

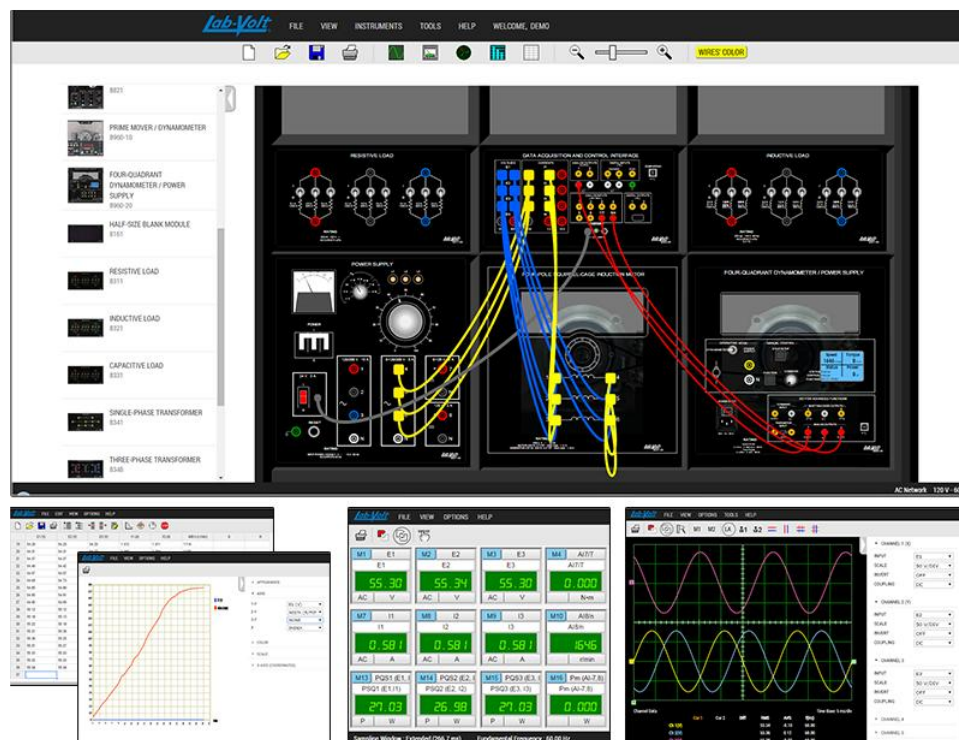
# Electromechanical Systems Simulation Software (LVSIM<sup>®</sup>-EMS)

8970-00

# FESTO

LabVolt Series

Datasheet



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## General Description

The Electromechanical Systems Simulation Software (LVSIM®-EMS) is a simulation software that covers the same courseware as the following systems:

- Computer-Assisted 0.2 kW Electromechanical Training System, Model 8006-1
- DC and AC Power Circuits Training System, Model 8010-1
- Electromechanical Training System, Model 8010-9
- AC Power Transmission Training System, Model 8010-B

With all multiple users licences, the software comes also all the PDF for the above curriculum (not included in single-user licences). With LVSIM-EMS, all the standard EMS laboratory equipment is replaced by images of the actual EMS modules that students can manipulate on the computer screen. Students can identify and set up equipment for a given exercise, make the necessary connections between the virtual EMS modules, and verify the connections made without the need for actual EMS equipment.

Sophisticated mathematical models fully simulate the electrical and mechanical characteristics of all the actual EMS modules: power supplies, motors, generators, transformers, electrical and mechanical loads, etc. All modules simulated in the LVSIM-EMS software feature the same front panel information as the actual EMS modules. Short-circuit connections in the virtual equipment setup cause the virtual circuit-breaker protection to trip. This trip condition is clearly indicated on the virtual EMS modules.

Used either as a complement to the actual EMS laboratory equipment, or as a stand-alone product, LVSIM-EMS is a cost-effective tool that enables students to perform the same exercises as in the courseware of the above-mentioned training systems. When used as a stand-alone package, the LVSIM-EMS software allows students to perform hands-on activities related to electrical power and machines, including active, reactive, and apparent power, phasors, ac/dc motors and generators, three-phase circuits, and transformers.

LVSIM-EMS is a web-browser based application **available in three different configurations**. The simulation software can either be installed locally on a Windows® personal computer (local version), on a Windows server (network version), or accessed directly online through the labvolt.com website at [lvsim.labvolt.com](http://lvsim.labvolt.com) (online

version). Both network and local versions are delivered with perpetual licence for the current version. The online version is delivered as a annual licence with possibility to expand for more years.

