

Electric Power / Controls 0.2 kW BASIC MOTORS/GENERATORS MODELS 8211, 8221, 8231, AND 8241



# **GENERAL DESCRIPTION**

The Lab-Volt ElectroMechanical System (EMS) is a unique approach to electric power technology in philosophy and in design. All machines are designed, engineered, and manufactured for education and are not adaptations of equipment designed for any other use.

The EMS machines are the result of Lab-Volt's engineering expertise and the careful research of educational requirements and industrial applications. The machines are scale models of their industrial counterparts and are designed to operate like large power equipment used in industry. This engineering detail, coupled with Lab-Volt's dedication to educational requirements, permits students to investigate industrial machinery characteristics not previously observable in a classroom.

All machines are mounted in standard size EMS modules. The modules are constructed of heavy gauge steel, finished in baked enamel, and 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 electrical components of the machine are terminated on the faceplate by 4 mm color-coded safety jacks and are identified by schematic symbols, numbered terminal codes, and the electrical rating.

All machines have cut away bell housings (front and rear) to permit visual inspection of the internal construction and observation of the machine during operation with the aid of a Stroboscope (Model 8922). Externally mounted components, such as centrifugal switches, capacitors, brushes, slip rings, and commutators in addition to the exposed salient poles, squirrel cage, and wound rotors, permit students to clearly determine component function as well as understand relative position, turns, and wire sizes of the machinery.

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The shaft of each machine has a concave and slotted end to facilitate the use of tachometers, holding brakes, plugging switches, and inertia wheels. A geared pulley is fitted on each machine shaft to mechanically couple machines together through the use of a non-slip Timing Belt (Model 8942). This flexible belt has molded teeth which mesh with the geared machine pulleys. Tension for the timing belt is provided by the idler tensioning ball bearings which are mounted on each machine module.

Each of the following machines is also available equipped with search coils through which the magnetic flux distribution at various locations in the machine can be observed on an oscilloscope. These coils are brought out to smaller size banana terminals on the faceplate. The coils are wound around a pole or a tooth in the stator or in the rotor.

Most of the Lab-Volt machines are also available in dissectible versions which can be disassembled and assembled without the use of tools. Students can then easily examine the internal parts and the construction of these machines.

#### Model 8211 – DC Motor/Generator



This machine can be run independently as a DC motor or a DC generator. The armature, shunt field, and series field windings are terminated separately on the faceplate to permit long and short shunt as well as cumulatively and differentially compounded motor and generator connections. This machine is fitted with exposed movable brushes to allow students to study the effect of armature reaction and commutation while the machine is operating under load. An independent, circuit- breaker protected, shunt-field rheostat is mounted on the faceplate for motor speed control or generator output voltage adjustment.

# Model 8221 – Four-Pole Squirrel-Cage Induction Motor



Each phase of the stator windings of this motor is independently terminated and identified on the faceplate to permit the student to wire the machine in either delta or star (wye) configuration. When driven by a prime mover, this machine will also function as a three-phase asynchronous generator.

# THREE-PHASE WOUND-ROTOR INDUCTION MOTOR

# Model 8231 – Three-Phase Wound-Rotor Induction Motor

Each phase of the stator windings of this motor is independently terminated and identified on the faceplate to permit operation in either delta or star (wye) configuration. The rotor windings are brought out to the faceplate via external slip rings and brushes. This machine can be used as a wound-rotor induction motor, phase shifter, single-phase variable coupling transformer, three-phase transformer, selsyn control, frequency converter or asynchronous induction generator. The speed of this machine can be controlled through the use of the Three-Phase Rheostat (Model 8731).

#### Model 8241 – Three-Phase Synchronous Motor/Generator



Each phase of the stator windings of this machine is independently terminated and identified on the faceplate to permit operation in either delta or star (wye) configuration. The rotor of this machine is equipped with a squirrel-cage damper. Variable DC excitation is fed through the externally mounted slip rings and brushes which are pre-wired to a rheostat and control switch mounted on the faceplate. This machine can also be operated as a three-phase synchronous condenser or generator.

