Engineering and Technical Teaching Equipment

Voltage Transformer Fundaments Application for Protection Devices

AEL-VTFP

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PRODUCTS
4.- ELECTRICITY

INTRODUCTION

Transformers are electrical machines widely used in different applications with several purposes. Basically, there are two types of transformers: power transformers and instrument transformers. Within instrument transformers, there are two types: voltage instrument transformer and current instrument transformer.

Voltage transformers (VT) are a parallel connected type of instrument transformer. When a voltage is too high to measure directly, a voltage transformer can be used to provide an isolated lower voltage in its secondary which is proportional to the voltage in the primary circuit. The secondary voltage is then suitable for measuring instruments or processing in electronic equipment. Voltage transformers are used in electronic equipment and are widely used for metering and protective relays in the electrical power industry.

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

European Union Certificate (total safety)

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

"Worlddidac Quality Charter" and Platinum Member of Worlddidac

GENERAL DESCRIPTION

The Voltage Transformer Fundaments Application for Protection Devices, "AEL-VTFP", has been designed by Edibon to show the students which the main functions of voltage transformers are and which the parameters that must be considered in order to choose the adequate voltage transformer are.

The AEL-VTFP allows the student to check the transformation ratio of the voltage transformer and checking the class of accuracy. These maneuvers can be realized with or without earth fault on the primary side.

The AEL-VTFP consists of a series of modules in order to carry out all exercises and practical possibilities related to voltage instrument transformers. These modules are, for instance, the three-phase AC variable power supply, the network analyzer, the digital multimeter, the overcurrent time electronic relay, the variable resistor and the three-phase voltage transformer modules.

The AEL-VFTP includes the following modules:

- N-REV/VT. Variable Resistor for Voltage Transformer.
- N-TRTV. Three-Phase Voltage Transformer.

Required modules:

- N-VPS01. AC 3PH Variable Power Supply.
- N-EALD. Network Analyzer Unit with Data Acquisition (2 units).
- MED65. Digital Multimeter.
- N-REVT/1K. 1kW Three-Phase Variable Resistors Module.
- N-CON02. 3-poles Contactor (230 VAC.).
- N-REL09. Time Electronic Relay against Overcurrents (1.2 - 7 A).

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

Option A:

This application needs the following racks:

- N-RACK-A.
- N-RACK-B.

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

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

- N-REV/VT. **Variable Resistor for Voltage Transformer.**
  Variable resistor between 1 and 11kohm.
  Nominal Power: 20 W.


N-REV/VT

- N-TRTV. **Three-Phase Voltage Transformer.**
  Input voltage max: 3 x 230 VAC.
  Output voltage max: 3 x 63 VAC.
  Nominal Power: 1VA.
  Vector group: YY0.


N-TRTV

- N-VPS01. **AC 3PH Variable Power Supply.**
  ON-OFF removable key.
  Input Voltage: : 400 VAC, 3PH+N.
  Output Voltage:
    0…450 VAC.
    0…240 VDC.
  Maximum current: 2A.
  Frequency: 50/60 Hz.
  Wheel to regulate the voltage.
  Three lamps.
  Measurement commutators:
    One commutator to measure the voltage:
      6 positions: L1-N ; L2-N ; L3-N ; L1-L2 ; L1-L3 ; L2-L3.
    One commutator to measure the current:
      3 positions: L1, L2, L3.
  Three-Phase supply hose with IP44 3PN+E 32A 400V connecting plug.
  Differential magnetothermal, 4 poles, 25A, 300mA AC 6KA.


N-VPS01

- N-EALD. **Network Analyzer Unit with Data Acquisition (2 units).**
  The network analyzer module allows fulfilling measurements, displaying and analyzing all the parameters of the AC electrical networks. It has an LCD screen and push-buttons for the navigation through the different menus. It includes specific software for monitoring current and voltage curves, harmonics display, tariffs programming, alarms programming and electrical parameters storage.
  Features:
    Multifunctional three-phase power meter:
      Single and three-phase voltage. Up to 690 VAC L-L.
      Phase and line current. Current range up to 200%. Measurement from 0-10 A.
      Active, reactive and apparent power.
      Suitable frequencies: 25 Hz, 50 Hz, 60 Hz y 400 Hz.
      Display of the V-I vector diagram.
      Supply voltage: 85-265 VAC.
    Energy quality control:
      Current and voltage individual harmonics measurement. Up to the 40th harmonic.
      THD voltage and current, TDD and K-factor.
      Maximums and minimums display.
      Waveforms display, 128 samples/sec.
    Events and data storage.
    Harmonics analyzer:
      THD voltage and current, TDD current and K-factor, up to the 40th harmonic.
      Current and voltage harmonic spectrum and angles.
    Tariff programming:
      Class 0.5S IEC 62053-22, active and reactive power in four quadrants.
      Measurement of the total and per phase three-phase active, reactive and apparent powers.
      Usage time, 4 energy/demand records of total tariffs.
      8 tariffs, 4 seasons, 4 types of days.
      Automatic daily report of energy consumption maximums and minimums.
    Communications:
      Modbus TCP communication protocol with Ethernet interface.


