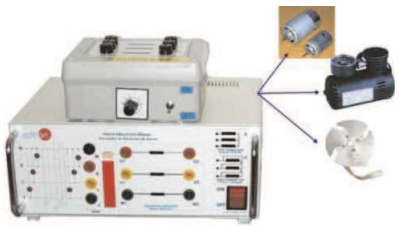
Teaching trainer for the simulation of faults in three-phase motors.
Unit and motor are mounted in a painted steel structure.
Unit:
Metallic box. Electrical diagram of the motor on the front panel.
The motor can be connected in star or delta connection.
Connections for the measurements. The resistance of the windings can be measured. Pilot lamps. 6-position selector for the selection of the fault sequences. Switch for faults activation.
Faults are implemented by means a PLC and internal relays. This lets the motor can keep on working in different conditions when certain faults are caused.
6 fuses of 2A to protect the motor. Automatic Magnetothermal Differential switch.
Dahlander three-phase motor, including cable and connector.
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions: 800 mm x 400 mm x 400 mm approx. Weight: 30Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ESAM.pdf

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.

ESAE. **Electrical Faults Simulation Trainer**



SPECIFICATIONS SUMMARY

Metallic box. Diagram in the front panel with similar distribution to the elements in the real unit.

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.
- Ground fault.
- Detection of fault on the supply voltage.
- Capacitor.
- Thermostat contacts stuck open and closed.
- Relay contacts stuck closed.
- Relay windings open.
- Fan.
- Motor.
- Compressor.
- Low voltage.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions: 400 x 330 x 400 mm. approx.

Weight: 10 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ESAE.pdf

PRACTICAL POSSIBILITIES

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

1.- Power off.
2.- Fuse blown.
3.- Defective main circuit broker.
4.- Defective leak current coil relay.
5.- Ground fault.
6.- Detection of fault on the supply voltage.
7.- Capacitor:
   Starting capacitor open and run capacitor open.
   Starting capacitor shorted and run capacitor shorted.
8.- Thermostat contacts stuck open and closed.
9.- Relay contacts stuck closed.
10.- Relay windings open.
11.- 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.
12.- Motor:
   Starting motor windings open and shorted.
   Running motor windings open and shorted.
13.- Compressor:
   Thermal overload open.
   Compressor motor winding grounded.
14.- Low voltage.

EEA. **Alternators Study Unit**

SPECIFICATIONS SUMMARY

Unit for the study of alternators. Starting, operation and regulation of an alternator without load, half load and full load.

The unit comprises:

Base structure (painted steel and anodized aluminium). Couplings. Connectors.

EMT7. Asyncrhonous Three-phase motor of squirrel cage.

EMT6. A. C. Syncrhonous alternator motor.

VVCA/B. AC motors speed controller:

This unit enables to change the speed of an asynchronous motor, obtaining features which characterize a motor.

Cables and accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

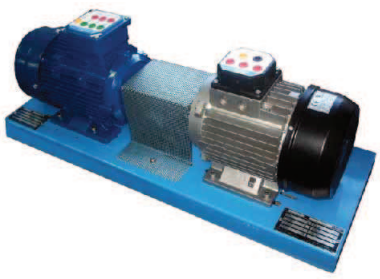
Dimensions (approx.): 750 x 250 x 250 mm. Weight: 30 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/EEA.pdf

PRACTICAL POSSIBILITIES

1.- Starting, voltage and frequency regulation in a three-phase alternator.
2.- Typical practices for a three-phase alternator.
3.- Characteristic curve of an alternator without load.
4.- Characteristic curve of an alternator in short circuit.
5.- Characteristic curve of an alternator with load.
6.- Synchronous motor starting.
7.- Working at a frequency given.
8.- Curves in V at constant power (1/4, 1/3, ½,1) PN and different power factors.

EGMG24. **Motor-Generator Group,** three-phase 24 Vac, no excitation required (permanent magnets)



SPECIFICATIONS SUMMARY

Motor-Generator Group mounted in a painted steel structure.

This Motor-Generator Group allows the study of the three phase alternator in both no-load and load regime.

Couplings.

Connectors.

EMT6/E. Permanent magnets synchronous three-phase generator (24 Vac):

Power: 450 W. Speed: 750 r.p.m. Frequency: 50 Hz.
V. Armature: 3 x 24 Vac.
I. Armature: 11 A.