# **SPECIFICATIONS**

Model 8211 – DC Motor/Ger	nerator	120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz		
Power Requirement		120/208 V	220/380 V	240/415 V		
Rating	Motor Output Power	175 W				
	Generator Output Power	120 W	110 W	120 W		
	Armature Voltage	120 V – DC	220 V – DC	240 V – DC		
	Shunt Field Voltage	120 V – DC	220 V – DC	240 V – DC		
	Full Load Speed	1800 r/min	1500 r/min	1500 r/min		
	Full Load Motor Current	2.8 A	1.3 A	1.1 A		
	Full Load Generator Current	1 A	0.5 A	0.5 A		
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	14.1 kg (31 lb)				
Model 8221 – Four-Pole Squ	uirrel-Cage Induction Motor	120/208 V – 60 Hz	220/380 V – 50/60 Hz	240/415 V – 50 Hz		
Power Requirement		120/208 V	220/380 V	240/415 V		
Rating	Output Power	175 W				
	Stator Voltage	120/208 V, 3-phase	220/380 V, 3-phase	240/415 V, 3-phase		
	Full Load Speed	1670 r/min	50 Hz: 1395 r/min 60 Hz: 1650 r/min	1395 r/min		
	Full Load Current	1.2 A	0.48 A (50/60 Hz)	0.46 A		
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	13.5 kg (29.7 lb)				
Model 8231 – Three-Phase Motor	Wound-Rotor Induction	120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz		
Power Requirement		120/208 V	220/380 V	240/415 V		
Rating	Output Power	175 W				
	Stator Voltage	120/208 V, 3-phase	220/380 V, 3-phase	240/415 V, 3-phase		
	Rotor Voltage	60/104 V, 3-phase	110/190 V, 3-phase	120/208 V, 3-phase		
	Full Load Speed	1500 r/min	1240 r/min	1315 r/min		
	Full Load Current	1.3 A	0.53 A	0.48 A		
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	. 14 kg (30.8 lb)				

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# **SPECIFICATIONS** (cont'd)

Model 8241 – Three-Phase Synchronous Motor/Generator		120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz	220/380 V – 60 Hz	
Power Requirement		120/208 V	220/380 V	240/415 V	220/380 V	
Rating	Motor Output Power	175 W				
	Generator Output Power	120 VA	110 VA	120 VA	211 VA	
	Stator Voltage	120/208 V, 3-phase	220/380 V, 3-phase	240/415 V, 3-phase	220/380 V, 3-phase	
	Rotor Inductor Voltage	120 V – DC	220 V – DC	240 V – DC	220 V – DC	
	Speed	1800 r/min	1500 r/min	1500 r/min	1800 r/min	
	Full Load Motor Current	0.8 A	0.36 A	0.35 A	0.32 A	
Full Load Generator Current		0.33 A	0.17 A	0.17 A	0.32 A	
Physical Characteristi	cs Dimensions (H x W x D)	D) 308 x 291 x 440 mm (12.1 x 11.5 x 17.3 in)				
	Net Weight	14 kg (30.8 lb)				

### **ORDERING NUMBERS**

120/208 V – 60 Hz		220/380 V – 50 Hz			240/415 V – 50 Hz	220/380 V – 60 Hz	
ENGLISH	FRENCH	SPANISH	ENGLISH	FRENCH	SPANISH	ENGLISH	ENGLISH
8211-00	8211-01	8211-02	8211-05	8211-06	8211-07	8211-0A	8211-05
8211-10 <sup>1</sup>	TBE <sup>2</sup>	TBE	TBE	TBE	TBE	TBE	TBE
8211-D0 <sup>3</sup>	8211-D1	8211-D2	8211-D5	8211-D6	8211-D7	8211-DA	8211-D5
8221-00	8221-01	8221-02	8221-05	8221-06	8221-07	8221-0A	8221-05
8221-10	TBE	TBE	TBE	TBE	TBE	TBE	TBE
8221-D0	8221-D1	8221-D2	8221-D5	8221-D6	8221-D7	8221-DA	TBE
8231-00	8231-01	8231-02	8231-05	8231-06	8231-07	8231-0A	TBE
8231-10	TBE	TBE	TBE	TBE	TBE	TBE	TBE
8231-D0	8231-D1	8231-D2	8231-D5	8231-D6	8231-D7	8231-DA	TBE
8241-00	8241-01	8241-02	8241-05	8241-06	8241-07	8241-0A	8241-0E
8241-10	TBE	TBE	TBE	TBE	TBE	TBE	TBE
8241-D0	8241-D1	8241-D2	8241-D5	8241-D6	8241-D7	8241-DA	TBE

Table 1. Equipment Ordering Numbers

<sup>1</sup> Model numbers with suffix "1" correspond to versions of machines with search coils.

<sup>2</sup> TBE = To be established

<sup>3</sup> Model numbers with suffix "D" correspond to dissectible versions of machines.

Reflétant l'engagement de Lab-Volt à atteindre les normes de qualité les plus élevées en ce qui concerne les produits ainsi que la conception, le développement, la production, l'installation et le service, notre unité de fabrication et de distribution a obtenu la certification ISO 9001.

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