N-EALD

Specifications

- MED65. **Digital Multimeter.**

  This module has a digital multimeter of about 3 ½ digits, with double-jack ending cables of about 4 mm to facilitate interconnections.

  With this digital multimeter we will be able to measure:

  Voltage.

  Current.

  Resistance.

  Capacitors capacity.

  Temperature.

MED65

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

  Parallel, series, star and delta connection.

  Resistance: 3 x 750 Ohm.

  Current: 3 x 2 A.

N-REVT/1K

- N-CON02. **3-poles Contactor (230 VAC.).**

  Supply Voltage Coil: 230 VAC.

  Power terminals:

  3 input power terminals.

  3 output power terminals.

  Auxiliary contacts:

  3 normally open contacts (black).

  3 normally closed contacts (red).

N-CON02

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

  Electronic thermal relay.

  Overload protection.

  Range 1.2 - 7 A.

  Reset and test function.

  1 NONC contact.

  Temporization.

N-REL09

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

Cables and accessories, for normal operation.

Manuals:

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

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Voltage transformer characteristics.

2.- Calculation of class of accuracy.

3.- Effects of load on the transformation ratio.

4.- Three-Phase voltage transformer in healthy grid.

5.- Three-Phase voltage transformer in a grid with earth-fault on the primary side.

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

REQUIRED SERVICES

- Electrical supply: three-phase, 380 VAC- 400 VAC/50 Hz o 190 VAC-240/60 Hz, 2 kW.

DIMENSIONS AND WEIGHTS

AEL-VTFP:

- Dimensions: 1600 x 550 x 2000 mm approx.
  (62.99 x 21.65 x 78.74 inches approx.)
- Weight: 60 Kg approx.
  (132 pounds approx.)

AVAILABLE VERSIONS

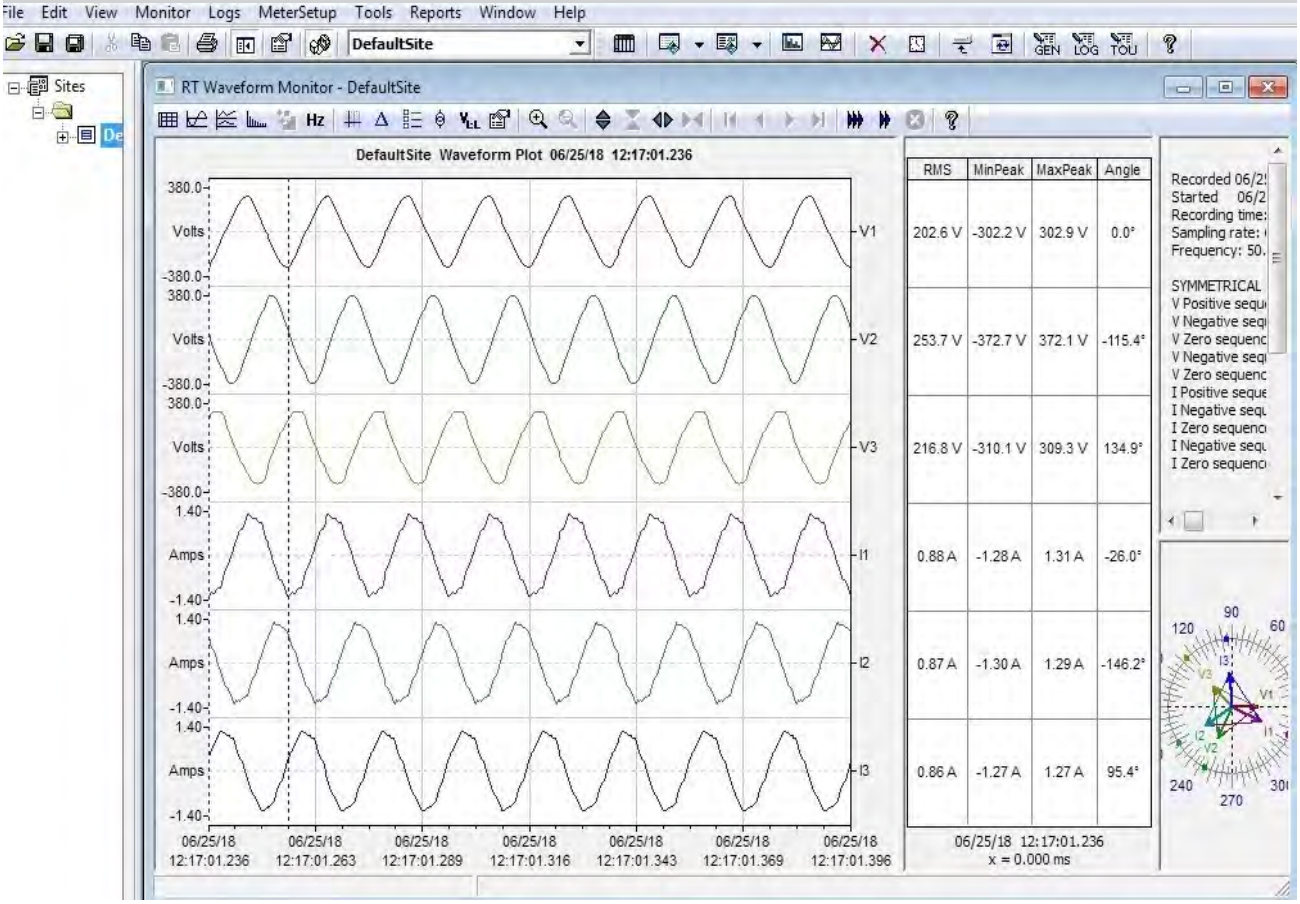
Offered in this catalogue:

