

BWatch3 System monitoring systems for Gas Insulated Switchgear

Description and Operation

Ref. K1001E



Destinated for

Engineers and senior technicians, supervisors involved in the operation and maintenance of GIS substations using BWatch3 Optimum product
Basics in electrical and mechanicals, experience in GIS substations.



Required knowledge

Ø



Method

Theory: 80% /Practice: 20%
Lecture, hardware description, software use



Duration

1 day



Number of participants

2 to 6 trainees



Place

TIA/Site



Objectives

- Interpreting the BWatch3 Optimum functions
- Knowing the general device architecture
- Analyzing and interpreting the BWatch3 Optimum output data



Program

Introduction to GIS monitoring

History of GIS status monitoring
Solutions provided by BWatch3 Optimum and BWatch3 System

BWatch3 Optimum functions

Overview and architecture of the monitoring system
Measurement details (pressure, temperature, density)
Alarm details (thresholds, advanced alarms, liquefaction, internal arc location)
Digital communication details (serial Modbus, Bluetooth, IEC61850)

Acquisition system by function

Presentation, specific features, and location of:

- Gas transmitters
- Fieldbus and its architecture
- Distribution boxes
- Modular acquisition units (CPUs, I/O modules)

Indicators and local HMI (Human Machine Interface)

Presentation of interfaces
Description of main LEDs
Embedded HMI (touch screen)
Details of operating and maintenance modes



Practice condition

In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.

On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

Experienced trainer with a strong field experience.

Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 Optimum monitoring system for Gas Insulated Switchgear

Description and Operation / Erection & Commissioning

Ref. K1029E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS substations using BWatch3 Optimum product.
Basics in electrical and mechanicals, experience in GIS substations.



Required knowledge

Ø



Method

Theory: 50% /Practice: 50%
Lecture, hardware description, software use



Duration

1.5 days



Number of participants

2 to 6 trainees



Place

TIA/Site



Objectives

- Interpreting the BWatch3 Optimum functions
- Understanding the general device architecture
- Knowing the procedures for installation, commissioning
- Analyzing and interpreting the BWatch3 Optimum output data



Program

Introduction to GIS monitoring

History of GIS status monitoring
Software and hardware evolution between previous versions
Solutions provided by BWatch3 Optimum

Basics of BWatch3 Optimum

Overview and architecture of the monitoring system
Study of internal architecture:
- Gas sensor network
- Acquisition and Processing Unit
- Human-Machine Interfaces
- Specific features of older versions (local display, gateway, inter-bay network)
Fundamentals of gas monitoring: equations of state for gases

Acquisition system by function

Detailed study of each monitoring function
- Measurements: Density, Pressure, Temperature
- Alarms: Thresholds, Advanced alarms, Liquefaction, Internal arc location
Digital communication

Indicators and local HMI (Human Machine Interface)

Identification of main LEDs
Current local display (graphic, color and touch panel)
Older local display (text, monochrome)
Operating modes
Portable Bluetooth test box
Analysis of different parameters by function



Practice condition

In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.

On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

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Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 Optimum monitoring system for Gas Insulated Switchgear

Trouble shooting

Ref. K1043E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS substations using BWatch3 devices



Required knowledge

K1029E certified for BWatch3 optimum - PD & EC - Basic



Method

Theory: 50% /Practice: 50%



Duration

1.5 days



Number of participants

2 to 6 trainees



Place

TIA



Objectives

- Analyze and interpret BWatch3 Optimum alarms
- Be familiar with troubleshooting procedures (diagnosis, maintenance, repair)
- Update the BWatch3 Optimum configuration



Program

Introduction to BWatch3 Optimum troubleshooting

Troubleshooting: diagnosis time, repair time
Why update?

