

Motor Maintenance and Testing

4 Days, 2.8 CEUs

Electric motors provide the means to convert electrical energy into a meaningful and measurable output. Because they are so common and critical in industrial facilities, the ability to quickly recognize, diagnose, and remedy an evolving motor problem will help prevent catastrophic failures. When troubleshooting motors, technicians should perform electrical tests on insulation before mechanical inspections because of the lower time investment. This course provides information to enable class participants to establish effective motor maintenance programs. This will increase productivity, reduce unnecessary downtime, maximize electrical motor efficiency, and save money.

This hands-on course is intended for new or experienced electricians and technicians that install, maintain, repair, or troubleshoot rotating machines. The participant should have basic knowledge of AC/DC electricity.

Lab and Classroom Attire

AVO Training Institute is committed to the personal safety of each participant and require long pants and ANSI rated "safety-toe" work shoes for lab activities. Lecture courses may involve a tour of a work or shop area and for this reason open-toe shoes and shorts are not considered appropriate attire for the classroom.

Learning Objectives

To receive 2.8 CEUs, participants must attend 4 days of class (28 contact hours) and attain a minimum average grade of 80% (overall grade will consist of 50% lab practice and 50% final exam). Upon completion of this course and lab practice, the participant will demonstrate that he/she is able to:

- Outline the fundamentals of AC and DC motor construction.
- Interpret nameplate data and NEMA design codes.
- Explain installation, starting/stopping methods and maintenance of single-phase and three-phase synchronous, squirrel-cage (induction), and wound-rotor motors.
- Identify appropriate configurations of motor protection and control circuits.
- Perform and evaluate results from motor rotation, insulation, and surge tests.

SCOPE

Day 1* (7 contact hours)

- I. Basic Theory and Fundamentals (4 hrs)
 - A. Magnetism and Induction
 1. Fundamental Properties
 2. Force between Magnetic Poles
 3. Magnetic Fields and Flux
- AM Break
- B. Electro-Magnetism
 1. Current Flow and Magnetism
 2. Induction and Inductance
- C. Electromagnetic Induction
- Lunch

- II. AC Motor Theory and Construction (3 hrs)
 - A. The Rotating Magnetic Field
 - B. Types of AC Motors
 1. Three-Phase Motors
 2. Induction Motors
- PM Break
3. Wound-Rotor Motors
4. Synchronous Motors
5. Single-Phase Motors

Day 2 (7 contact hours)

- C. Motor Nameplate Data
 1. Electrical Rating

2. Power Rating
3. NEMA Design Codes
- AM Break
4. Motor Nameplate Information
- D. Motor Protection
 1. Overcurrent Protection
 2. Overload Protection
- Lunch
- III. AC Alternator Theory and Construction (3 hrs)
 - A. Principles of Operation
- PM Break
- B. Construction of Small Alternators
- C. Alternator Controls

*Class scheduling times may vary based on discussions and size of class

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SCOPE (cont'd)

Day 3 (7 contact hours)

IV. DC Motor Theory and Construction (2 hrs)

- A. Operating Theory
- B. Construction
- C. Self-Excited DC Motors

AM Break

V. DC Generator Theory and Construction (2 hrs)

- A. Operating Theory
- B. Construction
- C. Separately Excited and Permanent Magnetic DC Generators
- D. Self-Excited DC Generators

Lunch

VI. AC and DC Motor Control (3 hrs)

- A. Starting Methods
- B. Braking Methods
- C. Multi-Speed Motors

PM Break

- D. Adjustable-Speed Motors
- E. Mechanical Drive Systems
- F. Motor Rotation

Day 4

VII. AC Motor Maintenance and Troubleshooting (6 hrs)

- A. NFPA 70B Requirements for Motor Testing
- B. Labs
 - 1. Motor Rotation Test
 - 2. Insulation Test
 - 3. Surge Test

AM Break

- C. Visual Inspection
- D. Mechanical Maintenance
 - 1. Bearings
 - 2. Alignment
- E. Motor Failure Causes

Lunch

- F. Control Circuit Troubleshooting
- G. Motor Winding Identification
 - 1. Wye Identification and Connection

PM Break

- 2. Delta Identification and Connection

VIII. Conclusion (1 hr)

- A. Review
- B. Final Exam