- AEL-VTFP. Voltage Transformer Fundaments Application for Protection Devices.

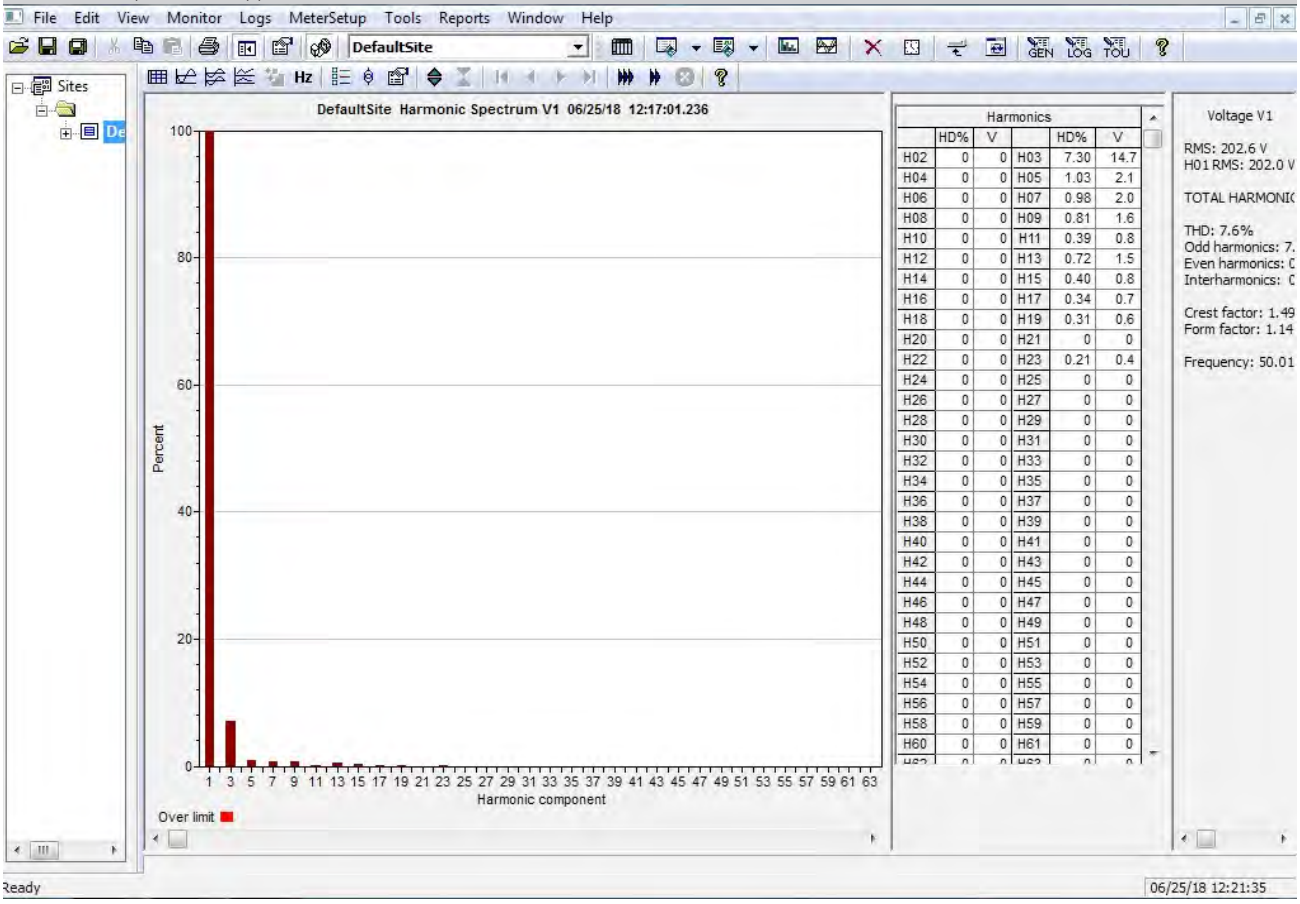
Offered in other catalogue:

- AEL-CTFP. Current Transformer Fundaments Application for Protections Devices.