EMT7/E. Asynchronous three-phase motor of squirrel cage:

Power: 550 W. Speed: 750 r.p.m. Connections: Triangle/Star.
Frequency: 50-60 Hz.
V. Armature: 3 x 230/400 V.
I. Armature nominal: 3,6-2 A.

Protections cover.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.): 750 x 250 x 250 mm. Weight: 35 Kg. approx.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/EGMG24.pdf

PRACTICAL POSSIBILITIES

1.- Measurements of voltage with no load, measurement of the frequency and measurement of no load losses.
2.- Connection to a load. Measurement of the voltage drop with load. Measurement of the power supplied.
3.- Behaviour of the alternator with different cos φloads.

ERP. **Protection Relays Test:**

ERP-UB. **Protection Relays Test Unit**

SPECIFICATIONS SUMMARY

This is a teaching unit which gives students theoretical and practical experience with several industrial relays. Unit designed for comprehensive investigations into the theory and practice of electrical power system protection.

This unit is common for the relays modules type "ERP" and can use one or more relays.

Floor-standing unit, mounted in anodized aluminium structure and panels in painted steel, enabling wide range of protection relay investigations.

It uses genuine industrial application relays, not simulations, with full range of safety features incorporated throughout.

Diagrams on the unit enable students to set up and perform practices and experiments with minimal supervision.

Comprehensive controls, transformers, supplies and instrumentation.

Modern, ergonomic and practical design which includes desk space for users or students to work on, and mounting area for relays.

It is supplied with relay support software.

This Unit basically consists on these main parts:

- Main connections, control and measurement board.
- Three-phase Voltage Regulation Dial Selector.
- Three-phase Load Regulation Dial Selector.
- Unit Power Supply and Protection.
- Transmission Lines Simulation Module.
- Fault Injection Module.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

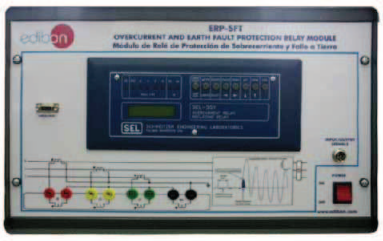
Dimensions (approx.): 1250 x 800 x 2000 mm. Weight: 400 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ERP.pdf

PRACTICAL POSSIBILITIES

1.- A wide range of practices and investigations into the performance and characteristics of a variety of different industrial relays.

ERP-SFT. **Overcurrent and Earth Fault Protection Relay Module**



SPECIFICATIONS SUMMARY

ERP-SFT. Overcurrent and Earth Fault Protection Relay Module, for use with the Protection Relays Test Unit (ERP-UB), to enable investigations into protection and monitoring of transformers, transmission lines and distribution schemes.

Modern and robust enclosure (steel box) with carrying handles.

The connections are via safety sockets.

The main functions:

- Phase Instantaneous Overcurrent (50P1-50P6).
- Phase Time-Overcurrent (51P1T, 51P2T).
- Single-phase Instantaneous Overcurrent (50A, 50B, 50C).
- Neutral Ground Instantaneous Overcurrent (50N1, 50N2).
- Neutral Ground Time-Overcurrent (51N1T).
- Residual Ground Instantaneous Overcurrent (50G1, 50G2).
- Residual Ground Time-Overcurrent (51G1T).
- Negative-Sequence Instantaneous Overcurrent (50Q1, 50Q2).
- Negative-Sequence Time-Overcurrent (51Q1T, 51Q2T).
- Setting Range, 5 A nominal, Instantaneous Overcurrent (OFF, 0.5-80.0 A).
- Setting Range, 5 A nominal, Time- Overcurrent (OFF, 0.5-16.0 A).
- One Auto-Reclosing Function 79.
- Selectable blocking.
- Circuit monitoring.
- Trend, fault and disturbance records.

The connection to the experimental circuit is via current transformers with ratio to suit the inputs of the relay.

It allows an effective demonstration of the effect of current and voltage transformer ratio, connection and rating on protective relays.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.): 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ERP.pdf

PRACTICAL POSSIBILITIES

1.- Verification of Overcurrent Protection functionality.

2.- Verification of Phase Overcurrent Elements.

3.- Verification of Residual Ground Overcurrent Elements.

