



Testing & Commissioning



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Introduction:

The "Start-up, Commissioning, and Testing of Electrical Systems" training seminar is meticulously designed to impart a comprehensive understanding of the principles underlying electrical installation and commissioning. Ensuring equipment readiness for commercial service involves rigorous testing of all its functions under varied conditions. The axiom 'Do not believe until it is proven' underscores the importance of thorough testing for the reliable operation of electrical systems. Equipment validation culminates in its energization and load testing during the start-up phase initial energization.

Commissioning serves as a crucial stage where overlooked errors from earlier project phases are identified. Engineers, during testing, must handle both high and low voltages and currents. To mitigate risks of injuries and damages, it is imperative that they receive training to thoroughly comprehend the processes and meticulously plan every step of the commissioning procedure.

Targeted Groups:

- Testing Engineers / Technicians.
- Maintenance Engineers / Technicians.
- Managers of Engineering departments.
- Consulting Engineers / Technicians.
- Project Engineers.
- Safety Professionals.

Course Objectives:

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

- Understand the testing process.
- Plan and prepare for testing.
- Plan and carry out inspections.
- Perform primary and secondary injections.
- Plan the first energization.
- Perform phasing tests.
- Consider safety aspects during testing.
- Train staff to be able to carry out testing and commissioning.
- Make the participants aware of equipment testing during the project. construction or maintenance.
- The course will allow delegates to interact and gain knowledge from shared experiences.
- The staff will understand the concept of equipment testing and appreciate its importance in the operation and maintenance of an electrical power system.
- Awareness of safety during testing and commissioning.

Targeted Competencies:

- Importance of Start-Up, Commissioning and Testing of Electrical Systems
- Commissioning Test Equipment CPC 100, Omicron 356, CIBANO, ARCO, TESTRANO and Circuit Breakers including Instrument Transformers

- IR test, Primary Injection Test, Secondary Injection Test
- Commissioning Test Equipment for Transformers Integrity
- Transformer Noise
- Commissioning Test for Earthing and Lightning Systems
- Neutral Earthing Resistors
- Restricted Earth Fault
- First Energization and Commissioning Documentation

Course Content:

Unit 1: Importance of Start-Up, Commissioning and Testing of Electrical Systems:

- Definition of Start-up, Commissioning and Testing
- Pre-commissioning Procedures
- Reasons for Start-up, Commissioning and Testing
- Substation Commissioning - Gas Insulated Substation
- Managing Commissioning with IEC 61850 and GOOSE
- Earthing System including Clean Earth, Intrinsic Safe Earth and Planet Earth
- Major Components of GIS Substations
- GIS with Vacuum Interrupter

Unit 2: Commissioning Test Equipment CPC 100, Omicron 356, CIBANO, ARCO, TESTRANO and Circuit Breakers including Instrument Transformers:

- Types of Tests and Equipment for Commissioning
- IR test, Primary Injection Test, Secondary Injection Test
- HV Test, AC Hipot Test, DC Hipot Test and Connections
- Infrared and Partial Discharge Monitoring
- Circuit Breaker Functional Tests
- Tests for SF6 Circuit Breaker
- SF6 Management
- Construction and Test for Current Transformer and Voltage Transformers

Unit 3: Commissioning Test Equipment for Transformers Integrity:

- Transformer Noise
- Commissioning Test and Test Equipment for Power Transformers
- Functional Tests for Power Transformer
- Vector Group of Transformer
- Transformer Oil Characteristics and Tests
- Sweep Frequency Response Analysis SFRA Test Significance
- Tan Delta Test and Polarization Index
- Transformer Protection with Multi-functional Numerical Relays

Unit 4: Commissioning Test for Earthing and Lightning Systems:

- Importance of Earthing
- Network Earthing



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- Neutral Earthing Resistors
- Restricted Earth Fault
- Sensitive Earth Fault
- Lightning Protection Systems
- Commissioning Testing for Protection
- Numerical Relays Functionalities

Unit 5: First Energization and Commissioning Documentation:

- Battery Charger Commissioning Tests
- Commissioning Switching Plans
- Managing the First Energisation
- Switching Plans
- Soak Tests and Phasing Tests
- Commissioning Certificates