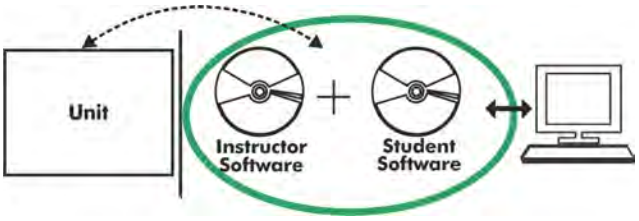
Waveform plot of the real time currents and voltages measured by the analyzer, showing the angular, maximum, minimum and RMS values, and the phasors corresponding to such electrical parameters.



Representation of the torque-speed curve for the Three-Phase Asynchronous Squirrel Cage Motor. Notice that the motor nominal speed and the maximum torque can be appreciated.



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



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

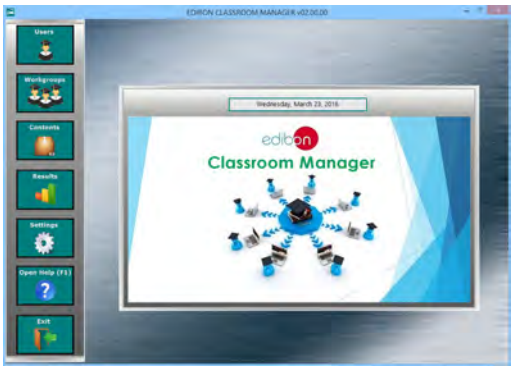
Instructor Software

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

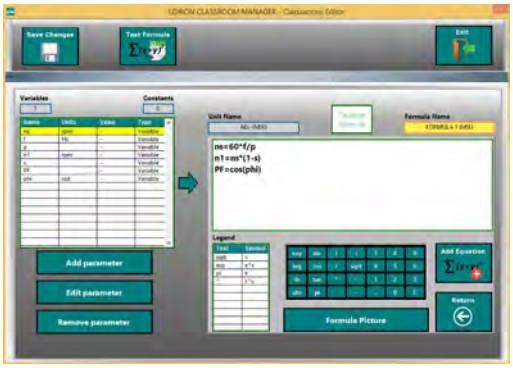
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

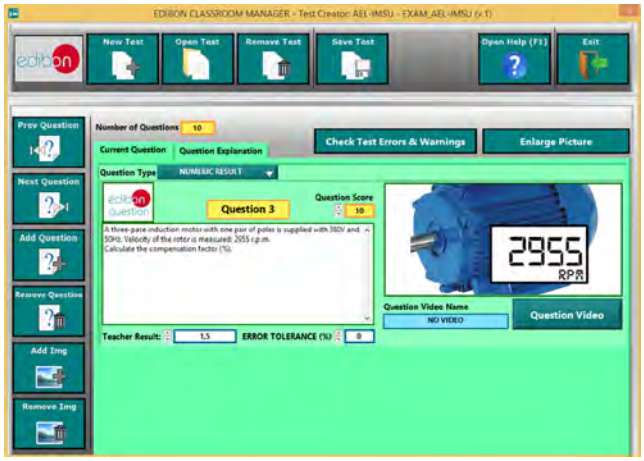
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation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



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



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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

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

Optional

Student Software

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

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

Innovative features:

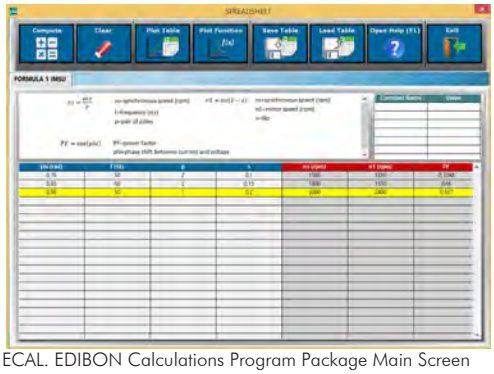
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge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

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

EPE. EDIBON Practical Exercise Program Package Main Screen

For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/files/expansion/ICAI/catalog

ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

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

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REPRESENTATIVE: