



## SPECIALIZED PRODUCTS

Over the years, Lab-Volt has created a number of specialized models in response to customer requests, in order to meet their specific needs. Those models are either small variations of existing Lab-Volt models or completely new items.

These models do not include any type of courseware (unless specified).





Specialized Products

## DISTRIBUTION TRANSFORMER TRAINER, MODEL 8361-10<sup>1</sup>



### GENERAL DESCRIPTION

The Distribution Transformer Trainer (Star Primary), Model 8361-10, is a portable, hands-on trainer designed to allow students to develop competence in completing single/three-phase transformer connections similar to those performed in the field.

The trainer contains two sets of three single-phase transformers to demonstrate three-phase banking configurations, such as wye-wye, delta-delta, closed delta-wye, closed wye-delta, open-wye, open-delta, and others. Each individual transformer winding is thermally protected and designed to accept multiple faults.

The trainer is faultable in order to develop sound techniques for troubleshooting single-phase and three-phase transformer banks. Eight (8) trainer faults are available, as follows:

- F1 . . . . . Open primary on T1
- F2 . . . . . Open secondary on T2
- F3 . . . . . Secondary of T3 shorted to ground
- F4 . . . . . Line  $b_1$  shorted to ground
- F5 . . . . . Open primary on T4
- F6 . . . . . Open secondary T5
- F7 . . . . . Secondary of T6 shorted to ground
- F8 . . . . . Line  $c_1$  shorted to ground

The Model 8361-10 is a variation of the Model 8361-00 but is built to supply 240 VAC with a center tap on the secondary winding when the primary winding is connected between line and neutral instead of line to line.

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware.

## SPECIALIZED PRODUCTS

### SPECIFICATIONS

| Model 8361-10 <sup>1</sup> – Distribution Transformer Trainer (Star Primary) |                                 | 120/208 V – 60 Hz                              | 220/380 V – 50 Hz | 240/415 V – 50 Hz |
|--|---------------------------------|--|-------------------|-------------------|
| Input  | Voltage                         | 120/208 V                                      | 220/380 V         | 240/415 V         |
|  | Phases                          | 3  |                   |                   |
|  | Wires                           | 4 wires plus ground                            |                   |                   |
|  | Current rating                  | 5 A  | 3 A               | 3 A               |
| Transformers   | Primary Voltage                 | 120 V  | 220 V             | 240 V             |
|  | Secondary Voltage               | 120/120 V                                      |                   |                   |
|  | Power Capacity                  | 25 VA  |                   |                   |
|  | Quantity                        | 6  |                   |                   |
|  | Protection                      | Thermal Circuit Breaker                        |                   |                   |
| Service Lines  | 2 sets of three lines + neutral |  |                   |                   |
| Load Lamps   | Quantity                        | 3  |                   |                   |
|  | Rated Voltage                   | 250 V  |                   |                   |
|  | Rated Power                     | 25 W   |                   |                   |
| Test Leads   | 2 (probe type)                  |  |                   |                   |
| Faults   | Quantity                        | 8 (switch insertable)                          |                   |                   |
|  | Accessibility                   | Through locked door at the back of the trainer |                   |                   |
| Physical Characteristics   | Dimensions (H x W x D)          | 340 x 491 x 253 mm (13.4 x 19.3 x 10.0 in)     |                   |                   |
|  | Net weight                      | 24 kg (53 lb)                                  |                   |                   |

### ORDERING NUMBERS

| 120/208 V – 60 Hz |         |         | 220/380 V – 50 Hz |         |         | 240/415 V – 50 Hz |
|-------------------|---------|---------|-------------------|---------|---------|-------------------|
| ENGLISH           | FRENCH  | SPANISH | ENGLISH           | FRENCH  | SPANISH | ENGLISH           |
| 8361-10           | 8361-11 | 8361-12 | 8361-15           | 8361-16 | 8361-17 | 8361-1A           |

Table 1. Equipment Ordering Numbers

<sup>1</sup> Various versions are available. Refer to Ordering Numbers section.



Specialized Products

## STEPPER MOTOR & MICROSTEPPING DRIVE<sup>1</sup> MODELS 8244 & 9018

### GENERAL DESCRIPTION

The Lab-Volt Stepper Motor, Model 8244, and Microstepping Drive, Model 9018, are optional Lab-Volt Electromechanical System (EMS) models designed for the study of stepper motor control. Both machines use industrial-grade components and are mounted in standard-size EMS modules.

machine through the use of a non-slip timing belt (Model 8942). This flexible belt has molded teeth which mesh with the geared pulley. Tension for the timing belt is provided by the idler tensioning ball bearings mounted on the machine.

#### Model 8244 – Stepper Motor



The Stepper Motor, Model 8244, consists of an 8-lead stepper motor which can be connected either in series or in parallel, depending on the user configuration. It also has high torque capability.

The module is constructed of heavy gauge steel and is equipped with a clear plastic faceplate fitted with a chrome piano hinge. The faceplate can be lowered for access to the machinery and, when closed, is secured by two quick-lock fasteners. All motor leads are terminated on the faceplate by 4-mm safety jacks and are identified by schematic symbols. A geared pulley has been fitted to mechanically couple the motor with another EMS

#### Model 9018 – Microstepping Drive



The Microstepping Drive, Model 9018, is used to control the Stepper Motor, Model 8244. The powerful microstepping amplifier provides high torque and smooth, quiet motion. The drive can be controlled using 24 V dc signals from another controller, such as the Programmable Logic Controller, Model 9066.

The Microstepping Drive accepts a wide range of motors due to its selectable current range. The Microstepping Drive is easy to configure, with on-board switches and potentiometers for all settings. Two modes of operation are available: Pulse and Direction Mode to control the motor using a source of step pulses, and Oscillator Mode

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware (other than manufacturer user manuals).

## SPECIALIZED PRODUCTS

to operate the motor directly with the Microstepping Drive and the external potentiometer mounted on the faceplate.

Two speed ranges are available and can be selected "on the fly" using a digital signal and with automatic

ramping between speeds. An Enable input allows motor current to be shut off on command. A Tach Out signal allows easy measurement of speed. Overtemp, Overcurrent and surge protection are included.

## SPECIFICATIONS

| <b>Model 8244 – Stepper Motor</b>       |                                 |  |
|---|---------------------------------|--|
| Leads                                   |                                 | 8  |
| Series Configuration                    | Minimum Holding Torque          | 13 N·m   |
|   | Voltage                         | 4.8 V  |
|   | Current                         | 4.5 A  |
|   | Resistance                      | 1.08 Ω   |
|   | Inductance                      | 9.6 mH   |
| Parallel Configuration                  | Minimum Holding Torque          | 13 N·m   |
|   | Voltage                         | 2.4 V  |
|   | Current                         | 9 A  |
|   | Resistance                      | 0.27 Ω   |
|   | Inductance                      | 2.4 mH   |
| Physical Characteristics                | Dimensions (H x W x D)          | 308 x 291 x 440 mm (12.1 x 11.5 x 17.3 in)   |
|   | Net Weight                      | TBE  |
| <b>Model 9018 – Microstepping Drive</b> |                                 |  |
| Power Input (1 ~)                       |                                 | 208-220 V ac - 340 W - 50-60 Hz  |
| Amplifier type                          |                                 | Dual, MOSFET H-bridge, 3 state with pulse width modulated switching at 20 kHz  |
| Motor Output                            | Current ranges (Amps per phase) | 0.5, 0.7, 0.9, 1.1, 1.3, 1.5, 1.7, 1.9, 2.1, 2.3, 2.5, 2.7, 2.9, 3.1, 3.3, 3.5, 3.7, 3.9, 4.1, 4.3, 4.5, 4.7, 4.9, 5.1, 5.3, 5.5 |
|   |                                 | Power Rating   |
| Digital Inputs                          | Rating                          | 24 V dc  |
|   | Type                            | Step, Direction, Enable and Speed  |
| Digital Outputs                         | Rating                          | 304 V dc - 20 mA   |
|   | Type                            | Tachometer and Fault   |
| Operation Modes                         |                                 | Pulse-Direction and Oscillator   |
| Microstep Resolution                    | Selections (steps/rev)          | 200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 50800                          |
| Physical Characteristics                | Dimensions (H x W x D)          | 203 x 230 x 187 mm (8 x 9 x 7.4 in)  |
|   | Net Weight                      | TBE  |

