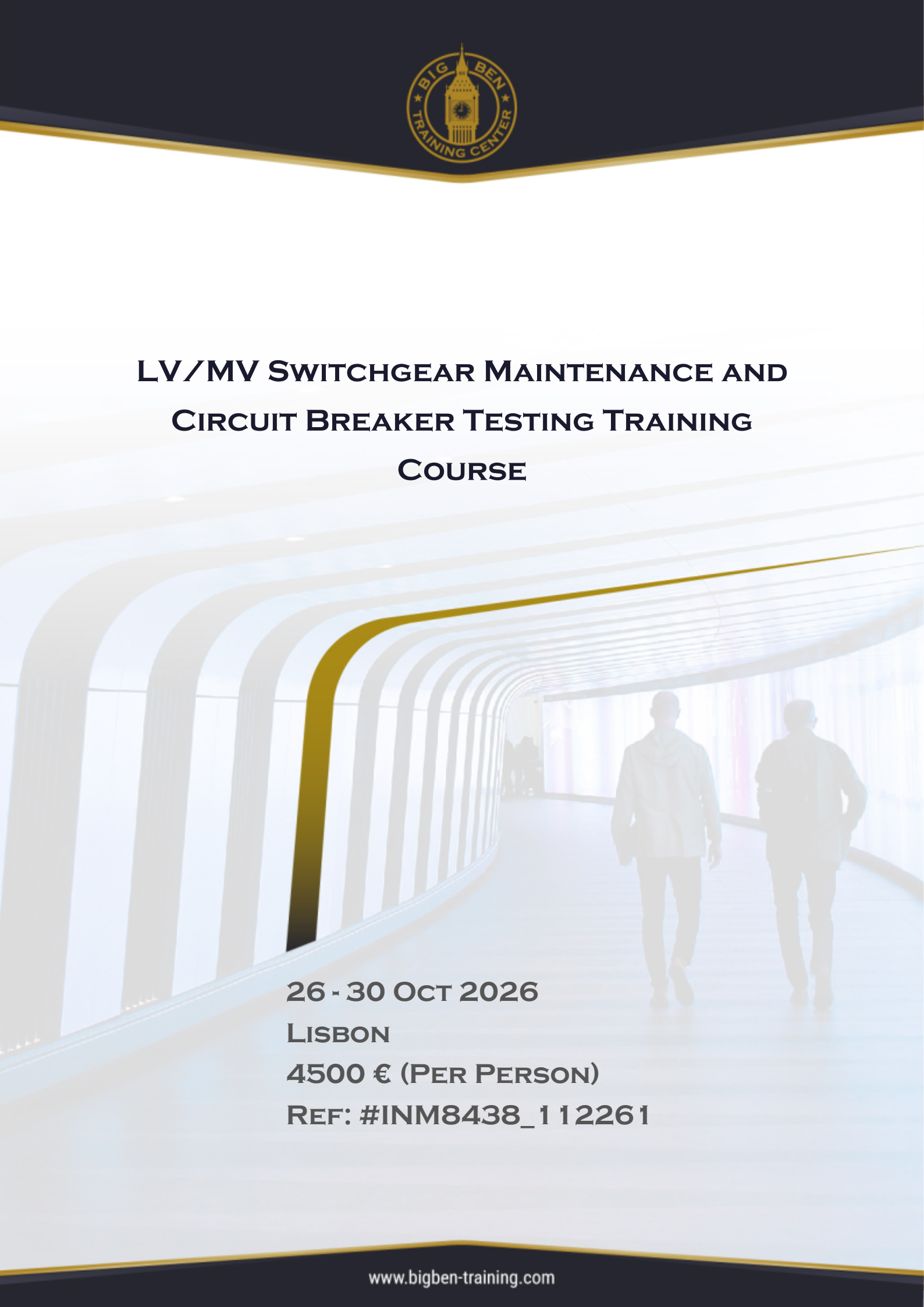
LV/MV Switchgear Maintenance and Circuit Breaker Testing Training Course



26 - 30 Oct 2026

Lisbon

4500 € (Per Person)

Ref: #INM8438_112261

Course Introduction / Overview:

This course provides a comprehensive and in-depth exploration of Low Voltage (LV) and Medium Voltage (MV) switchgear and circuit breaker maintenance and testing. In modern electrical power systems, the reliability of protective devices is paramount to ensuring operational continuity and safety. This training program is meticulously designed to equip participants with the essential theoretical knowledge and practical skills required to maintain, test, and troubleshoot these critical assets effectively. Drawing upon foundational principles outlined in works like "Switchgear and Protection" by the esteemed author Sunil S. Rao, the curriculum delves into the construction, operation, and failure modes of various types of switchgear and circuit breakers. Participants will move beyond basic procedures to develop a deep understanding of diagnostic testing, data interpretation, and preventive maintenance strategies. BIG BEN Training Center has developed this course to bridge the gap between theoretical understanding and hands-on application, ensuring that attendees can confidently manage the lifecycle of their electrical switchgear, minimize downtime, and enhance the overall safety and resilience of their power distribution networks. This is a definitive A-to-Z guide for any professional responsible for electrical system integrity.

Target Audience / This training course is suitable for:

- Electrical Engineers.
- Maintenance Technicians and Supervisors.
- Substation Engineers and Operators.
- Electrical Contractors.
- Power System Protection Engineers.
- Project Engineers involved in electrical installations.
- Asset Management Professionals.
- Health and Safety Officers overseeing electrical work.
- Facilities Managers.