4.- Verification of Phase Instantaneous Overcurrent Protection.

5.- Verification of Phase Time Overcurrent Protection.

6.- Verification of Neutral Ground Instantaneous Overcurrent Protection.

7.- Verification of Neutral Ground Time-Overcurrent Protection.

8.- Verification of Residual Ground Instantaneous Overcurrent Protection.

9.- Verification of Residual Ground Time-Overcurrent Protection.

10.- Verification of Current Transformer Measurement accuracy.

11.- Power Transformer Overcurrent Protection.

12.- Power Transmission Line Overcurrent Protection.

13.- Load Feeder Overcurrent Protection.

14.- Distribution System Overcurrent Protection.

15.- Power Transmission System Overcurrent Protection.

ERP. **Protection Relays Test:**

ERP-SDND. **Directional/Non Directional Overcurrent Protection Relay Module**

SPECIFICATIONS SUMMARY

ERP-SDND. Directional/Non Directional Overcurrent Protection Relay Module, for use with the Protection Relays Test Unit (ERP-UB), to enable investigations into protection and monitoring of generator and transformer schemes, overhead lines, underground cables and backup on high-voltage systems.

Modern and robust enclosure (steel box) with carrying handles.

The connections are via safety sockets.

The main functions:

The ERP-SDND Unit includes numerous phase, negative-sequence, residual-ground, and neutral overcurrent elements, as shown in the next table:

Overcurrent Element Operating Quantity	Number of Elements	Directional Control	Torque Control	Definite-Time Delay
Maximum phase current (IA, IB, or IC)	1 inverse-time (51P) 6 instantaneous (50P1-50P6)	Yes Yes, on first 4	Yes Yes, on first 4	NA Yes, on first 4
Maximum phase-phase current (IAB, IBC, or ICA)	4 instantaneous (50PP1-50PP4)	No	No	No
Independent phase current	3 inverse-time (51A, 51B, 51C)	Yes	Yes	NA
Residual-ground current (3I0)	2 inverse-time (51G1,51G2) 6 instantaneous (50G1-50G6)	Yes Yes, on first 4	Yes Yes, on first 4	NA Yes, on first 4
Negative-sequence current (3I2)	1 inverse-time (51Q) 6 instantaneous (50Q1-50Q6)	Yes Yes, on first 4	Yes Yes, on first 4	NA Yes, on first 4
Neutral current (IN)	1 inverse-time (51N) 6 instantaneous (50N1-50N6)	Yes Yes, on first 4	Yes Yes, on first 4	NA Yes, on first 4

Inverse-time overcurrent element settings include a wide and continuous pickup current range, continuous time-dial setting range, and time-current curve choices from both US (IEEE) and IEC standard curves.

Undervoltage Protection Element (27).

Phase Overvoltage Protection Element (59P).

Ground Overvoltage Protection Element (59G).

Negative Sequence Overvoltage Protection (59Q).

Creating fault and disturbance records.

Selectable blocking.

Selogic Control Equations.

Event Report.

Sequential Events Recorder (SER).

Breaker Wear Monitor.

Station Battery Monitor.

DNP3 Serial LAN/WAN Outstation (Slave).

Modbus RTU and TPC.

High-Accuracy Metering.

Remote and Local Control Switches.

Wye or Delta Voltage Connection.

Synchrophasor Measurements.

Fault Locator.

Fast SER Protocol.

Directional/Definite-Time Overcurrents Elements.

Two Residual-Ground Time-Overcurrents Elements.

Six Frequency Elements.

Sensitive Earth Fault Protection and Directional Protection for Various System Grounding Practices.

Load-Encroachment Logic.

Synchronism Check.

ACSELERATOR QuickSet Compatible.

The connection to the experimental circuit is via current transformers with ratio to suit the inputs of the relay.

It allows an effective demonstration of the effect of current and voltage transformer ratio, connection and rating on protective relays.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.): 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ERP.pdf

PRACTICAL POSSIBILITIES

1.- Verification of Directional Protection functionality.

2.- Directional Protection with different measurement circuit conditions.

3.- Directional Protection application to Transmission Line under different load conditions.

4.- Forward Directional Protection.

5.- Reverse Directional Protection.

6.- Non-Directional Overcurrent Protection.

7.- Residual Ground Time-Overcurrent Protection.