## ORDERING NUMBERS

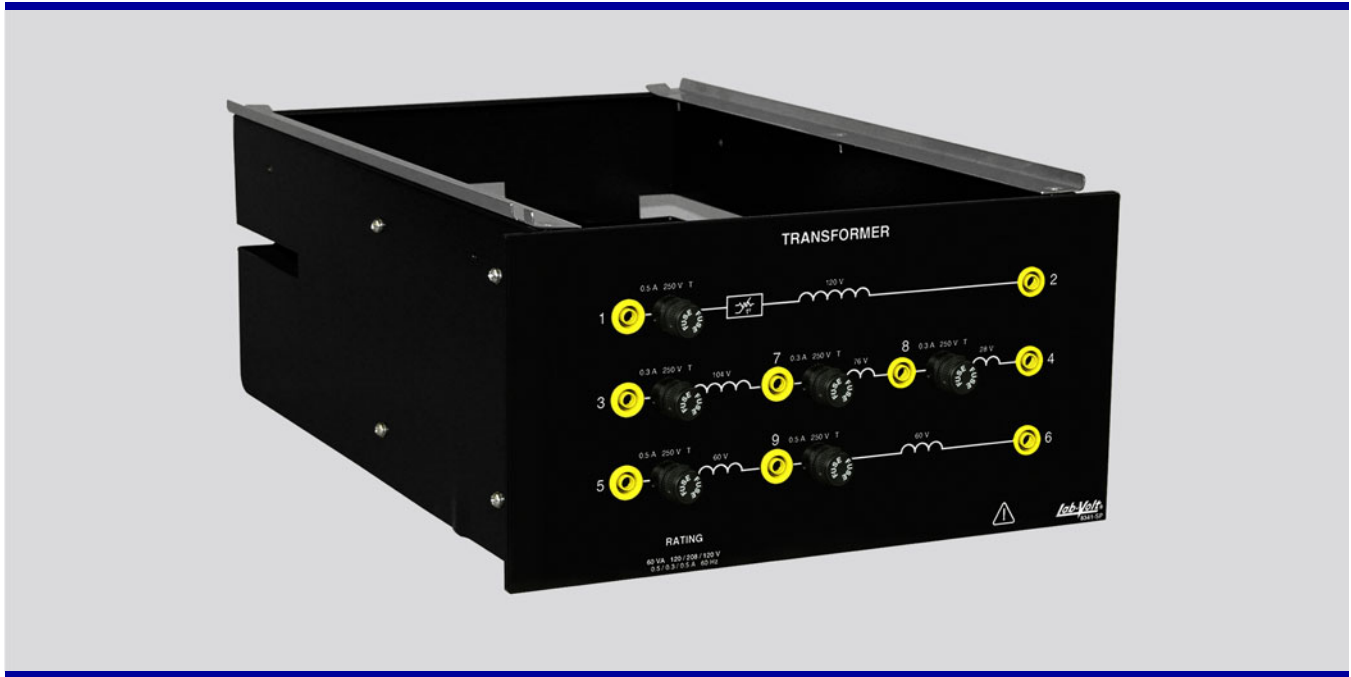
| 120 V – 60 Hz |         |         | 220 V – 50 Hz |        |         | 240 V – 50 Hz |
|---------------|---------|---------|---------------|--------|---------|---------------|
| ENGLISH       | FRENCH  | SPANISH | ENGLISH       | FRENCH | SPANISH | ENGLISH       |
| 8244-00       | 8244-01 | 8244-02 | TBE           | TBE    | TBE     | TBE           |
| 9018-00       | 9018-01 | 9018-02 | TBE           | TBE    | TBE     | TBE           |

Table 1. Equipment Ordering Numbers



Specialized Products

## SINGLE-PHASE TRANSFORMER<sup>1</sup> MODEL 8341-SP



### GENERAL DESCRIPTION

This transformer has three discrete windings. Any winding can be used as either a primary or a secondary, which increases the number of laboratory applications. Its various taps allow it to be used with many different input and output voltages. For this reason, the single phase transformer can be used for impedance matching and other transformer experimentation. By using multiple 8341 transformers, students can explore transformer phasing, distribution transformers, open and closed delta transformer configurations, delta-star (wye), star-delta, star-star and delta-delta connections. Other specialized transformer connections, such as Scott (3-phase to 2-phase), 3-phase to 6-phase, and zig-zag are also possible.

These transformers have been carefully engineered so that the regulation curves produced by resistive, inductive, and capacitive loads are readily distinguishable.

As an option, the Single-Phase Transformer can be equipped with two search coils, which allows observation of the magnetic flux waveform in the iron core. One search coil is wound around the center core and the other around an outer leg of the transformer. These coils are brought out to smaller-size banana terminals on the faceplate so they cannot be damaged by misconnection.

The Model 8341-SP has an additional feature compared to the Model 8341. Each transformer conductor is equipped with a protective fuse.

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware (other than manufacturer user manuals).

## SPECIALIZED PRODUCTS

### SPECIFICATIONS

| <b>Model 8341 – Single-Phase Transformer</b> |                        | <b>120/208 V – 60 Hz</b>                  | <b>220/380 V – 50 Hz</b> | <b>240/415 V – 50 Hz</b> |
|--|------------------------|---|--------------------------|--------------------------|
| Coil 1 Rating                                | Voltage                | 120 V – AC                                | 220 V – AC               | 240 V – AC               |
|  | Current                | 0.5 A                                     | 0.25 A                   | 0.25 A                   |
| Coil 2 Rating                                | Voltage                | 208 V                                     | 380 V                    | 415 V                    |
|  | Current                | 0.3 A                                     | 0.15 A                   | 0.15 A                   |
|  | Taps                   | 50% and 86,6%                             |                          |                          |
| Coil 3 Rating                                | Voltage                | 120 V – AC                                | 220 V – AC               | 240 V – AC               |
|  | Current                | 0.5 A                                     | 0.25 A                   | 0.25 A                   |
|  | Taps                   | 50%                                       |                          |                          |
| Search Coils                                 | Center Core            | 20 turns                                  | TBE <sup>1</sup>         |                          |
|  | Outer Leg              | 20 turns                                  | TBE                      |                          |
| Fuses (6)                                    |                        | 0.5 A SB (3),<br>0.375 A SB (3)           | TBE                      |                          |
| Physical Characteristics                     | Dimensions (H x W x D) | 154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in) |                          |                          |
|  | Net Weight             | 6.5 kg (14.3 lb)                          |                          |                          |

<sup>1</sup>TBE = To Be Established



Specialized Products

## POWER THYRISTORS<sup>1</sup> MODEL 8841-SP



### GENERAL DESCRIPTION

The Model 8841-SP Power Thyristors consists of six power thyristors and a firing unit mounted in a half-size module. Each individual thyristor is protected against overcurrents and short-circuits. All anodes and cathodes of the thyristors are terminated on the faceplate by color-coded 4-mm banana safety sockets.

A switching control section allows six 0-5 V pulse signals to be applied from the built-in Thyristor Firing Unit or from any compatible 0-5 V control unit to the gating circuit of each thyristor. Six miniature banana jacks in this section are used as test points to monitor the firing signals on an oscilloscope. They can also be used to inject 0-5 V pulse signals from an alternate firing unit, as well as to inhibit each gating circuit. A disable input allows the whole switching control section to be disabled.

The built-in Thyristor Firing Unit can be connected to the gating circuit of the power thyristors with a 9-pin cable (included). It generates four 0-4 V pulse signals in the single-phase control mode, and six in the 3-phase mode. The firing angle is determined by a low-level DC signal applied to the angle control input. The DC source output on the front panel can be used to produce this control signal. Four conversion functions can be selected to change the direction and the rate of change of the firing angle, which can be easily monitored on the front panel 7-segment display. A synchronization signal from the AC network is applied to safety 4-mm sockets.

The Model 8841-SP is a variation of Model 8841 but with a Thyristor Firing Unit (Model 9030) and a +5 V dc, +15 V dc and -15 V dc power supply (previously provided by Model 8840) all in the same module.

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware (other than manufacturer user manuals).