The BWatch3 Optimum

Description of BWatch3 Optimum equipment fault indicators

Troubleshooting principles (diagnosis, hardware repair)

Updating the BWatch3 Optimum configuration

BWatch3 Optimum hardware and software upgrades – V8/V9/V10 modifications

Interpretation of fault indicators with diagnosis and replacement (using local HMI)

Sensor failure

Failure of the sensor chain

Failure of an Acquisition and Processing Unit module

Failure of the CPU module

Failure of the local HMI

Parameter setting (configuration)

Correction of configuration errors (configuration update procedure)

BWatch3 Optimum troubleshooting exercises

Real-life situation



Practice condition

A bay in dead conditions with gas will be at your disposal for the practical works.



Trainer

Experienced trainer with a strong field experience.
Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 System and BWatch3 Optimum monitoring systems for Gas Insulated Switchgear

Description and Operation

Ref. K1101E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS substations using BWatch3 devices
Basics in electrical and mechanicals, experience in GIS substations.



Required knowledge



Method

Theory: 80% /Practice: 20%
Lecture, hardware description, software use



Duration

1.5 days



Number of participants

2 to 8 trainees



Place

TIA/Site



Objectives

- Interpreting the BWatch3 functions
- Knowing the general device architecture
- Analyzing and interpreting the BWatch3 output data



Program

Introduction to GIS monitoring

History of GIS status monitoring
Solutions provided by BWatch3 Optimum and BWatch3 System

BWatch3 Optimum

Overview and architecture of the monitoring system
Measurement details (pressure, temperature, density)
Alarm details (thresholds, advanced alarms, liquefaction, internal arc location)
Digital communication details (serial Modbus, Bluetooth, IEC61850)

Acquisition system by function

Presentation, specific features, and location of:

- Gas transmitters
- Fieldbus and its architecture
- Distribution boxes
- Modular acquisition units (gateways, CPUs, I/O modules)

Indicators and local HMI (Human Machine Interface)

Presentation of interfaces
Description of main LEDs
Embedded HMI (touch screen)
Portable test box (Test Pad)
Details of operating and maintenance modes

BWatch3 System

General overview of the functions and architecture of the monitoring system
Details of the inter-bays network (Ethernet gateways and switches, fiber optics, supervision)
Details of the supervision display and recordings (current and daily densities, events, graphs)

Alarm details (internal arc location in the circuit breaker)
Overview of circuit breakers and disconnector switches condition monitoring functions
Digital communications details (IEC61850, web server, email generator)

Note: The BWatch3 Optimum is the basis of the BWatch3 System. It is necessary to process the BWatch3 Optimum to address the BWatch3 System.



Practice condition

In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.
On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

Experienced trainer with a strong field experience.
Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 System and BWatch3 Optimum monitoring systems for Gas Insulated Switchgear

Description and Operation / Erection & Commissioning

Ref. K1129E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS substations using BWatch3 devices



Required knowledge

Basics in electrical and mechanicals, experience in GIS substations.
Knowledge of the Windows operating system and automatism fundamentals



Method

Theory: 50% /Practice: 50%



Duration

2.5 days (3 days with the option)



Number of participants

2 to 6 trainees



Place

TIA/Site



Objectives

- Interpreting the BWatch3 functions
- Understanding the general device architecture
- Knowing the procedures about installation, commissioning
- Analyzing and interpreting the BWatch3 output data
- In option, the previous hardware/software versions evolutions (in magenta)



Program

Introduction to GIS monitoring

History of GIS status monitoring
Software and hardware evolution between previous and current versions
Solutions provided by BWatch3 Optimum and BWatch3 System

Basics of BWatch3 Optimum and BWatch3 System

Overview and architecture of the monitoring system
Study of the internal architecture:

- Gas sensor network
- Acquisition and Processing Unit
- Human-Machine Interfaces
- Specific features of older versions (local display, gateway, inter-bay network)

Fundamentals of gas monitoring: equations of state for gases

Acquisition system by function

Detailed study of each monitoring function

- Measurements: Density, Pressure, Temperature
- Alarms: Thresholds, Advanced alarms, Liquefaction, Internal arc location

Digital communication

Indicators and local HMI (Human Machine Interface)