8.- Residual Ground Instantaneous Overcurrent Protection.

9.- Verification of Cable Undervoltage Protection.

10.- Verification of Cable Overvoltage Protection.

11.- Verification of Current Transformers Measurements accuracy.

12.- Verification of Voltage Transformers Measurements accuracy.

13.- Distribution System Directional Protection.

ERP. **Protection Relays Test:**

ERP-PDF. **Differential Protection Relay Module**

SPECIFICATIONS SUMMARY

ERP-PDF. Differential Protection Relay Module, for use with Protection Relays Test Unit (ERP-UB), to enable investigations into protection of transformers, autotransformers, generators, Bus Bar and other apparatus with two windings.

It demonstrates the characteristics of three-phase differential protection.

Modern and robust enclosure (steel box) with carrying handles.

The connections are via safety sockets.

The main functions:

Eight Overcurrent Elements for Winding 1	Instantaneous	Definite Time	Inverse Time
Phase	50P1H	50P1	51P1
Negative Sequence		50Q1	51Q1
Residual	50N1H	50N1	51N1
Eight Overcurrent Elements for Winding 2	Instantaneous	Definite Time	Inverse Time
Phase	50P2H	50P2	51P2
Negative Sequence		50Q2	51Q2
Residual	50N2H	50N2	51N2
Setting Ranges, 5 A Model, (A secondary)	OFF, (0.5-80)	OFF, (0.5-80)	OFF, (0.5-16)

Selogic Control Equations. Event Reports.

ASCII. Bynari, and Distributed Port Switch Communications.

Phase, Ground, Negative-Sequence, Differential and Harmonic Metering.

Restrained and Unrestrained Differential Elements.

Second- and Fourth Harmonic Restraint.

Fifth-Harmonic and DC Blocking.

CT and Transformer Connection Compensation.

Connection to the primary and secondary windings of the experimental is circuit via current transformers with ratio to suit the inputs of the relay. This provides an effective demonstration of the effect of current and voltage transformer ratio, connection and rating on protective relays.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.): 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ERP.pdf

PRACTICAL POSSIBILITIES

1.- Verification of Differential Protection functionality.
2.- Transformer Differential Protection with variable TAP's voltage regulation.
3.- Transformer Differential Protection with different transformer connection diagrams.
4.- Verification of Phase Instantaneous Overcurrent Protection for Winding 1.
5.- Verification of Phase Definite Time-Overcurrent Protection for Winding 1.
6.- Verification of Phase Inverse Time-Overcurrent Protection for Winding 1.
7.- Verification of Phase Instantaneous Overcurrent Protection for Winding 2.
8.- Verification of Phase Definite Time-Overcurrent Protection for Winding 2.
9.- Verification of Phase Inverse Time-Overcurrent Protection for Winding 2.
10.- Verification of Current Transformers Measurement accuracy.
11.- Power Transformer Overcurrent Protection.
12.- Distribution Substation Bus-Bar Differential Protection.
13.- Transmission Substation Bus-Bar Differential Protection.
14.- Analysis of Event Reports and Human Machine Interface.

ERP-MA. **Feeders Management Relay Module**

SPECIFICATIONS SUMMARY

ERP-MA. Feeders Management Relay Module, for use with the Protection Relays Test Unit (ERP-UB), to enable investigations into protection and monitoring of overhead lines, underground cables and feeders.

Modern and robust enclosure (steel box) with carrying handles.

The connections are via safety sockets.

The main functions:

Four levels of Phase Instantaneous Overcurrent Element (50P).
Four levels of Negative-Sequence Overcurrent Element (50Q).
Four levels of Residual Overcurrent Element (50G).
Four levels of Neutral Overcurrent Element (50G).
Two levels of Phase Time-Overcurrent Element (51P).
Two levels of Residual Time-Overcurrent Element (51G).
Two levels of Ground Time-Overcurrent Element (51G).
One level of Negative-Sequence Time-Overcurrent Element (51Q).
Phase to Ground Overvoltage (59G).
Phase to Phase Overvoltage (59P).
Negative-Sequence Overvoltage (59Q).
Residual Overvoltage (59G).
Phase to Ground Undervoltage (27G).
Phase to Phase Undervoltage (27P).
Six levels of Secure Overfrequency (81O).
Six levels of Secure Underfrequency (81U).
Two levels of Negative Power Flow with Definite Time Delay (32).
Two levels of Positive Power Flow with Definite Time Delay (32).
Station Battery Monitor. Breaker Wear Monitoring.
Synchrophasor Protocol. Peak Demand and Demand Metering. Auto-Reclosing.
Creating fault and disturbance records.