## SPECIALIZED PRODUCTS

### SPECIFICATIONS

| <b>Model 8841-SP – Power Thyristors</b> |                        | <b>120/208 V – 60 Hz</b>                  | <b>220/380 V – 50 Hz</b> | <b>240/415 V – 50 Hz</b> |
|---|------------------------|---|--------------------------|--------------------------|
| Thyristor Rating                        | Peak Inverse Voltage   | 600 V                                     | 1200 V                   | 1200 V                   |
|   | Maximum Current        | 2 A                                       | 1 A                      | 1 A                      |
|   | Gate Control Signals   | 0-5 V Pulses (TTL compatible)             |                          |                          |
| Firing Unit Control Input               | Level                  | - 10 to +10 V                             |                          |                          |
|   | Input Impedance        | 2 MΩ                                      |                          |                          |
| Firing Unit DC Source                   | Voltage Range          | - 10 to +10 V                             |                          |                          |
|   | Output Impedance       | 1 kΩ                                      |                          |                          |
| Firing Unit Control Outputs             | Quantity               | 7   |                          |                          |
|   | Level                  | 0-5 V (TTL compatible)                    |                          |                          |
|   | Operating Frequency    | 50/60 Hz                                  |                          |                          |
|   | Output Impedance       | 300 Ω                                     |                          |                          |
| Physical Characteristics                | Dimensions (H x W x D) | 154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in) |                          |                          |
|   | Net Weight             | 5.6 kg (12.35 lb)                         |                          |                          |

## SYNCHRONOUS MOTOR/ GENERATOR<sup>1</sup>, MODEL 8507-SP



### GENERAL DESCRIPTION

The Three-Phase Synchronous Motor/Generator consists of a 4-pole machine rated at 2 kW. Each phase of the stator winding is accessible via the connection module to allow wye or delta connections. The rotor winding is connected to two slip rings for external connection to a DC source. A squirrel cage damper winding is inserted in the salient-pole rotor to produce induction-motor action, making the synchronous motor self-starting.

Features of the Wiring Module for Synchronous Motor/Generator include:

- A damping resistor connected across the rotor winding to limit induced voltage and increase the torque during motor start-up.
- A toggle switch connected in series with the rotor winding, to isolate the winding from the DC source during motor start-up.
- A normally-closed push-button connected in series with the damping resistor, which enables students to measure the true exciting current.
- A full-pitch stator pole and a rotor-pole search coil to allow observation of the flux distribution.

The module has eight 4-mm color-coded safety jacks for the power windings and four 2-mm jacks for the search coils. Jacks of different sizes prevent accidental connections between power windings and search coils.

The Model 8507-SP was designed to combine two existing Lab-Volt models into one module:

- |      |   |
|------|---|
| 8507 | Three-Phase Synchronous Motor/Generator       |
| 8508 | Wiring Module for Synchronous Motor/Generator |

The frame was also modified to couple this motor with a particular non-Lab-Volt motor. This new frame can easily be stored under a table.

The other Lab-Volt 2 kW motors can also be ordered with this type of frame.

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware.

## SPECIALIZED PRODUCTS

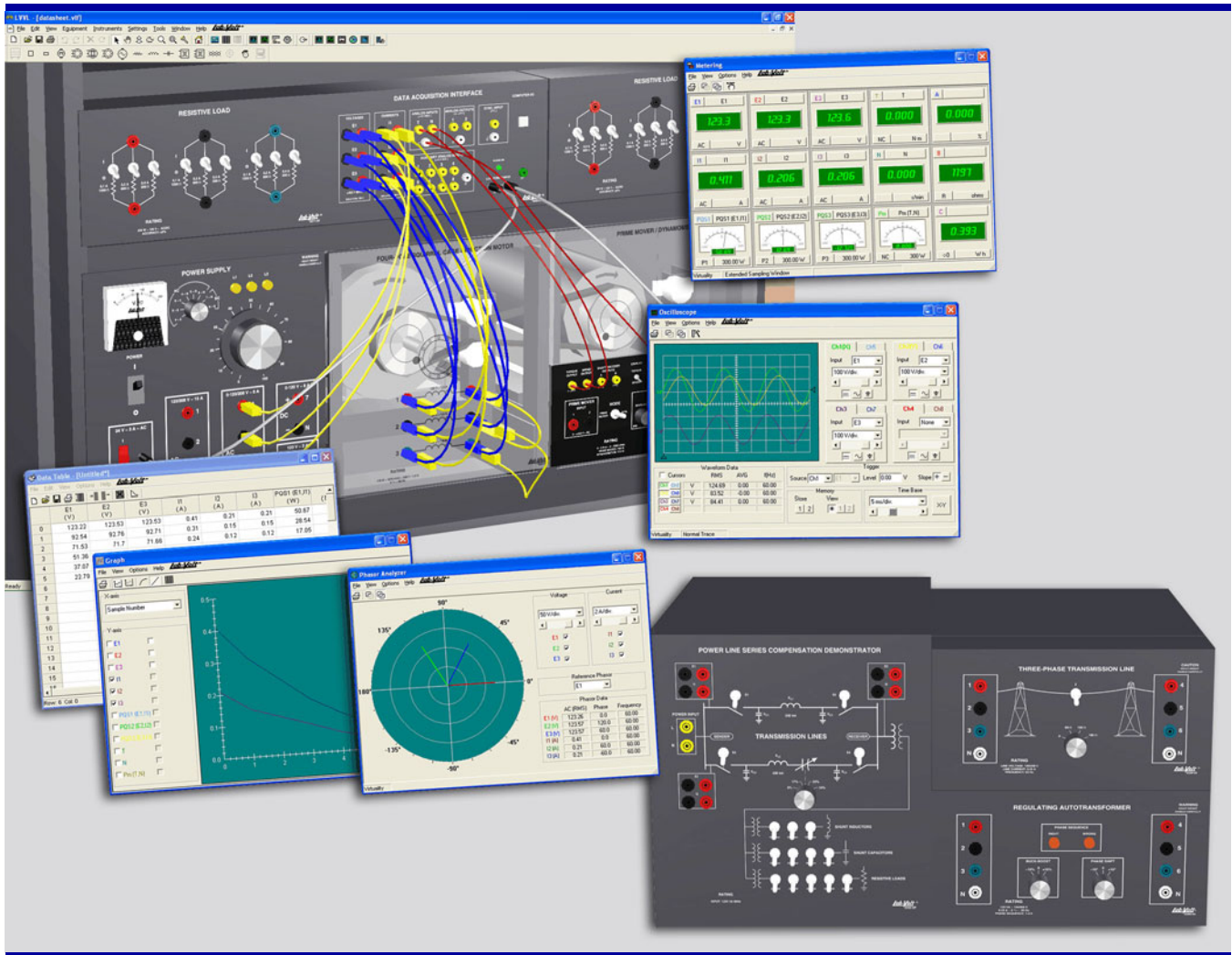
### SPECIFICATIONS

| <b>Model 8507 – Three-Phase Synchronous Motor/Generator</b> |                                | <b>120/208 V – 60 Hz</b>                            | <b>220/380 V – 50 Hz</b> | <b>240/415 V – 50 Hz</b> |
|---|--------------------------------|---|--------------------------|--------------------------|
| Motor (Full Load)   | Connection                     | 3 ~, wye connected                                  |                          |                          |
|   | Line Voltage                   | 120/208 V – 60 Hz                                   | 220/380 V – 50 Hz        | 240/415 V – 50 Hz        |
|   | Power                          | 2 kW  |                          |                          |
|   | Speed                          | 1800 r/min  | 1500 r/min               |                          |
|   | Current                        | 6.8 A   | 3.6 A                    | 3.3 A                    |
|   | Excitor Current                | 1 A – DC  | 0.55 A – DC              |                          |
|   | Torque                         | 10.6 N·m (93.8 lbf·in)                              | 12.7 N·m (112.4 lbf·in)  |                          |
|   | Efficiency                     | 80%   | 80%                      | 83%                      |
|   | Friction and Windage Losses    | 150 W   | 110 W                    |                          |
|   | Iron Losses                    | 125 W   | 80 W                     |                          |
| Motor (Starting)  | Current                        | 34 A  | 18 A                     | 16.5 A                   |
|   | Torque                         | 24.0 N·m (212.4 lbf·in)                             | 30.0 N·m (265.5 lbf·in)  |                          |
| Generator   | Connection                     | 3 ~, wye connected                                  |                          |                          |
|   | Power                          | 1.5 kVA   |                          |                          |
|   | Current                        | 4.2 A – AC  | 2.3 A – AC               | 2.1 A – AC               |
|   | Excitor Current                | 0.9 A – DC  | 0.53 A – DC              | 0.5 A – DC               |
|   | Efficiency                     | 79%   | 81%                      |                          |
| Resistance (per phase at 25°C)                              | Stator                         | 0.6 Ω   | 2.2 Ω                    | 2.3 Ω                    |
|   | Rotor                          | 81 Ω  | 236 Ω                    | 246 Ω                    |
| Synchronous Reactance                                       |                                | 18.5 Ω  | 77 Ω                     | 96 Ω                     |
| Excitor Inductance  |                                | 6 H   | 21.9 H                   | 26 H                     |
| Search Coils  | Stator - One Pole - Full Pitch | 5 turns   |                          |                          |
|   | Rotor - One Pole               | 5 turns   |                          |                          |
| Physical Characteristics                                    | Moment of Inertia              | 0.097 kg·m <sup>2</sup> (331.5 lb·in <sup>2</sup> ) |                          |                          |
|   | Dimensions (H x W x D)         | TBE   |                          |                          |
|   | Net Weight                     | TBE   |                          |                          |