Please visit <https://lvsim.labvolt.com> and try the online version!

The LVSIM-EMS virtual equipment is so representative of the actual EMS laboratory equipment that it allows students to develop hands-on abilities as they would with actual equipment. It also allows students to prepare laboratories in advance by virtually making the connections required in the exercise, validating their connections, and finally saving and printing the setup. Such a preparation can significantly reduce laboratory time and the need for physical hardware. By combining stations using virtual equipment with stations using actual equipment, with students using each type alternately, it is possible to set up an electromechanical training station that maximizes cost-effectiveness.

LVSIM-EMS simulates the following modules from the 8006-1, 8010-1, 8010-9, and 8010-B training systems:

- Capacitive Load, Model 8331
- Capacitor-Start Motor, Model 8251
- Data Acquisition Interface, Model 9062
- Data Acquisition and Control Interface, Model 9063
- DC Motor/Generator, Model 8211
- Four-Pole Squirrel-Cage Induction Motor, Model 8221
- Four-Quadrant Dynamometer / Power Supply, Model 8960-2
- Full-Size Blank Module, Model 8160
- Half-Size Blank Module, Model 8161
- Inductive Load, Model 8321
- Lead-Acid Battery Pack, Model 8802
- Permanent-Magnet DC Motor, Model 8213
- Power Supply, Model 8821
- Power Supply, Model 8823
- Prime Mover / Dynamometer, Model 8960-1
- Regulating Autotransformer, Model 8349
- Resistive Load, Model 8311
- Single-Phase Transformer, Model 8341
- Synchronizing Module, Model 8621
- Synchronizing Module / Three-Phase Contactor, Model 8621-A
- Synchronous Motor/Generator, Model 8241
- Synchronous Motor/Generator with Thermistor Output, Model 8241-2
- Three-Phase Transformer, Model 8348
- Three-Phase Transmission Line, Model 8329
- Universal Motor, Model 8254

Make sure to select the right license type (8970 Series for local or network installations, 8972 Series for online access).

## Virtual Instrumentation

LVSIM-EMS comprises a set of conventional and specialized instruments that can be used for measuring, observing, and analyzing electrical and mechanical parameters in electric power systems and power electronic circuits. Each instrument appears as a window on the computer screen. The conventional instruments include ac/dc voltmeters and ammeters, power meters, and an eight-channel oscilloscope. The specialized instruments include a six-channel phasor analyzer, a harmonic analyzer, torque, speed, and mechanical power meters, and user-programmable meters. The software is also provided with data-recording and graph-plotting capabilities. The various instruments are briefly described in the next section of this datasheet.

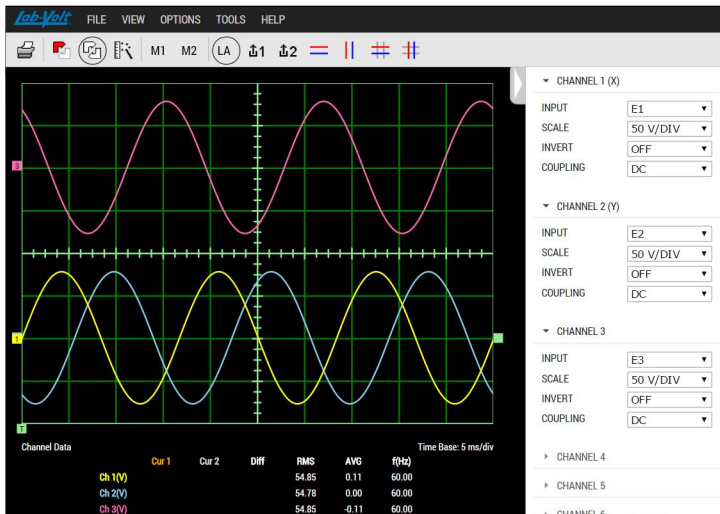
## Metering Window



The Metering window displays up to eighteen meters, which can be configured individually for measuring ac/dc voltage and current, electrical power (active, reactive, and apparent), torque, speed, mechanical power, etc. The voltage and current meters have several modes of operation that allow measurement of the mean (dc) value, RMS value, crest factor, RMS value of a particular harmonic (up to the 15th

value), RMS value of the harmonics, and total harmonic distortion (THD). Six of the eighteen meters are user-programmable and give access to a larger variety of functions for measurement of power factor, efficiency, impedance, frequency, energy, phase shift, etc. The layout of the meters in the Metering window is user-customizable.