Identification of main LEDs
Current local display (graphic, color and touch panel)
Older local display (text, monochrome)
Operating modes
Portable Bluetooth test box
Analysis of different parameters by function

In situ study of a BWatch3 Optimum associated with a GIS

Use of the bay HMI and the Bluetooth TestPad
Presentation of the different types of connection
Installation of a gas sensor
Sensor calibration (reference sensor)
Testing density thresholds
Testing internal arc location alarms
Additional filling
Identifying installed software versions

BWatch3 System advanced functions

System architecture and network
Study of the internal architecture:
- Recordings: daily densities, events
- Alarms: location of internal arc in circuit breaker, circuit breaker monitoring, disconnectors, and earthing switches
- Digital communication: IEC61850 server, email generator, webserver

Central HMI (supervision PC)

Operating modes: global views of instantaneous data, recorded data, and system status

Obsolescence of components from previous versions
Presentation of component evolution and replacement solutions

In-situ study of a BWatch3 System associated with a GIS

Commissioning/setting of circuit-breaker condition monitoring
Commissioning/setting of disconnector and earthing switches condition monitoring
Identification of installed software versions



Practice condition

In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.

On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

Experienced trainer with a strong field experience.
Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 System and BWatch3 Optimum monitoring systems for Gas Insulated Switchgear Trouble shooting

Ref. K1143E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS substations using BWatch3 devices



Required knowledge

K1129E certified for BWatch3 optimum and system - PD & EC - Basic



Method

Theory: 50% /Practice: 50%



Duration

2.5 days (3 days with the option)



Number of participants

2 to 6 trainees



Place

TIA



Objectives

- Analyze and interpret BWatch3 Optimum and BWatch3 System alarms
- Be familiar with troubleshooting procedures (diagnosis, maintenance, repair)
- Update the BWatch3 Optimum configuration
- **Optional procedures for previous hardware/software versions (in magenta)**



Program

Introduction to BWatch3 Optimum and BWatch3 System troubleshooting

Troubleshooting: diagnosis time, repair time
Why update?

The BWatch3 Optimum

Description of BWatch3 Optimum equipment fault indicators

Troubleshooting principles (diagnosis, hardware repair)

Updating the BWatch3 Optimum configuration

BWatch3 Optimum hardware and software upgrades – V8/V9/V10 modifications

Interpretation of fault indicators with diagnosis and replacement (using local HMI)

Sensor failure

Failure of the sensor chain

Failure of an Acquisition and Processing

Unit module

Failure of the CPU module

Failure of the local HMI

Parameter setting (configuration)

Correction of configuration errors

(configuration update procedure)

BWatch3 Optimum troubleshooting exercises

Real-life situation

The BWatch3 System

Description of BWatch3 System equipment fault indicators

Troubleshooting principles (diagnosis, hardware repair)

BWatch3 System configuration updates by GE Vernova specialists

BWatch3 System hardware and software developments – V8/V9/V10 modifications

Interpretation of fault indicators with diagnosis and replacement (using the central HMI - supervision PC)

Failure of an Acquisition and Processing Unit module

CPU module failure

IWatch and CoilWatch failure

Circuit breaker position sensor failure

Failure of the CPL35 (current sensor for disconnect control motors)

Failure of the central HMI, intelligent switches or network

Parameter setting (configuration)

System configuration management by GE Vernova specialists (configuration update principle)

Exercises in troubleshooting a BWatch3 System

Real-life situation

Note: the BWatch3 Optimum is the basis of the BWatch3 System. It is necessary to treat the BWatch3 Optimum to approach the BWatch3 System.



Practice condition

A bay in dead conditions with gas will be at your disposal for the practical works.



Trainer

Experienced trainer with a strong field experience.

Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 Axioline Optimum and System monitoring systems for Gas Insulated Switchgear

Description & Operation

Ref. K1301E



Destinated for

Engineers and senior technicians, supervisors involved in the operation of GIS substations using BWatch3 Axioline devices
Fundamentals of electricity and mechanics, experience with GIS



Prerequisites

NA



Method

Theory: 80% / Practice: 20%
Lecture, hardware description, software use



Number of participants

2 to 8 trainees



Duration

1.5 day



Place

TIA or site



Objectives

- Interpreting the BWatch3 functions
- Understanding the general device architecture
- Analysing and interpreting the BWatch3 output data



Program

Introduction of the BWatch3 Axioline range

History of GIS condition monitoring
Solutions provided by BWatch3 Axioline Optimum and BWatch3 Axioline System

BWatch3 Axioline Optimum

Overview of the monitoring system's functions and architecture
Details of measurements (pressure, temperature, density)
Details of alarms (thresholds, advanced alarms, liquefaction, internal arc location)
Details of digital communications (serial Modbus, IEC61850, and Bluetooth)

Acquisition system by function

Presentation, specific features, and location of:

- Gas transmitters
- Fieldbus and its architecture
- Distribution boxes
- Modular acquisition units (gateways, CPUs, I/O modules)

Indicators and local HMI (Human Machine Interface)

Overview of interfaces
Description of main LEDs
Embedded HMI (touch screen)
Portable test box (Test Pad)
Details of operating and maintenance modes

BWatch3 Axioline System

General overview of the functions and architecture of the monitoring system
Details of the inter-bays network (Ethernet gateways and switches, fiber optics, supervision)
Details of the supervision display and recordings (current and daily densities, events, graphs)

Alarm details (internal arc location in the circuit breaker)
Overview of circuit breakers and disconnector switches condition monitoring functions
Digital communications details (IEC61850, web server, email generator)

Note: the BWatch3 Axioline Optimum is the basis of the BWatch3 Axioline System. It is necessary to process the BWatch3 Axioline Optimum to address the BWatch3 Axioline System.



Practice condition

In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.
On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

Experienced trainer with a strong field experience.
Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 Axioline Optimum and System monitoring systems for Gas Insulated Switchgear

Description and Operation / Erection & Commissioning

Ref. K1329E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS. Knowledge of the Windows operating system and automatism fundamentals



Required knowledge

None



Method

Theory: 50% /Practice: 50%
Lecture, practical exercises in installing gas sensors, their calibration, checking alarms and recording reference curves



Duration

2.5 days (3 days with the option)



Number of participants

2 to 6 trainees



Place

TIA/Site



Objectives

- Interpret the functions of the BWatch3 Axioline Optimum and System
- Be familiar with the general architecture of the devices
- Be familiar with installation and commissioning procedures
- Analyze and interpret Axioline Optimum and System BWatch3 output data
- Learn about changes from previous versions of Inline equipment (option in magenta)



Program

Introduction to GIS monitoring

History of GIS status monitoring
Software and hardware evolution between previous and current versions
Solutions provided by BWatch3 Axioline Optimum and System

Basics of BWatch3 Axioline Optimum and System

Overview and architecture of the monitoring system
Study of the internal architecture:
- Gas sensor network
- Acquisition and Processing Unit
- Human-Machine Interfaces
- **Specific features of older versions (local display, gateway, inter-bay network)**
Fundamentals of gas monitoring: equations of state for gases

Acquisition system by function

Detailed study of each monitoring function
- Measurements: Density, Pressure, Temperature
- Alarms: Thresholds, Advanced alarms, Liquefaction, Internal arc location
Digital communication

Indicators and local HMI (Human Machine Interface)

Identification of main LEDs
Current local display (graphic, color and touch panel)
Older local display (text, monochrome)
Operating modes
Portable Bluetooth test box
Analysis of different parameters by function

In situ study of a BWatch3 Axioline Optimum associated with a GIS

Use of the bay HMI and the Bluetooth TestPad

Presentation of the different types of connection
Installation of a gas sensor
Sensor calibration (reference sensor)
Testing density thresholds
Testing internal arc location alarms
Additional filling
Identifying installed software versions

