Condition Monitoring Solutions

LIFEVIEW®

Quartzteq Training

Technical Training Portfolio

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Contents

1 Introduction

Does this feel familiar in your plant?

- When a generator test report lands on your desk, how often do you ask:
  "Is this serious enough to risk an outage, or can we safely defer?"

- How much pressure do you feel when an insurer or regulator says:
  "Show us how you are monitoring generator insulation risk."

What happens to availability when a hidden stator or rotor issue turns into a forced outage during peak demand?

This training portfolio is designed for operations and maintenance teams who face these questions every day — and cannot afford guesswork.

2 Purpose of the Training

Quartzelec's Generator Diagnostics Training helps operations, maintenance and engineering teams turn diagnostic test results into clear, defensible operational decisions, rather than unexplained plots and numbers.

After the course, participants will be able to say with confidence:

"This is what the machine is telling us, this is the risk, and this is the action we recommend."

3 Who should attend

The courses are aimed at professionals working with medium- and high-voltage rotating machines in power stations and industrial plants, including:

- Control room and unit engineers responsible for generator and HV motor operation
- Maintenance engineers and planners defining outage scope and timing
- Condition monitoring and reliability engineers analysing test and monitoring data
- Plant managers and asset owners balancing risk, production and budget

No "PD guru" level knowledge is required — a basic understanding of electrical machines is sufficient.

4 Why Choose Quartzelec Training?

- Focused on real power-plant generators and large motors, grounded in field experience rather than generic classroom theory
- Delivered by experienced practitioners with hands-on involvement in generator diagnostics, outage support and life-extension programmes
- Flexible delivery: open-enrolment or tailored in-house courses aligned with specific fleets, OEM designs and plant-specific challenges

5 Training Portfolio at a Glance

Course	Title	Focus	Target Participants	Duration
1	Partial Discharge Testing of Generators and Motors – Fundamentals	Introduction to PD, insulation systems and basic online/offline testing	Anyone involved in the operation, maintenance, engineering or assessment of generators and large motors, including engineers, technicians, planners and support staff who want a practical introduction to PD.	1 day
2	Integrated Generator Condition Monitoring – PD, Flux Probes and Shaft Voltage	Systems-level interpretation of multiple monitoring channels	Personnel working with generator operation, maintenance, diagnostics or asset management who want a broader understanding of condition monitoring and how different systems work together.	1.5 days
3	Advanced Generator Diagnostics – Online Monitoring and High-Voltage Tests	Structured condition assessment and risk-based decision-making	Engineers, specialists and decision-makers involved in generator condition assessment, maintenance planning, life-extension or investment decisions, as well as anyone seeking a deeper, structured diagnostic approach.	2 days

Course 1

Partial Discharge Testing of Generators and Motors – Fundamentals

Course Description

This one-day course provides a practical introduction to partial discharge (PD) in generators and large motors. It explains how PD originates, how it is measured, and how results should be interpreted to support engineering, maintenance and operational decisions.

The training covers stator insulation basics, PD measurement principles, sensors and typical PD sources in rotating machines. International standards are explained in a practical context, and real-life examples are used to link PD behaviour with insulation condition and maintenance actions.

Learning Outcomes

After completing Course 1, participants will be able to:

- Understand how stator insulation design influences PD behaviour
- Explain how partial discharges initiate and develop in rotating machines
- Distinguish PD from corona and electrical noise in practice
- Understand what PD sensors measure and how bandwidth and filtering affect results
- Recognise typical PD sources and relate patterns to likely failure mechanisms
- Interpret basic PD trends to support maintenance and condition-based decisions
- Understand the practical role of standards and good practice
- Compare online and offline PD testing and know when to use each

Who Should Attend

Anyone involved in the **operation, maintenance, engineering or assessment of generators and large motors** who wants a practical understanding of partial discharge. No specialist PD background is required.

Duration and Format

- **Duration:** 1 day
- **Format:** Classroom sessions, worked examples, interpretation exercises and open Q&A

Course 2

Integrated Generator Condition Monitoring – PD, Flux Probes and Shaft Voltage

Course Description

This course provides a systems-level understanding of generator condition monitoring, focusing on how partial discharge (PD), rotor flux probes and shaft voltage/current monitoring work together to assess generator health.

Rather than viewing each system in isolation, the course explains what each technique measures, which failure mechanisms it detects, and how correlating trends across systems reduces uncertainty and false conclusions. Real examples from operating generators are used to show how changes in PD, flux and shaft measurements can indicate developing electrical, magnetic or mechanical issues and support timely maintenance decisions.