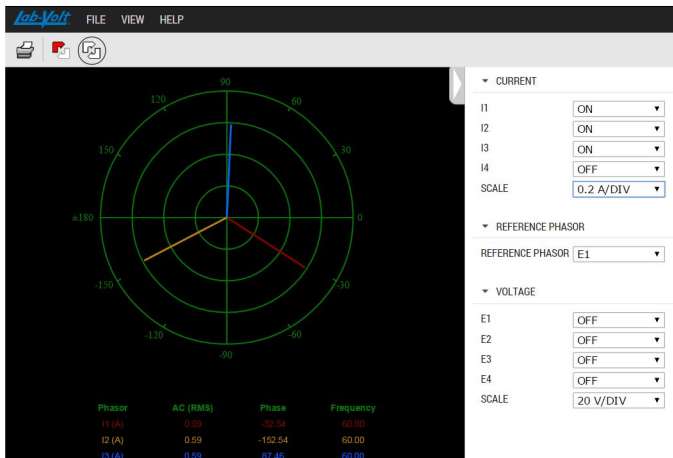
## Oscilloscope



The Oscilloscope displays up to eight waveforms simultaneously, each of a different color for easy identification. Each channel has independent vertical controls similar to those found on conventional oscilloscopes. An automatic scale-setting function allows the sensitivity of each channel to be set automatically according to the magnitude of the observed parameter. The time base and trigger controls are similar to those found on most oscilloscopes. The RMS value, average value, and frequency of each observed parameter can be displayed

in the Oscilloscope window. Two vertical cursors can be activated to perform precise measurements at particular points on the displayed waveforms. The Oscilloscope toolbar includes two memory buttons for saving displayed waveforms.

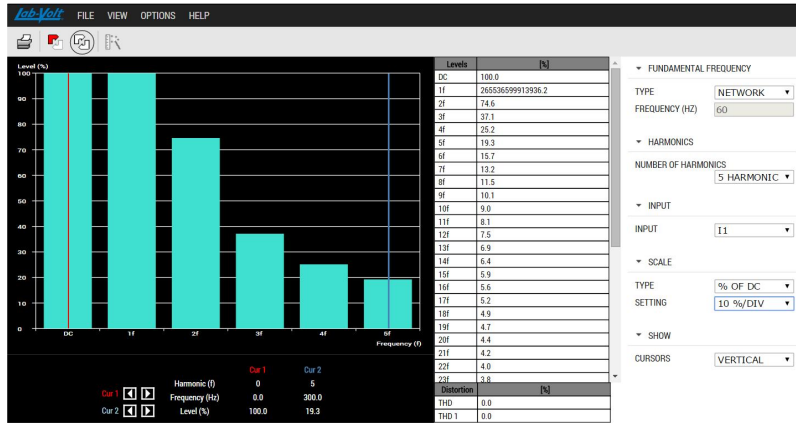
## Phasor Analyzer



The Phasor Analyzer displays the phasors related to the measured voltages and currents. The amplitude and phase angle of each voltage and current is clearly represented by the orientation and length of their corresponding phasors, allowing easy comparison between the displayed parameters. This produces a unique and dynamic display of the voltages and currents in a circuit (especially in three-phase circuits) that cannot be obtained with conventional

instruments. The RMS value, phase angle, and frequency of the voltage or current related to each phasor is displayed in the Phasor Analyzer window.

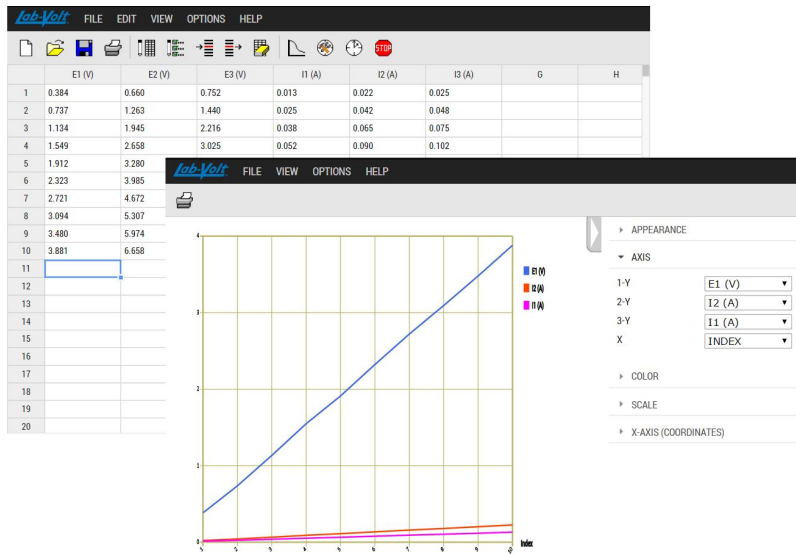
## Harmonic Analyzer



The Harmonic Analyzer allows observation and analysis of the harmonic components in the measured voltages and currents. The fundamental frequency can be manually set to the ac power network frequency or automatically set to the frequency of the fundamental component of the selected voltage or current. The harmonic components of the selected voltage or current can be displayed using a vertical scale

graduated in either absolute or relative values. A group of data displays in the Harmonic Analyzer indicates the values of the dc component of the selected voltage or current, as well as the total harmonic distortion (THD). Vertical and horizontal cursors can be displayed to perform precise measurements at particular points on the display. Since the equipment simulated by LVSIM-EMS produces only dc and sinusoidal ac signals (without harmonics), the Harmonic Analyzer, which is intended for use with devices that produce harmonics, is not often used with LVSIM-EMS.

## Data Table and Graph Windows



The values indicated by the various meters in the Metering window, as well as values measured by the other instruments, can be recorded in the Data Table window with a click of the mouse. The values recorded in the Data Table can be saved to a file (ASCII-formatted file). The recorded data can also be used to plot graphs by selecting which parameter(s) to plot in the Graph window. This allows lab results to be plotted quickly and easily. More sophisticated graphs can be created by exporting the contents of the Data Table window to any spreadsheet, such as

Microsoft Excel®, directly through the Windows Clipboard.

## Software Protection and Licensing

The local and network version provides a perpetual licence and the online access version provides a annual licence (additional years can be purchased when ordering).

The local and network version of LVSIM-EMS are copy-protected by means of a hardlock security device. When LVSIM-EMS detects the security device, students have complete access to all measuring functions of the virtual instruments and other protected features of LVSIM-EMS, as well as to the student manuals included with the simulation software. Note that students are allowed to copy the software onto their personal computer to allow them to prepare laboratories in advance.

Two different security devices are available for LVSIM-EMS: a single-user hardlock key, which can be inserted in the USB port of the user's computer, and a multiple-user hardlock key, which can be inserted in the USB port of the network server or any computer in the same network. Once the hardlock key is active on the network, the other computer will see the available licences. Alternately, the multiple-user hardlock key can be inserted in a USB port inside the server using a circuit board with edge-type connector (provided with the key) that can be installed in a PCI expansion slot of the server.

The multiple-user hardlock key can be installed in servers running under one of the following Microsoft® operating systems: Windows 7, Windows 8, Windows 10, Windows 2008 Server, and Windows 2013 Server. As its name indicates, the multiple-user hardlock key allows several users of a network to run LVSIM-EMS simultaneously. Different versions of LVSIM-EMS are available, each allowing a particular number of users.

## Online Edition

The online version of LVSIM-EMS is accessible directly via the internet, and requires no software installation nor any update since the latest version of the software is always available. The online version of LVSIM-EMS also includes a demo mode that allows students to prepare laboratories in advance by familiarizing with the equipment and connections. The demo mode does not require any login.

## Computer Requirements

Local and Network Versions:

- One (1) USB 2.0 port for the security dongle, Microsoft Windows 10 operating system recommended (compatible with Windows 7 and 8), basic dual core CPU, Google Chrome web browser installed (for better experience)

Online Version:

- Microsoft Windows 10 operating system recommended (compatible with Windows 7 and 8 but not fully compatible with mobile devices), basic dual core CPU, internet access (bandwidth usage of 50 KB/s maximum), Google Chrome web browser installed (for better experience)

## Topic Coverage

- Fundamentals for Electric Power Technology
- Alternating Current
- Capacitors in AC Circuits
- Inductors in AC Circuits
- Power, Phasors, and Impedance in AC Circuits

- Three-Phase Circuits
- Special Transformer Connections
- Single- and three-Phase Transformers
- Fundamentals for Rotating Machines
- DC Motors and Generators
- Special Characteristics of DC Motors
- AC Induction and Synchronous Motors
- Three-Phase Synchronous Generators

## Features & Benefits

- Replicates the Electromechanical Training System, enabling students to perform actual experiments using virtual equipment
  - Install, move, and remove EMS modules in and from the workstation
  - Modify module connections at any time and change the color of wires
  - Install a timing belt between two EMS machines
  - Verify module connections using a tool that highlights all wires connected to a same circuit point
  - Perform measurements of voltage, current, power, speed, torque, impedance, resistance, reactance, and frequency and display the values on digital or analog meters
  - Record measurements in a data table and plot graphs using the recorded data
  - Display waveforms on a multi-channel oscilloscope and ac voltages and currents as phasors
- Students prepare for laboratories in advance using virtual equipment, thereby decreasing the time they require to perform the exercises using actual equipment
- Decreases the quantity of actual equipment required per student
- Allows students to practice with EMS equipment operation and connection at home on a personal computer

## List of Available Training Systems

Qty	Description	Model number
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 1 User _____	586920 (8970-00)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 5 Users _____	586923 (8970-A0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 10 Users _____	586926 (8970-B0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 15 Users _____	586929 (8970-C0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 20 Users _____	586932 (8970-D0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 25 Users _____	586935 (8970-E0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 30 Users _____	586938 (8970-F0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 35 Users _____	586941 (8970-G0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 40 Users _____	586944 (8970-H0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 5 Users Network _____	586947 (8970-P0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 10 Users Network _____	586950 (8970-Q0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 15 Users Network _____	586953 (8970-R0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 20 Users Network _____	586956 (8970-S0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 25 Users Network _____	586959 (8970-T0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 30 Users Network _____	586962 (8970-U0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 35 Users Network _____	586965 (8970-V0)



Qty	Description	Model number
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 40 Users Network _____	586968 (8970-W0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 1 User Online _____	586971 (8972-00)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 5 Users Online _____	586974 (8972-A0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 10 Users Online _____	586977 (8972-B0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 15 Users Online _____	586980 (8972-C0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 20 Users Online _____	586983 (8972-D0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 25 Users Online _____	586986 (8972-E0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 30 Users Online _____	586989 (8972-F0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 35 Users Online _____	586992 (8972-G0)
1	Electromechanical Systems Simulation Software (LVSIM®-EMS) - 40 Users Online _____	586995 (8972-H0)