Target Sectors and Industries:

- Electrical Power Generation, Transmission, and Distribution Utilities.
- Oil and Gas Sector (Upstream, Midstream, and Downstream).
- Heavy Manufacturing and Industrial Plants.
- Petrochemical and Chemical Processing Industries.
- Data Centers and Critical Infrastructure Facilities.
- Commercial and High-Rise Buildings.
- Transportation Sector including Rail and Airports.
- Government, Military, and Public Sector Facilities.
- Renewable Energy Sector (Solar and Wind Farms).

Target Organizations Departments:

- Maintenance and Operations.
- Engineering and Technical Services.
- Health, Safety, and Environment (HSE).
- Facilities Management.
- Project Management and Execution.
- Asset Integrity and Reliability.
- Quality Assurance and Control.

Course Offerings:

By the end of this course, the participants will have able to:

- Identify different types of LV/MV switchgear and circuit breakers and their components.
- Understand the operational principles and interruption techniques of various circuit breakers.
- Develop and implement comprehensive preventive maintenance programs for switchgear.
- Perform standard electrical tests such as insulation resistance and contact resistance measurements.
- Execute and interpret circuit breaker timing tests to assess mechanical performance.
- Apply safe work practices in compliance with international standards like NFPA 70E.
- Troubleshoot common switchgear and circuit breaker faults effectively.
- Analyze test results to make informed decisions about equipment repair or replacement.
- Document maintenance activities and test results in a clear and professional manner.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and engaging learning environment that maximizes knowledge retention and practical skill development. This course moves beyond traditional lecture-based formats by integrating a balanced mix of theoretical instruction, interactive discussions, and practical application. Our expert instructors facilitate sessions using real-world case studies and examples from various industries, allowing participants to connect complex concepts to their own operational challenges. The program heavily emphasizes participant engagement through group problem-solving activities, Q&A sessions, and collaborative workshops. High-quality video demonstrations of key testing procedures, such as circuit breaker timing and contact resistance tests, will be utilized to illustrate complex techniques safely and effectively. Participants will be encouraged to share their experiences and challenges, creating a rich learning environment built on shared knowledge. The focus is on building diagnostic acumen and practical competence, ensuring that attendees leave with skills they can immediately apply in their workplace to improve safety and reliability.

Course Agenda (Course Units):

Unit One: Fundamentals of LV/MV Switchgear and Electrical Safety

- Introduction to switchgear and its role in power systems.
- Classification of switchgear (LV, MV, HV).
- Key components of switchgear assemblies.
- Understanding electrical ratings and specifications.
- Introduction to relevant IEC and ANSI/IEEE standards.
- Principles of electrical safety and hazard identification.
- Arc flash hazards and mitigation strategies based on NFPA 70E.
- Lockout-Tagout (LOTO) procedures for electrical systems.

Unit Two: Circuit Breaker Technologies and Operating Mechanisms

- Principles of arc extinction and current interruption.
- Detailed study of Air Circuit Breakers (ACBs).
- Construction and operation of Vacuum Circuit Breakers (VCBs).
- Principles of SF6 gas-insulated circuit breakers.
- Legacy Oil Circuit Breakers (OCBs) and their maintenance challenges.
- Analysis of different operating mechanisms (spring, pneumatic, hydraulic).
- Control circuits, trip coils, and closing coils.
- Interlocking schemes and their importance in safe operation.

Unit Three: Switchgear Inspection and Preventive Maintenance

- Developing a systematic switchgear maintenance plan.
- Visual and mechanical inspection procedures.
- Techniques for cleaning and lubricating switchgear components.
- Busbar inspection and torqueing requirements.
- Maintenance of auxiliary devices and control wiring.
- Infrared thermography for detecting potential failures.
- Partial discharge testing principles and applications.
- Strategies for extending the life of aging switchgear assets.

Unit Four: Diagnostic Testing of Circuit Breakers

- The purpose and theory behind electrical testing.
- Insulation resistance and polarization index testing.
- Static and dynamic contact resistance measurement (Ductor test).
- Circuit breaker timing tests (open, close, close-open).
- Travel and velocity analysis of circuit breaker contacts.
- Power factor/dissipation factor testing for insulation assessment.
- High potential (Hipot) testing procedures and safety.
- Interpreting test results against industry standards and manufacturer limits.

Unit Five: Advanced Troubleshooting, Data Interpretation, and Reporting

- A systematic approach to troubleshooting switchgear and breaker failures.
- Analyzing common failure modes and their root causes.
- Interpreting trends in test data for predictive maintenance.
- Case studies on complex electrical fault investigations.
- Best practices for documenting maintenance and testing activities.
- Creating comprehensive and actionable test reports.
- Introduction to condition-based and reliability-centered maintenance.
- Future trends in switchgear technology and digital monitoring.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the shift towards smart grids and digital substations, how might traditional switchgear maintenance and testing methodologies evolve to incorporate real-time data analytics and predictive diagnostics?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by offering a holistic and deeply practical perspective on switchgear and circuit breaker management, moving far beyond simple operational training. While other programs may focus solely on the procedural aspects of testing, this curriculum places a strong emphasis on the diagnostic acumen required to interpret test data accurately. Participants learn not just how to perform a test, but why it is performed and what the results signify about the health of the equipment. We explore the intricate relationship between different test results to build a complete picture of asset condition, enabling a proactive rather than reactive maintenance approach. The course integrates a robust understanding of international safety standards, particularly arc flash hazard analysis, ensuring that all maintenance and testing strategies are grounded in safe work practices. Furthermore, the content is structured to address the entire lifecycle of the equipment, from commissioning to end-of-life, providing insights into asset management strategies that optimize performance and reliability. The focus on real-world case studies and advanced troubleshooting techniques equips participants with the problem-solving skills needed to handle complex failures in the field, ensuring a higher level of operational resilience.