The connection to the experimental circuit is via current transformers with ratio to suit the inputs of the relay.

It allows an effective demonstration of the effect of current and voltage transformer ratio, connection and rating on protective relays.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.): 490 x 330 x 310 mm. Weight: 10 Kg.

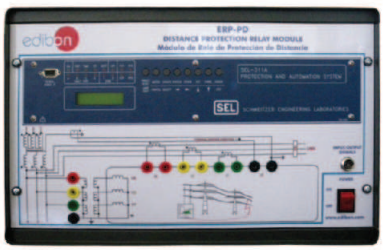
More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ERP.pdf

PRACTICAL POSSIBILITIES

1.- Verification of the Feeder Management Relay functionality.
2.- Phase Overcurrent Element of the Feeder Management Relay.
3.- Residual Ground Overcurrent Element of the Feeder Management Relay
4.- Overvoltage Element of the Feeder Management Relay
5.- Undervoltage Element of the Feeder Management Relay.
6.- Verification of Phase Instantaneous Overcurrent Protection.
7.- Verification of Phase Time-Overcurrent Protection.
8.- Verification of Residual Overcurrent Element.
9.- Verification of Residual Time-Overcurrent Element.
10.- Verification of Neutral Overcurrent Element.
11.- Verification of Overfrequency Protection Element.
12.- Verification of Underfrequency Protection Element.
13.- Verification of Positive (forward) Power Flow Protection Element.
14.- Verification of Negative (reverse) Power Flow Protection Element.
15.- Protection of Distribution Feeder Example.
16.- Protection of Overhead Transmission Line Example.

ERP. **Protection Relays Test:**

ERP-PD. **Distance Protection Relay Module**



SPECIFICATIONS SUMMARY

For use with the Protection Relays Test Unit (ERP-UB), to enable investigations into protection and monitoring of overhead transmission lines and underground cables.

Modern and robust enclosure (steel box) with carrying handles.

The connections are via safety sockets.

The main functions:

- Two zones of Phase Mho Distance Protection Element (21P).
- Two zones of Ground Mho Distance Protection Element (21G).
- Directional Phase Overcurrent Protection Element (67P).
- Directional Ground Overcurrent Protection Element (67G).
- Phase Overcurrent Protection Element (50P).
- Ground Overcurrent Protection Element (50G).
- Phase Time-Overcurrent Protection Element (51P).
- Ground Time-Overcurrent Protection Element (51G).
- Event Reports.
- Breaker Wear Monitor.
- Fault Locator.
- Local Display.
- Synchronophasors.
- Load Encroachment.
- Metering and Monitoring Functions.
- Creating fault and disturbance records.
- Blocking of any one protection element.

The connection to the experimental circuit is via current transformers with ratio to suit the inputs of the relay.

It allows an effective demonstration of the effect of current and voltage transformer ratio, connection and rating on protective relays.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.): 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machines/ERP.pdf

PRACTICAL POSSIBILITIES

1.- Verification of Line Distance Protection functionality.
2.- Line Distance Protection with different measurement circuit conditions.
3.- Line Distance Protection with different Line Loads conditions.
4.- Verification of Phase Instantaneous Overcurrent Element.
5.- Verification of Ground Instantaneous Overcurrent Element.
6.- Verification of Phase Time-Overcurrent Protection Element.
7.- Verification of Ground Time-Overcurrent Protection Element.
8.- Verification of Current Transformer Measurement accuracy.
9.- Verification of Current Transformers Connection Diagram.
10.- Verification of Voltage Transformers Measurement Accuracy and Connection Diagram for Distance Protection.
11.- Overhead Transmission Line Parameters Estimation for Distance Protection.
12.- Overhead Transmission Line Distance Protection.
13.- Distance Protection Event Reports Analysis.
14.- Distance Protection Relay Human Machine Interface.
15.- Distance Protection Relay Configuration.
16.- Distance Protection of Simple Power System Example.

EMT-KIT. **Disassembly Machines Kit**

SPECIFICATIONS SUMMARY

This Disassembly Machines Kit "EMT-KIT" allows the student to construct, operate and make more than 50 assemblies and practices of different electrical machines.

We have designed EMT-KIT to introduce students to electrical machines basic principles and a good understanding of motors and generators operation.

The student, using this Kit, will see clearly the machines components and how interconnecting them, both electrically and mechanically.

It includes:

- Baseplate.
- Frame ring.
- Fixed and removable bearing housings.
- Shaft.
- Squirrel cage rotor.
- Wound stator.
- Couplings.
- Armature poles and hub.
- Brushes.
- Brush holders.
- Commutator/slip rings.
- Interpoles.
- Armature, field and interpole coils.
- Compound field coils.
- Field poles.
- Centrifugal switch.
- Robust case for the elements.
- Necessary tools and elements for normal working operation.
- All machines that may be assembled use low voltage.
- Protected rotating parts.
- Operating at low power levels.
- Panel for connections and protections:
  - Anodized aluminium structure with panel in painted steel.
  - Diagrams for each practice, which explains the different connection configurations.
  - Connections box, that allows to make different connections for each practice.
  - Protection circuit that is used to protect each module short circuits.
- Drive motor: Asynchronous Three-phase motor of squirrel cage:
  - Power: 370W. Speed: 2730 r.p.m.
- WCA/M. AC Motor Speed Controller (intermediate option):
  - This unit consist in a simple AC motor speed controller.
  - This unit also is used for feeding the drive motor and for feeding and controlling the induction motor, squirrel cage assembly.
  - Power: 3kVA. Frequency: 1-50 Hz. Phase voltage: 230 Vac. Maximum current: 8A.
  - It has two blocks in the front panel:
    - Speed control: Start/Stop switch and speed control potenciometer.
    - Connections to motor: Three-phase connection to AC motor and ground connection.
- WCC/M. DC Motor Speed Controller (intermediate option):
  - This unit consists in a variable transformer followed by a rectifier bridge and an anti-ripple capacitor with a resistor to get discharged.
  - This unit is used for controlling the DC motors assemblies.
  - Adjustable voltage: up to 320 Vdc. Maximum current: 2 A. At the top of the unit there is a knob to adjust the DC voltage. Front panel including: Positive, negative and ground connections. ON/OFF switch.
- WPP/B. Velocity Control for stepper motor:
  - This unit is used for controlling the stepper motor assembly.
- Cables and accessories, for normal operation.
- Manuals: This Kits is supplied with 8 manuals.

More information in: www.edibon.com/products/catalogues/en/units/electricity/machineskits/EMT-KIT.pdf

PRACTICAL POSSIBILITIES

The student can study and make these machines assemblies:

1.- Machines operating principles.
2.- Electromagnetism introduction.
3.- Basic DC and AC generators.
4.- DC shunt motor (with and without interpoles).
5.- DC shunt motor faults.
6.- DC series motor (with and without interpoles).
7.- DC compound motor (with and without interpoles).
8.- DC shunt generator (with and without interpoles).
9.- DC series generator (with and without interpoles).
10.- DC compound generator (with and without interpoles).
11.- DC separately excited generator (with and without interpoles).
12.- Single-phase AC series universal motor.
13.- Single-phase AC induction motor, squirrel cage (4 pole).
14.- Single-phase AC induction motor, squirrel cage (2 pole).
15.- Single-phase AC synchronous motor/generator (4 pole).
16.- Single-phase AC synchronous motor/generator (2 pole).
17.- Single-phase AC repulsion motor.
18.- Single-phase AC generator, rotating armature.
19.- Single-phase AC generator, rotating field.
20.- AC brushless generator.
21.- Three-phase AC induction motor, squirrel cage (4 pole).
22.- Three-phase AC induction motor, squirrel cage (2 pole).
23.- Three-phase AC synchronous motor (2 pole).
24.- Three-phase AC synchronous generator (2 pole).
25.- Shaded pole induction motor.
26.- Split field series motor.
27.- Stepper motors.
28.- 4 pole induction motor faults.
29.- Pole changing induction motor.
30.- Synchronous motor characteristics.
31.- Synchronisation.
32.- AC motors power factor correction.
33.- DC motor dynamic braking.