## List of Manuals

Description	Manual number
Electromechanical Training System (Manuals on CD-ROM)	579707 (86357-A0)
AC Power Transmission Training System (Manuals on CD-ROM)	580209 (20521-A0)
Electromechanical Systems Simulation Software (User Guide)	583879 (20858-E0)
Manuals on CD-ROM – LVSIM-EMS (Student Manual)	584111 (30329-A0)
Computer-Based Instruments for EMS (User Guide)	584396 (36221-E0)
Power Factor Correction (Student Manual)	590283 (20116-00)
Power Factor Correction (Instructor Guide)	590284 (20116-10)
Power Factor Correction (Instructor Guide)	590285 (20116-15)
Power Factor Correction (Instructor Guide)	590286 (20116-1A)
Power Factor Correction (Instructor Guide)	590287 (20116-1E)
AC Transmission Lines (Student Manual)	590297 (20521-00)
AC Transmission Lines (Instructor Guide)	590298 (20521-10)
AC Transmission Lines (Instructor Guide)	590299 (20521-15)
AC Transmission Lines (Instructor Guide)	590300 (20521-1A)
AC Transmission Lines (Instructor Guide)	590301 (20521-1E)
Electromechanical Systems Simulation Software (User Guide)	590337 (20858-E0)
Software de simulación de sistemas electromecánicos (User Guide)	590338 (20858-E2)
Power Circuits and Transformers (Student Manual)	590571 (30328-00)
(Student Manual)	590572 (30328-01)
Circuitos de Potencia y Transformadores (Student Manual)	590573 (30328-02)
Power Circuits and Transformers (Instructor Guide)	590574 (30328-10)
Sistema Electromecánico (EMS) de 0,2 kW / Guía del profesor (Instructor Guide)	590575 (30328-12)
ElectroMechanical System ( EMS ) 0.2 kW (Instructor Guide)	590576 (30328-15)
Circuitos de potencia y transformadores (Instructor Guide)	590577 (30328-17)
ElectroMechanical System ( EMS ) 0.2 kW (Instructor Guide)	590578 (30328-1A)
ElectroMechanical System (EMS) 0.2 kW (Instructor Guide)	590579 (30328-1E)
Circuitos de potencia y transformadores (Instructor Guide)	590580 (30328-1F)
AC/DC Motors and Generators (Student Manual)	590581 (30329-00)
Machines c.a./c.c. (Student Manual)	590582 (30329-01)
Motores y generadores CC/CA (Student Manual)	590583 (30329-02)
AC/DC Motors and Generators (Instructor Guide)	590584 (30329-10)
AC/DC Motors and Generators (Instructor Guide)	590585 (30329-15)
AC/DC Motors and Generators (Instructor Guide)	590586 (30329-1A)
AC/DC Motors and Generators (Instructor Guide)	590587 (30329-1E)
Computer-Based Instruments for EMS (User Guide)	590837 (36221-E0)
Instruments informatisés (User Guide)	590838 (36221-E1)
Instrumentos para EMS basados en computadora (User Guide)	590839 (36221-E2)
Electric Power Technology Training Equipment (User Guide)	591259 (38486-E0)
Equipos del Sistema didáctico en tecnología de la energía eléctrica (User Guide)	591260 (38486-E2)
DC Power Circuits (Student Manual)	591809 (86350-00)
Circuitos cc (Student Manual)	591810 (86350-02)
Circuitos de Potência de CC (Student Manual)	591811 (86350-04)
DC Power Circuits (Instructor Guide)	591812 (86350-10)
Circuitos cc (Instructor Guide)	591813 (86350-12)
Circuitos de Potência de CC (Instructor Guide)	591814 (86350-14)
Permanent Magnet DC Machine (Student Manual)	591842 (86357-00)
Máquina cc de imán permanente (Student Manual)	591843 (86357-02)
Máquina de CC de Imã Permanente (Student Manual)	591844 (86357-04)
Permanent Magnet DC Machine (Instructor Guide)	591845 (86357-10)

<b>Description</b>	<b>Manual number</b>
Circuitos ca monofásicos (Instructor Guide) _____	591851 (86358-12)
Three-Phase AC Power Circuits (Student Manual) _____	591858 (86360-00)
Circuitos ca trifásicos (Student Manual) _____	591859 (86360-02)
Circuitos de Potência de CA Trifásicos (Student Manual) _____	591860 (86360-04)
Three-Phase AC Power Circuits (Instructor Guide) _____	591861 (86360-10)
Circuitos ca trifásicos (Instructor Guide) _____	591862 (86360-12)
Circuitos de Potência de CA Trifásicos (Instructor Guide) _____	591863 (86360-14)
Three-Phase AC Power Circuits (Instructor Guide) _____	591864 (86360-15)
Circuitos de Potência de CA Trifásicos (Instructor Guide) _____	591865 (86360-19)
Three-Phase AC Power Circuits (Instructor Guide) _____	591866 (86360-1A)
Three-Phase AC Power Circuits (Instructor Guide) _____	591867 (86360-1E)
Three-Phase Rotating Machines (Student Manual) _____	591903 (86364-00)
Máquinas rotatorias trifásicas (Student Manual) _____	591904 (86364-02)
Three-Phase Rotating Machines (Instructor Guide) _____	591905 (86364-10)
Máquinas rotatorias trifásicas (Instructor Guide) _____	591906 (86364-12)
Three-Phase Rotating Machines (Instructor Guide) _____	591907 (86364-15)
Máquinas rotatorias trifásicas (Instructor Guide) _____	591908 (86364-17)
Three-Phase Rotating Machines (Instructor Guide) _____	591909 (86364-1A)
Three-Phase Rotating Machines (Instructor Guide) _____	591910 (86364-1E)
Máquinas rotatorias trifásicas (Instructor Guide) _____	591911 (86364-1F)
Single-Phase Power Transformers (Student Manual) _____	591954 (86377-00)
Transformadores de potencia monofásicos (Student Manual) _____	591955 (86377-02)
Single-Phase Power Transformers (Instructor Guide) _____	591956 (86377-10)
Transformadores de potencia monofásicos (Instructor Guide) _____	591957 (86377-12)
Three-Phase Transformer Banks (Student Manual) _____	591967 (86379-00)
Bancos trifásicos de transformadores (Student Manual) _____	591968 (86379-02)
Bancos de Transformadores Trifásicos (Student Manual) _____	591969 (86379-04)
Three-Phase Transformer Banks (Instructor Guide) _____	591970 (86379-10)
Bancos trifásicos de transformadores (Instructor Guide) _____	591971 (86379-12)
Bancos de Transformadores Trifásicos (Instructor Guide) _____	591972 (86379-14)
Three-Phase Transformer Banks (Instructor Guide) _____	591973 (86379-15)
Bancos trifásicos de transformadores (Instructor Guide) _____	591974 (86379-17)
Bancos de Transformadores Trifásicos (Instructor Guide) _____	591975 (86379-19)
Three-Phase Transformer Banks (Instructor Guide) _____	591976 (86379-1A)
Three-Phase Transformer Banks (Instructor Guide) _____	591977 (86379-1E)
Bancos trifásicos de transformadores (Instructor Guide) _____	591978 (86379-1F)
Computer-Based Instruments for EMS (User Guide) _____	592016 (86718-E0)
Instrumentos para EMS computarizados (User Guide) _____	592018 (86718-E2)
Conventional DC Machines and Universal Motor (Student Manual) _____	592168 (88943-00)
Máquinas cc convencionales y motor universal (Student Manual) _____	592169 (88943-02)
Conventional DC Machines and Universal Motor (Instructor Guide) _____	592170 (88943-10)
Máquinas cc convencionales y motor universal (Instructor Guide) _____	592171 (88943-12)
Conventional DC Machines and Universal Motor (Instructor Guide) _____	592172 (88943-15)
Máquinas cc convencionales y motor universal (Instructor Guide) _____	592173 (88943-17)
Conventional DC Machines and Universal Motor (Instructor Guide) _____	592174 (88943-1A)
Conventional DC Machines and Universal Motor (Instructor Guide) _____	592175 (88943-1E)
Máquinas cc convencionales y motor universal (Instructor Guide) _____	592176 (88943-1F)
Single-Phase Induction Motors (Student Manual) _____	592177 (88944-00)
Motoras de inducción monofásicas (Student Manual) _____	592178 (88944-02)

<b>Description</b>	<b>Manual number</b>
Single-Phase Induction Motors (Instructor Guide) _____	592184 (88944-1E)
Motores de inducción monofásicos (Instructor Guide) _____	592185 (88944-1F)
DC Power Circuits (Student Manual) _____	594401 (86350-0C)
DC Power Circuits (Instructor Guide) _____	594402 (86350-1C)
Single-Phase AC Power Circuits (Student Manual) _____	594403 (86358-0C)
Single-Phase AC Power Circuits (Instructor Guide) _____	594404 (86358-1C)
Three-Phase AC Power Circuits (Student Manual) _____	594405 (86360-0C)
Three-Phase AC Power Circuits (Instructor Guide) _____	594406 (86360-1C)
Circuitos ca trifásicos (Instructor Guide) _____	594407 (86360-1F)
Circuitos ca trifásicos (Instructor Guide) _____	594408 (86360-17)
Máquinas Rotativas Trifásicas (Student Manual) _____	594413 (86364-04)
Máquinas Rotativas Trifásicas (Job Sheets - Student) _____	594414 (86364-14)
Single-Phase Power Transformers (Student Manual) _____	594445 (86377-0C)
Single-Phase Power Transformers (Instructor Guide) _____	594446 (86377-1C)
Three-Phase Transformer Banks (Student Manual) _____	594447 (86379-0C)
Three-Phase Transformer Banks (Instructor Guide) _____	594448 (86379-1C)
Corrección del factor de potencia (Student Manual) _____	595688 (20116-02)
Corrección del factor de potencia (Instructor Guide) _____	595689 (20116-1F)
Corrección del factor de potencia (Instructor Guide) _____	595690 (20116-12)
Corrección del factor de potencia (Instructor Guide) _____	595691 (20116-17)
Transformateurs de puissance monophasés (Instructor Guide) _____	8108882 (86377-11)
Transformateurs de puissance monophasés (Student Manual) _____	8108884 (86377-01)
Transformateurs de puissance monophasés (Instructor Guide) _____	8108886 (86377-1H)
Transformateurs de puissance monophasés (Student Manual) _____	8108888 (86377-0H)
Banque triphasées de transformateurs (Instructor Guide) _____	8114282 (86379-11)
Banque triphasées de transformateurs (Student Manual) _____	8114284 (86379-01)
Banque triphasées de transformateurs (Instructor Guide) _____	8114286 (86379-16)
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Correction du facteur de puissance (Instructor Guide) _____	8116570 (20116-11)
Correction du facteur de puissance (Student Manual) _____	8116572 (20116-01)
Correction du facteur de puissance (Instructor Guide) _____	8116574 (20116-16)
Machines tournantes triphasées (Instructor Guide) _____	8116685 (86364-11)
Machines tournantes triphasées (Student Manual) _____	8116687 (86364-01)
Machines tournantes triphasées (Instructor Guide) _____	8116689 (86364-16)
Líneas de transmisión ca (Instructor Guide) _____	8120197 (20521-12)
Líneas de transmisión ca (Student Manual) _____	8120199 (20521-02)
Líneas de transmisión ca (Instructor Guide) _____	8120201 (20521-17)
Líneas de transmisión ca (Instructor Guide) _____	8120202 (20521-1F)
Power Factor Correction (Instructor Guide) _____	8123643 (20116-1C)
Power Factor Correction (Student Manual) _____	8123645 (20116-0C)

