

Fundamentals Of Electrical Systems Training

Description

Course Description

This 5 days course covers the electrical principles and components used in Electrical systems and industrial instrumentation, emphasizing safety. You'll cover schematic symbols and the use of basic test equipment.

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Course Objectives

At the end of this course the participant will be able to:

- Evaluate the direct current (DC) relationships between voltage, current, and resistance
- Determine alternating current (AC) characteristics including amplitude, frequency, and phase
- Identify the properties of an inductor and of a capacitor
- Using basic test equipment to evaluate and to determine basic electrical characteristics
- Apply safety considerations when measuring electrical values or working around electrical equipment
- Compare bridge operation in balanced and unbalanced condition
- Identify schematic symbols used for electrical devices
- Understand poly-phase voltages and currents found in the industrial environment
- Understand how to install, testing, commissioning and maintain of electrical equipment.

Course Outline Electrical Properties

- Basic Electricity
- The Atom
- Electrons of Different Materials
- Electrical Terms
- Electrical Potential Moves Electrons
- Why Electrons Move
- Voltage Defined
- Current Defined

- Resistance Defined
- Electrical Circuit

Sources of Electricity

- Magnetism
- Magnetic Field
- Introduction to Generating a Voltage
- Generating DC Electricity
- Controlling Voltage Generated
- Generating DC vs. AC power
- The Sine Wave
- Frequency
- Peak – Peak to Peak — RMS Voltages
- Multi Phase Power Generation
- Three Phase Power Voltage Advantage
- Why it is Hard to Push Electrons?
- Power Distribution

Law's of Electricity

- Ohm's Law
- Variations of Ohm's Law
- Ohm's Law
- Simple Ohm's Law Operations
- Sample Problems
- Kirchoff's Law for Voltage
- Kirchoff's Law for Current
- Watt's Law
- Computing Watts
- Electro Magnetic Fields
- Electrical Work Terms
- Large and Small Numbers

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Electrical Measurements

- Safety, Safety, Safety!
- Caution Note
- Measuring Voltage Precautions
- Current Measuring Precautions
- Resistance Measuring Precautions
- A Complete Path
- Measurement – Voltage
- Measurement – Current
- Measurement – Resistance

Series & Parallel Resistances

- Series or Parallel???
- Series Resistances
- Series Circuit
- Parallel Resistances
- Computing Parallel Resistance
- Combination Circuit (DC Bridge)
- Typical Bridge Circuit Depiction

Electrical Schematic Symbols

- Resistors Pictorial
- Resistor Schematic Symbols
- Signal Schematic Depiction
- Switches
- Push Button Switch
- Symbology of Connection
- Overload Symbology
- Limit & Other Switches
- An Electrical Circuit

Capacitance

- Electrostatic Field
- Factors Affecting Capacitance
- Dielectric Materials
- Capacitors in Parallel
- Capacitors in Series
- RC Time Constant
- Discharge Path
- Optional RC Assignment
- Capacitors & AC
- Capacitors & Switched DC
- Capacitive Reactance

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Inductance

- Magnetic Field
- Ferrous Core
- Solenoids
- LR Time Constant
- Inductive Kick
- Inductors & Switched DC
- Inductive Reactance

Impedance and Resonance

- Impedance Defined

- Impedance Determined by Vector
- Resonance – Defined
- Series Resonant Circuit
- Parallel Resonant Circuit
- Resonance Formula

Transformers

- Increasing Voltage for Distribution
- Step-Down vs. Step-Up
- Turns Ratio
- Power Distribution Power In/Power out
- Transformer Load Currents
- Transformer Efficiency
- Transformer Applications
- User End of Distribution
- Electrical Distribution with
- Transformers Transformer Isolation

Electromechanical Devices

- The Relay
- A Solenoid
- AC and DC Solenoids
- Contactors
- Uses of Contactors (Sealing Circuits)

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Industrial Power

- Definition of “Ground….”
- Solidly Grounded System
- Grounding Elements
- Single Rod
- Grid
- Radials
- Ground Maintenance
- Three-Phase Power
- WYE Transformers (Star)
- Delta Transformers
- Common Industrial Voltages
- Voltage Applications
- Typical Industrial Distribution System

Overcurrent Protection

- Overcurrent Contributors
- GF Protection Devices
- Fuses

- Plug Type Fuses
- Cartridge Fuses
- Cartridge Fuse Lengths
- Fuses – Rejection Feature
- Circuit Breakers

Industrial Wiring

- Equipment Grounding
- Power Wiring
- Signal Wiring
- Conductor Identification
- Wiring Insulation Color Codes
- Conductor Selection
- Documentation

Industrial Electrical Safety

- Hazardous Locations

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