The overall objective is to give participants the confidence to move from *"we have monitoring data"* to*"we understand what it means, what the risk is, and what action (if any) is required."*

Learning Outcomes

After completing Course 2, participants will be able to:

- Understand the role of online condition monitoring in generator lifecycle management
- Explain what PD, flux probes and shaft voltage/current monitoring measure on a running machine
- Identify which failure mechanisms each monitoring system is most sensitive to
- Understand typical sensor locations and monitoring system architectures
- Navigate monitoring dashboards, alarms and long-term trends with confidence
- Interpret changes in PD, flux and shaft measurements in an operational context
- Correlate indications from different monitoring systems to reduce ambiguity
- Use monitoring data to prioritise inspections, define outage scope and support risk-based decisions

Who Should Attend

- Power-plant operators and diagnostic engineers
- Asset managers reviewing monitoring reports
- Engineers with PD fundamentals who need a broader monitoring perspective

Duration and Format

- **Duration:** 1.5 days
- **Format:** Classroom theory, software demonstrations, practical exercises and case studies

Key Topics

Generator condition monitoring philosophy

- Continuous monitoring versus periodic diagnostic testing
- Strengths and limitations of online systems
- Role of monitoring in availability, risk reduction and life-extension

Partial discharge monitoring

- As as Course 1

Rotor flux probe monitoring

- Basic theory of flux probes and magnetic asymmetry
- Detection of rotor interturn faults and related issues
- Typical flux signatures and how they evolve with faults
- Interpretation of steady versus changing behaviour

Shaft voltage and shaft current monitoring

- Measurement principles
- Typical causes of elevated shaft voltage/current
- Risks to bearings, couplings and auxiliary equipment
- Interpretation of trends and transient events

Integrated interpretation

- Correlating PD, flux and shaft indications
- Distinguishing electrical, magnetic and mechanical drivers
- Practical workflows for moving from monitoring data to action
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Case examples

- Real monitoring scenarios illustrating early warnings, false alarms and confirmed faults
- Discussion of monitoring results in the context of maintenance and operational decisions

Course 3

Advanced Generator Diagnostics – Online Monitoring and Offline diagnostic Tests

Course Description

This advanced course provides a structured, end-to-end approach to generator diagnostics, combining interpretation of online monitoring data with the full range of offline and online electrical tests used on high-voltage generators.

The course is designed for professionals who already work with generator test results and monitoring systems and want to move beyond isolated test interpretation toward a consistent, defensible diagnostic methodology.

The programme begins with online diagnostics on operating machines, including partial discharge, rotor flux monitoring, shaft voltage and shaft current, and rotor-related tests such as RSO. Participants learn what each method actually measures, which failure mechanisms it is sensitive to, and where its limitations lie.

Building on this foundation, the course covers the complete portfolio of stator diagnostic tests, including insulation resistance and polarisation index, AC and DC high-voltage tests, stator core flux testing, EL-CID, offline PD, tan delta, capacitance and stator wedge tightness assessment. Rather than treating these as standalone tests, the emphasis is on why and when to apply each test and how to interpret results in context.

The course then addresses rotor diagnostic testing, including RSO, insulation resistance, polarisation index, winding resistance and drop-voltage testing. Typical rotor failure mechanisms are discussed alongside the strengths and limitations of each diagnostic method.

Throughout the programme, real test data and practical case examples are used to demonstrate how different diagnostic results interact, how conflicting indications can arise, and how engineers can still reach clear, risk-based conclusions.

The overall focus is on turning complex diagnostic data into actionable maintenance, outage and life-extension decisions, suitable for discussion with plant management, insurers and OEMs.

Learning Outcomes

After completing Course 3, participants will be able to:

- Understand the purpose, strengths and limitations of the main online and offline generator diagnostic tests
- Select appropriate diagnostic methods for different suspected failure mechanisms

- Confidently interpret online diagnostic data, including PD, rotor flux, shaft voltage/current and RSO
- Interpret stator test results such as IR/PI, HV tests, core flux, EL-CID, tan delta and offline PD
- Understand rotor diagnostic techniques and their application to interturn and insulation faults
- Combine monitoring data and test results into a **coherent condition assessment**
- Develop **risk-based maintenance recommendations** and outage scopes
- Communicate diagnostic conclusions clearly to non-specialists and decision-makers