## Table of Contents of the Manual(s)

Electromechanical Systems Simulation Software (User Guide) (583879 (20858-E0))

- 1 Overview of LVSIM-EMS
- 2 Installing the Security Device
- 3 Installing and Running LVSIM-EMS

### Computer-Based Instruments for EMS (User Guide) (584396 (36221-E0))

- 1 Familiarization with the Metering Window and the Data Table
- 2 Familiarization with the Oscilloscope
- 3 Familiarization with the Phasor Analyzer
- 4 Familiarization with the Harmonic Analyzer
- 5 Measuring Three-Phase Power Using the Metering Window

### Power Factor Correction (Student Manual) (590283 (20116-00))

- 0-Intro Introduction to Power Factor Correction
- 1 Power Factor Correction

## Optional Equipment

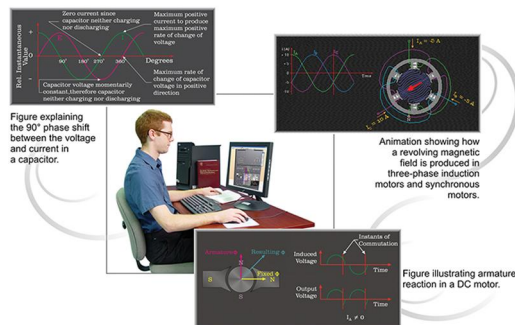
Qty Description

Model number

1 Electromechanical Training System - eSeries \_\_\_\_\_ 586998 (8980-E0)

## Optional Equipment Description

### Electromechanical Training System - eSeries (Optional) 586998 (8980-E0)



This site-license course is intended to be used in conjunction with either the Computer-Assisted 0.2 kW Electromechanical Training System, Model 8006, or the Electromechanical Systems Simulation Software, Model 8970. It contains all the technical content and exercise procedures of two manuals: Power Circuits and Transformers, Model 30328, and AC/

DC Motors and Generators, Model 30329. Each course begins with a pretest and ends with a posttest. Each course includes the topics covered in the book-based content and their related hands-on exercises. Exercise presentation of technical content is accompanied by voiceover narration to minimize the amount of on-screen reading.

The following learning platforms are available:

- 8980-E: Electromechanical Training System - eSeries
- 8980-F: Electromechanical Training System - SCORM
- 8980-G: Electromechanical Training System - Stand-Alone

Users running the Tech-Lab version of the Electromechanical Training System may upgrade their software to an eSeries course using the following variant:

- 8980-U: Electromechanical Training System Upgrade - eSeries

## Topic Coverage

- Power Circuits and Transformers
- AC/DC Motors and Generators

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**Festo Didactic SE**

Rechbergstrasse 3  
73770 Denkendorf  
Germany

P. +49(0)711/3467-0  
F. +49(0)711/347-54-88500

**Festo Didactic Inc.**

607 Industrial Way West  
Eatontown, NJ 07724  
United States

P. +1-732-938-2000  
F. +1-732-774-8573

**Festo Didactic Ltée/Ltd**

675 rue du Carbone  
Québec QC G2N 2K7  
Canada

P. +1-418-849-1000  
F. +1-418-849-1666

[www.labvolt.com](http://www.labvolt.com)

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