BWatch3 Axioline System advanced functions

System architecture and network
Study of the internal architecture:
- Recordings: daily densities, events
- Alarms: location of internal arc in circuit breaker, circuit breaker monitoring, disconnectors, and earthing switches
- Digital communication: IEC61850 server, email generator, webserver

Central HMI (supervision PC)

Operating modes: global views of instantaneous data, recorded data, and system status

Obsolescence of components from previous versions

Presentation of component evolution and replacement solutions

In-situ study of a BWatch3 Axioline System associated with a GIS

Commissioning/setting of circuit-breaker condition monitoring
Commissioning/setting of disconnector and earthing switches condition monitoring
Identification of installed software versions

Note: the BWatch3 Axioline Optimum is the basis of the BWatch3 Axioline System. It is necessary to treat the BWatch3 Axioline Optimum before addressing the BWatch3 Axioline System



Practice condition

- In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.
- On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

Experienced trainer with a strong field experience.
Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

BWatch3 Axioline Optimum and System monitoring systems for Gas Insulated Switchgear

Trouble shooting

Ref. K1343E



Destinated for

Engineers and senior technicians, supervisors involved in the commissioning, operation and maintenance of GIS



Required knowledge

K1329E certified for BWatch3 Axioline Optimum and System - Basic



Method

Theory: 50% /Practice: 50%
Lecture, practical exercises in troubleshooting, repairs, and case studies



Number of participants

2 to 6 trainees



Duration

2.5 days (3 days with the option)



Place

TIA



Objectives

- Analyze and interpret BWatch3 Axioline Optimum and System alarms
- Be familiar with troubleshooting procedures (diagnosis, maintenance, repair)
- Update the BWatch3 Axioline Optimum configuration
- Learn about procedures for previous versions of Inline equipment (option in magenta)



Program

Introduction to BWatch3 Axioline Optimum and System troubleshooting

Troubleshooting: diagnosis time, repair time
Why update?

The BWatch3 Axioline Optimum

Description of BWatch3 Axioline Optimum equipment fault indicators
Troubleshooting principles (diagnosis, hardware repair)

Updating the BWatch3 Axioline Optimum configuration

BWatch3 Axioline Optimum hardware and software upgrades – V8/V9/V10 Inline hardware modifications

Interpretation of fault indicators with diagnosis and replacement (using local HMI)

Sensor failure
Failure of the sensor chain
Failure of an Acquisition and Processing Unit module
Failure of the CPU module
Failure of the local HMI

Parameter setting (configuration)

Correction of configuration errors
(configuration update procedure)

BWatch3 Axioline Optimum troubleshooting exercises

Real-life situation

The BWatch3 Axioline System

Description of BWatch3 Axioline System
equipment fault indicators

Troubleshooting principles (diagnosis,
hardware repair)

BWatch3 Axioline System configuration
updates by GE Vernova specialists

BWatch3 Axioline System hardware and
software developments – V8/V9/V10 Inline
hardware modifications

Interpretation of fault indicators with diagnosis and replacement (using the central HMI - supervision PC)

Failure of an Acquisition and Processing Unit
module

CPU module failure

IWatch and CoilWatch failure

Circuit breaker position sensor failure

Failure of the CPL35 (current sensor for
disconnect control motors)

Failure of the central HMI, intelligent switches
or network

Parameter setting (configuration)

System configuration management by GE
Vernova specialists (configuration update
principle)

Exercises in troubleshooting a BWatch3 System

Real-life situation

Note: the BWatch3 Axioline Optimum is the basis of the BWatch3 Axioline System. It is necessary to treat the BWatch3 Axioline Optimum to approach the BWatch3 Axioline System.



Practice condition

A bay in dead conditions with gas will be at your disposal for the practical works.



Trainer

Experienced trainer with a strong field experience.

Extensive expertise in the development of digital products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session.

PDwatch On-line monitoring system for GIS

Presentation and operation

Ref. K2101E



Destinated for

Engineers and senior technicians involved in the operation and maintenance of GIS skilled with basics in electrical, mechanicals, and GIS



Required knowledge

None



Method

Theory: 80% (lectures, PD pattern studies)
Practice: 20% (software use, automatic/manual mode)



Duration

1.5 day



Number of participants

2 to 6 trainees max (for better efficiency and safety on application)



Place

TIA/Site*



Objectives

- To understand partial discharges during any GIS operation
- To know partial discharges on-line detection bay UHF method
- To know how to use PDwatch On-line device
- To use the dedicated PDwatch software in normal conditions on a real GIS equipment
- To apply the safety rules



Program

Partial discharges in GIS

Isolation defects in GIS system
Different types of isolation defects
Physical and chemical phenomena due to partial discharges
Electromagnetic waves propagated in GIS system

Means of detection

Conventional method
UHF method
Application of the two methods
UHF couplers using
Couplers used as capacitive voltage detectors
Sensor's sensitivity checking (CIGRE)
Methodology and signal classification

Acquisition principles

UHF signal acquisition technologies
Noise discrimination

PDwatch Online description

Hardware and architecture
Synchronization by VT (inductive), coupler (capacitive), PDTimer and PDSync
PDwatch functionalities
Event and alarm setting

In situ Study – PDWatch On-Line use operation *

Different screens

- MIMIC view
- Sensors and modules view
- Close and linked sensors view:
 - Trends and snapshot
 - Events signals
- Event log view
- Monthly report

Automatic/Manual mode

- Spectrum acquisition (frequental)
- Phase resolved acquisition (temporal)

PD alarm generation

- PD signals
- External noises without external sensor
- External noises with external sensor
- PD signals and external noises

Self-monitoring alarm generation

- Sensor alarm
- IED alarm
- Synchro alarm
- SCADA alarm

PDwatch Manager

- Spectrum and PR
- Automatic report
- Export to spreadsheet
- Expert system

*A dedicated equipment – a cell in dead conditions with gas – must be at our disposal on site for the practical works



Trainer

Experienced trainer
Extensive expertise in digital product development
Solid experience in the field



Evaluation

At the beginning of the training, the participants will be invited to express their expectations to validate the adequacy between the individual and training objectives.

These expectations will be considered during the evaluation of the training to determine the level of achievement expressed by the participants as well as their satisfaction with the content and the course of the training.

The evaluation of knowledge and skills is done directly by the trainer during the practical exercises in small groups.

An evaluation form will be filled in by each trainee.

A certificate of training follow-up is given to the trainees at the end of the course..

PDwatch On-line monitoring system for GIS Erection & Commissioning

Ref. K2129E



Destinated for

Engineers and senior technicians involved in supervision and commissioning of GIS substations and auxiliary equipment skilled with basics in electrical, networks, partial discharge, and GIS



Required knowledge

Presentation and operation of the PDwatch On-line monitoring system for GIS (Ref K2101E)



Method

Theory: 40% / Practice: 60%
System presentation, tools use, process description, software setup and tests



Duration

2 day(s)



Number of participants

2 to 6 trainees max (for better efficiency and safety on application)



Place

TIA



Objectives

- To know how to use PDwatch On-line device
- To know the role of each component of the system
- To know how to check the assembly and wiring of the system
- To know how to carry out the commissioning according to the SAT procedure
- To apply the safety rules



Program

Reminder of the principle of partial discharge detection

- Partial discharges in GIS
- Means of detection
- Acquisition principles

PDwatch description (Software)

- PDWatch functions
- PDWatch Online Software versions
- PDWatch Manager
- Software tools
- System network
- Cybersecurity

PDwatch description (Hardware)

- System architecture
- Components description
- Reference voltage (normal, HV, degraded mode conditions)
- Switching in operation
- Wired alarms

Pre-commissioning

- Presentation of assembly procedures
- Presentation of wiring procedures
- Coaxial cable testing

Commissioning & SAT

- LV checking
- Functional tests
- Commissioning mode
- Exclusion bands definition
- Sensitivity tests
- Thresholds setup

IEC61850 and cybersecurity

- IEC61850 communication tests
- Presentation of cybersecurity measures



Trainer

Experienced trainer
Extensive expertise in digital product development
Solid experience in the field



Evaluation

At the beginning of the training, the participants will be invited to express their expectations to validate the adequacy between the individual and training objectives.

These expectations will be considered during the evaluation of the training to determine the level of achievement expressed by the participants as well as their satisfaction with the content and the course of the training.

The evaluation of knowledge and skills is done directly by the trainer during the practical exercises in small groups.

An evaluation form will be filled in by each trainee.

A certificate of training follow-up is given to the trainees at the end of the course.

Description and operation of the CSD100 controlled switching device of circuit-breaker

Ref. K3101E



Destinated for

Managers, engineers & technicians, quality, tendering teams willing to be informed on the controlled switching of circuit-breaker using the CSD100



Required knowledge

∅



Method

100% theory



Duration

1 day



Number of participants

2 to 6 trainees (for better efficiency)



Place

TIA/Site



Objectives

- Understand:
 - The basics of the electrical phenomena related to circuit-breaker switching
 - The basics of the principles of controlled circuit breaker switching
 - The basics of the application cases of shunt reactance banks, capacity banks, power transformers and HV cables and lines
 - The constraints of the configuration specifications
 - The constraints of the commissioning process (wiring check, dry tests, live tests)
- Know the data management (measurement, status, monitoring, display, storage, communication)
- Know the Multiple Load Switching function)



Program

Introduction

HV networks and the power factor
Reactive power apparatus
Switching effects on the network
Means of mitigation

Principle of controlled switching

Synchronization principle: delay, processing time, target time
Calculation of the switching time of the CB
Calculation of the pre-arc time or the arc time
Application cases (Shunt Reactor Banks, Capacity Banks, Power Transformers and HV Cables and Lines)
Multiple Load Switching application

Equipment description

General characteristics
Dimensions, mounting
Inputs/outputs cabling
General description of the HMI (webserver)
General description of the archive's viewer

Configuration requirements

Network specifications (use case, neutral system, minimal requirements)
Load specifications
LV specifications (power supply, protections, LV diagrams, etc.), optional sensors
Ethernet network, communication protocols, cybersecurity

Pre-Commissioning & Commissioning process

1) Pre-commissioning:
Connections check CSD100 de-energized
2) Dry commissioning (without HV):
Connections check CSD100 energized
CB timings fingerprint

Dry switching tests
Integration into customer Network architecture
(IP address, RBAC, IEC61850, etc.)
3) Live commissioning (with HV):
LIVE switching tests
Reporting & traceability



Practice condition

In TIA: an apparatus similar to your own equipment – a bay in dead conditions with gas will be at your disposal for the practical works.

On site: customer must put at disposal a bay of the referenced GIS in dead conditions with gas for the practical works with the necessary tools. And provide safety access to the site and equipment.



Trainer

Experienced trainer with a strong field experience in AIS, GIS substations & associated Digital Products.



Evaluation

Participants will be invited at the beginning of the training to express their expectations in order to validate the adequacy between individual and training objectives.

A certificate of follow-up of the training is given to trainees at the end of the internship

RPH3 – Presentation, operation, and interpretation of the results

Réf. K3001E



Destinated for

Engineers and senior technicians involved in the operation and maintenance of HV switchgear > 50 kV



Required knowledge

None



Method

Theory: 60% /Practice: 40%



Duration

1,5 days



Number of participants

6 trainees



Place

TIA Aix-Les-Bains



Objectives

- Manage the safety rules
- Manage the electric phenomena during the switching operations
- Understand the RPH3's functionalities
- Use the RPH3
- Be able to analyze the results through the HMI (RPH3 viewer)



Program

Presentation of the session

Reception and welcome
Confirmation of the expectations

Electrical phenomena related to circuit-breaker operation

Presentation of an interrupting chamber
Study of electrical phenomena related to switching

Study of particular cases:

- opening operation on a shunt reactor
- closing on a capacitor bank
- closing on an offload transformer
- lines switching

Presentation of the RPH3

RPH3 presentation
Working of the relay
Synchronization definitions
Compensation functions
Configuration parameters
Commissioning

RPH3: Connection with the HMI

Prerequisites for installation/configuration
How to connect to the HMI

In situ Study synchronization operations

Synchronization on simulator CB

- on a capacitor bank
- on a shunt reactance
- on a transformer

Record and analyze the results

Evaluation of the session

Free discussion with trainer
Fill the training documentation



Trainer

Experienced trainer with a strong field experience.