Key Topics Covered

Online diagnostics – running machine

- Partial discharge measurement and interpretation
- Rotor flux monitoring and interturn fault detection
- Shaft voltage and shaft current: causes, consequences and mitigation
- RSO testing: online applicability, interpretation and limitations
- Legacy rotor diagnostic methods (impedance, open-circuit tests) and their relevance today

Stator diagnostic tests

- Insulation resistance and polarisation index (including temperature and moisture effects)
- AC and DC high-voltage testing – purpose, risks and interpretation
- Stator core diagnostics: flux testing and EL-CID
- Offline partial discharge testing
- Tan delta and capacitance testing and their relationship
- Stator wedge and slot tightness assessment (manual and robotic methods)

Rotor diagnostic tests

- RSO testing – offline comparison
- Rotor insulation resistance and polarisation index
- Rotor winding resistance and drop voltage testing

Integrated diagnosis

- Linking test results to failure mechanisms
- Dealing with mixed or conflicting evidence
- From raw data to condition statements and recommended actions

Who Should Attend

- Experienced plant engineers and diagnostic specialists
- Asset managers responsible for life-extension and investment decisions
- Technical leaders overseeing generator fleets

Duration and Format

- **Duration:** 2 days, with an optional additional workshop day for plant-specific case studies
- **Format:** Advanced classroom modules, group workshops and structured case studies

Key Topics

- Refresher on online monitoring channels: PD, flux, shaft, temperature and vibration
- Overview of common generator diagnostic tests (IR/PI, tan delta, EL CID, surge tests, RSO)
- Test selection, timing and prioritisation
- Advanced PD pattern analysis and noise discrimination
- Multi-source diagnostic workflows
- Case studies covering life-extension, rewind decisions and lessons learned

6 Delivery Options and Customisation

All courses can be delivered at:

- At Quartzelec or Quartzteq training premises
- In-house at the customer's site
- At external venues, such as hotels or conference centres

Courses can be combined into multi-day programmes for larger teams, and content emphasis can be adjusted to match customer priorities.

Instructor: Wojciech Betlej

With nearly two decades of hands-on experience in generator servicing, Wojciech brings a deep, practical command of rotating machines – from routine inspections and condition assessments through to complex overhauls, emergency breakdown interventions, and full refurbishment projects. Over the course of his career, he has been directly involved in more than 100 generator refurbishment projects and has supported dozens of major repairs covering both large utility power stations and demanding industrial sites

Wojciech has worked with generators from almost every major manufacturer, from small industrial units of a few megawatts up to large 1200 MW utility machines. His track record includes equipment from Alstom, Siemens, GE, Brush, Electrosila, Dolmel, English Electric, AEI, Ansaldo, Toshiba, Fuji, Ganz and many others, giving him a rare ability to compare designs, typical failure modes, and refurbishment strategies across fleets.

Academically, Wojciech holds a Master's degree from the Faculty of Electrical Engineering at the Wrocław University of Technology, complemented by additional qualifications from the Cork Institute of Technology in Ireland. Wojciech is also serves on the British Steam Turbine and Generator User Group (STGUG) committee and is an active member of CIGRE (the Council on Large Electric Systems). Passionate about knowledge transfer, Wojciech has trained more than 800 engineers across over 20 countries in generator servicing, diagnostics, fault analysis, rewinding, and major overhauls.

Instructor: Kristians Cernevics

Kristians Cernevics started his journey deep in science, completing an undergraduate degree in Chemical Physics at the University of Glasgow before earning a PhD in Physics at EPFL, one of Europe's top technical universities. He has worked across advanced materials for electronics, high-voltage physics, software and data engineering, often acting as the bridge between theory and experiment.

Today, Kristians serves as Product Manager at Quartzteq in Switzerland, where he is responsible for next-generation condition monitoring systems for high-voltage rotating machinery. He has led the end-to-end redesign of the LIFEVIEW PDA launching it as a modular, more powerful, and more connected diagnostic system that improves how operators see and manage the health of critical assets in demanding environments.

Kristians positions himself deliberately where hardware, software and real-world use meet. He works directly with field deployments, production teams, and customers, running trials in live environments to validate new features and refine user experience. Whether it is browser-based interfaces for machine health data or back-end processing pipelines, his focus remains on making complex diagnostics accessible, intelligible, and trustworthy for engineers and operators.

He has organised scientific seminars and delivered webinars on predictive maintenance and condition monitoring, consistently stepping into roles where someone must connect perspectives from science, engineering, and business.