Specialized Products

# ELECTROMECHANICAL SYSTEMS SIMULATION SOFTWARE (LVSIM<sup>®</sup>-EMS)<sup>1</sup>, MODEL 8970-SP



## GENERAL DESCRIPTION

The Lab-Volt Electromechanical Systems Simulation Software (LVSIM<sup>®</sup>-EMS) is a Windows<sup>®</sup>-based simulation software program that covers the same course work as the Computer-Assisted 0.2-kW Electromechanical Training System, Model 8006. With LVSIM<sup>®</sup>-EMS, all the standard EMS laboratory equipment is replaced by images of the actual EMS modules that students can manipulate on the computer screen. Using the mouse, students

can identify and set up equipment for a given exercise, make the necessary connections between the simulated (virtual) EMS modules, and verify the connections made—without ever touching actual EMS hardware.

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware (other than manufacturer user manuals).

## SPECIALIZED PRODUCTS

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The Model 8970-SP is a variation of the LVSIM<sup>®</sup>-EMS software. It includes 3 new modules for the analysis of transmission lines:

Model 8362-A0 – Power Line Series Compensation Demonstrator

Model 8370 – Three-Phase Transmission Line

Model 8371 – Regulating Autotransformer

The Model 8970-SP is available in 120 V only. The three new modules are not documented in the on-line help of the software.

For further information, please consult the datasheet for the Model 8970, LVSIM<sup>®</sup>-EMS.

## FOUR-POLE CAGE INDUCTION WITH RESISTANCE TEMPERATURE DETECTORS (RTD), MODEL 8503-SP WIRING MODULES, MODEL 8504-SP<sup>1</sup>

### GENERAL DESCRIPTION

#### Model 8503-SP – Four-Pole Squirrel-Cage Induction Motor with Resistance Temperature Detector



The Four-Pole Squirrel-Cage Induction Motor consists of a 3-phase machine rated at 2 kW. Each phase of the stator winding is accessible via the connection module to allow wye or delta connections. The machine is equipped with a standard cast-aluminum squirrel cage rotor.

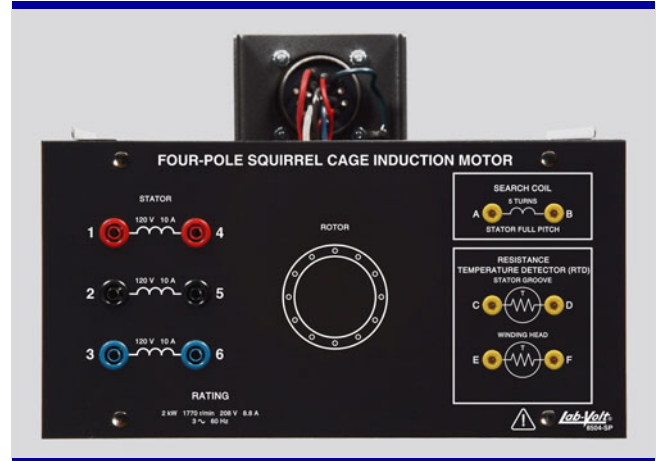
The winding dimensions permit the study of machine operation as a squirrel-cage induction motor or as an asynchronous generator when driven by a prime mover.

