

# Generator Excitation and AVR Diagnostics Training Course

22 – 26 August 2027
Johannesburg

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## Overview

Generator Excitation and AVR Diagnostics Training Course is a one-week advanced course for electrical maintenance, commissioning, and power-plant teams who leave with an Excitation Commissioning and Fault-Isolation Dossier. The course connects generator excitation systems, automatic voltage regulator diagnostics, AVR commissioning tests, voltage stability analysis, excitation limiter verification, alarm evidence, and safe return-to-service decisions. Agile Leaders Training Center delivers this course on generator excitation and AVR diagnostics.

## Who Should Attend

- Teams responsible for generator excitation operation, voltage control, and reactive-power performance
- Functions responsible for automatic voltage regulator maintenance, configuration records, and fault response
- Teams responsible for generator commissioning, functional testing, and acceptance evidence
- Functions responsible for electrical protection, control-system interfaces, and operating-limit verification
- Teams responsible for outage diagnostics, event analysis, maintenance planning, and return-to-service approval

The course assumes participants already work with synchronous generators, electrical measurements, control diagrams, or maintenance records and leaves out general generator construction, prime-mover maintenance, and live switching authorization.

## Departments and Industries

The course supports excitation and AVR decisions across power generation and asset-intensive operations.

- Electrical maintenance, reliability, commissioning, and technical services
- Power generation, utilities, industrial energy, and captive-power operations
- Oil and gas, petrochemical, mining, metals, and process manufacturing
- Marine, infrastructure, transport, and large-facility power systems
- Engineering projects, outage management, protection, and control functions

## Learning Objectives

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

- Compare excitation topologies, control modes, and feedback paths.
- Apply safe AVR commissioning and measurement-verification sequences.
- Analyze limiters, reactive-power control, and voltage-stability symptoms.
- Diagnose voltage buildup, sensing, oscillation, alarm, and component faults.
- Prioritize corrective actions and return-to-service evidence.
- Build an excitation commissioning and fault-isolation dossier.

## Course Agenda

### Day 1: Map Excitation Control

- Synchronous Generator Excitation Energy, Field, Terminal-Voltage, and Reactive-Power Map
- Static, Brushless, and Rotating Exciter Topology Comparison Matrix
- AUTO Voltage-Regulator, MAN Field-Current, VAR, and Power-Factor Control Model
- Voltage Sensing, Current Compensation, Feedback, Setpoint, and Reference Signal Diagram
- Excitation Transformer, Rectifier Bridge, Field Circuit, Crowbar, and De-Excitation Path

### Day 2: Assess Limits and Stability

- Over-Excitation, Under-Excitation, Stator-Current, and Volt-per-Hertz Limiter Map
- Generator Capability Curve and Excitation Operating-Point Assessment Method
- Droop, Reactive-Load Sharing, Power-Factor, and Supervisory Control Interaction Matrix
- PID Gain, Response Time, Overshoot, Damping, and Oscillation Evidence Sheet
- Power System Stabilizer Signal, Function, Boundary, and Symptom Review

### Day 3: Plan Commissioning Tests

- Excitation Safety Boundary, Isolation, Stored-Energy, Discharge, and Permit Checklist
- Standstill Wiring, Resistance, Polarity, Input-Output, and Configuration Verification Record
- No-Load Manual Buildup, Measurement Comparison, and Setpoint Progression Procedure
- AUTO-MAN Step-Response, Transfer, Follow-Up, and Limiter Functional Test Plan
- Grid-Connected Reactive Response, Droop Direction, and Protection Interface Check

### Day 4: Diagnose AVR Faults

- No Voltage Buildup, Residual Flux, Field Flashing, Supply, and Field-Circuit Fault Tree
- High, Low, Unstable, and Hunting Voltage Symptom-to-Cause Matrix
- Frequency, Speed, Sensing, Phase, Loading, and Compensation Diagnostic Sequence
- Alarm Log, Event Sequence, Trend, Transient Recorder, and Oscillography Evidence Review
- Regulator, Exciter, Generator, Protection, Wiring, and Configuration Fault-Boundary Test

## Day 5: Practice Diagnostic Decisions

- Exercise: Map Excitation Topology, Signals, Modes, and Operating Boundaries
- Exercise: Evaluate Limiter Operation, Capability-Curve Position, and Stability Evidence
- Exercise: Build the Commissioning Test Sequence and Acceptance-Evidence Record
- Exercise: Isolate Voltage Buildup, Oscillation, Sensing, and Alarm Scenarios
- Capstone Exercise: Build the Excitation Commissioning and Fault-Isolation Dossier

## Practical Exercises

The course uses suggested activities to connect excitation evidence with controlled maintenance decisions.

- Suggested activity: trace excitation power and signal paths from drawings and sample operating records.
- Suggested activity: interpret step-response plots, capability-curve positions, limiter actions, trends, and alarms.
- Suggested activity: apply fault trees to no-build, unstable-voltage, sensing, and control-transfer scenarios.
- Suggested activity: assemble test results, corrective actions, acceptance criteria, and return-to-service evidence.

## FAQs

### Who should attend generator excitation and AVR diagnostics training?

Generator excitation and AVR diagnostics training suits experienced electrical maintenance, commissioning, protection, and power-plant teams and assumes familiarity with synchronous generators, control diagrams, measurements, and safe electrical work boundaries.

### How does AVR diagnostics differ from general generator maintenance training?

AVR diagnostics focuses on excitation power paths, sensing, control modes, limiters, stability, commissioning tests, trends, alarms, and fault isolation, while general generator maintenance covers wider mechanical, winding, cooling, bearing, and prime-mover concerns.

### How are automatic voltage regulator faults isolated?

Automatic voltage regulator faults are isolated by confirming the symptom, establishing safe boundaries, checking speed and frequency, tracing supply and sensing paths, comparing measured signals, reviewing logs and trends, and testing the regulator, exciter, field, wiring, and protection interfaces.

## What evidence supports AVR return-to-service decisions?

AVR return-to-service decisions use verified configuration, completed safety checks, calibrated measurement comparisons, functional control-mode and limiter tests, acceptable response evidence, resolved alarms, documented corrective actions, and authorized acceptance criteria.

## Conclusion

Participants take back an Excitation Commissioning and Fault-Isolation Dossier. The dossier connects topology, signals, operating limits, commissioning tests, response plots, alarms, fault trees, corrective actions, and acceptance evidence. It changes scattered excitation observations into a traceable basis for diagnosis, maintenance, and return-to-service decisions.