The machine has a 5-turn, full-pitch stator search coil to allow the observation of the instantaneous flux distribution.

The machine comes with two resistance temperature detectors (RTDs) to monitor the temperature in the motor.

The first one is located in the winding head. The second one is located in one of the stator grooves.

#### Model 8504-SP – Wiring Module for 8503-SP



The Wiring Module for Squirrel-Cage Induction Motor consists of a connection module. It provides connection access to the Four-Pole Squirrel-Cage Induction Motor from the Mobile Workstation through a flexible connecting cable. The module has six 4-mm color-coded safety jacks for the power windings and six 2-mm jacks for the stator search coils and the two RTDs. Jacks of different sizes prevent accidental connections between power windings and search coils.

<sup>1</sup> These products were created in response to customer requests for specific needs and do not include any courseware (other than manufacturer user manuals).

## SPECIALIZED PRODUCTS

### SPECIFICATIONS

| <b>Model 8503 – Four-Pole Squirrel-Cage Induction Motor</b>         |                             | <b>120/208 V – 60 Hz</b>                            | <b>220/380 V – 50 Hz</b> | <b>240/415 V – 50 Hz</b> |
|---|-----------------------------|---|--------------------------|--------------------------|
| Motor (Full Load)   | Connection                  | 3 ~, wye connected                                  |                          |                          |
|   | Line Voltage                | 120/208 V – 60 Hz                                   | 220/380 V – 50 Hz        | 240/415 V – 50 Hz        |
|   | Power                       | 2 kW  |                          |                          |
|   | Speed                       | 1770 r/min  | 1465 r/min               | 1455 r/min               |
|   | Current                     | 8.8 A   | 4.6 A                    | 4.2 A                    |
|   | Torque                      | 10.8 N·m (95.6 lbf-in)                              | 13.0 N·m (115.1 lbf-in)  | 13.1 N·m (115.9 lbf-in)  |
|   | Efficiency                  | 80%   | 80%                      | 77%                      |
|   | Power Factor                | 0.77  | 0.83                     | 0.85                     |
|   | Friction and Windage Losses | 130 W   | 100 W                    |                          |
|   | Iron Losses                 | 70 W  | 70 W                     |                          |
| Motor (Starting)  | Current                     | 55 A  | 25.6 A                   | 23.5 A                   |
|   | Torque                      | 12.3 N·m (108.9 lbf-in)                             | 17.7 N·m (156.7 lbf-in)  | 16.2 N·m (143.4 lbf-in)  |
| Stator Resistance (per phase at 25° C)                              |                             | 0.6 Ω   | 2.2 Ω                    | 2.3 Ω                    |
| Search Coil   | Stator - Full Pitch         | 5 turns   |                          |                          |
| Resistance Temperature Detectors (2)                                |                             | 100 Ω, 3850 ppm/°C                                  |                          |                          |
| Physical Characteristics  | Moment of Inertia           | 0.107 kg·m <sup>2</sup> (365.7 lb·in <sup>2</sup> ) |                          |                          |
|   | Dimensions (H x W x D)      | 830 x 400 x 605 mm (32.7 x 15.7 x 23.8 in)          |                          |                          |
|   | Net Weight                  | 88 kg (193.6 lb)                                    |                          |                          |
| <b>Model 8504 – Wiring Module for Squirrel-Cage Induction Motor</b> |                             |   |                          |                          |
| Physical Characteristics  | Dimensions (H x W x D)      | 212 x 287 x 496 mm (8.3 x 11.3 x 19.5 in)           |                          |                          |
|   | Net Weight                  | 4.1 kg (9.0 lb)                                     |                          |                          |

Reflecting Lab-Volt's commitment to high quality standards in product, design, development, production, installation, and service, our manufacturing and distribution facility has received the ISO 9001 certification.

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