Evaluation

As part of our quality improvement policy, an evaluation sheet is submitted to trainees at the end of the training with the purpose of improving our programs through their comments.

Non-Intrusive Inspection fundamentals

HV switching devices

Ref. K5001E



Destined for

Managers, engineers & technicians, quality, tendering teams willing to be informed on non-intrusive inspection techniques on HV switching devices



Required knowledge

None



Teaching method

100% theory



Duration

0.5 day



Number of participants

10 trainees max (for better efficiency)



Location

TIA – Aix-les-Bains – France



Objectives

Understand:

- The basics of the non-intrusive inspection
- The advantages of non-intrusive inspection
- The knowledge about methods of non-intrusive inspection
- The basics of how to operate the non-intrusive inspection



Program

Advanced Methods of Non-Intrusive Inspection

Target of non-intrusive inspection

Requirement to perform non-intrusive inspection

Impact & gain for the customer to perform non-intrusive inspection

Non-intrusive inspection methods

Principles of X-Ray/Gamma-Ray method

Principles of the vibration monitoring method

Principles of UHF signals method

Principles of Dynamic Contact Resistance

Measurement (DCRM) of CB method

Process

Pre-intervention method statements

Inspection report and recommendations

Application cases (examples)



Trainer

Experienced trainer, specialist in AIS & GIS substations
Strong experience in the field



Evaluation of the session

At the start of the training, participants will be invited to express their expectations to validate the match between the individual and training objectives,
These expectations will be taken up during the training evaluation sequence to raise the level of achievement expressed by the participants as well as satisfaction with the content and progress of the training.
The assessment of learning and skills is done directly by means of a questionnaire at the end of the course.
An evaluation sheet will be completed by each of the trainees.

PDwatch Portable system for Non-Intrusive Inspection of Gas Insulated Substations

Product description

Ref. K5301E



Audience

Engineers and technicians involved in the operation and maintenance of GIS. Basics in electrical and mechanicals, GIS knowledge



Required knowledge

None



Teaching method

Theory 80% / Practice 20%



Duration

1 days



Number of participants

2 to 8 trainees max (for better efficiency)



Location

TIA/Site



Objectives

- To understand and recognize the types of partial discharges in GIS
- To know the conventional and UHF methods and why they are used
- To know the equipment features of the PDwatch Portable device
- To know the installation principle of the PDwatch Portable device
- To know the general acquisition & analysis functions of the embedded software of PDwatch Portable device



Program

Partial discharges, what is it?

Insulation defects in GIS system
Different types of insulation defects
Phenomena due to partial discharges
Electromagnetic waves propagated in GIS

Means of detection

Conventional method
UHF method
Principle of sensors sensitivity checking (CIGRE)
UHF couplers using
Noise discrimination
Analysis methodology

PDwatch Portable description

Hardware and architecture
PDwatch features

PDWatch Portable software tools

Introduction to the PDwatch Acquisition S/W
Introduction to the PDwatch Manager S/W

Means of analysis

Signals classification by types of insulation defects



Trainer

Experienced trainer
Extensive expertise in digital product development
Solid experience in the field



Evaluation of achievements

At the beginning of the training, the participants will be invited to express their expectations to validate the adequacy between the individual and training objectives.

These expectations will be considered during the evaluation of the training to determine the level of achievement expressed by the participants as well as their satisfaction with the content and the course of the training.

An evaluation form will be filled in by each trainee.

A certificate of training follow-up is given to the trainees at the end of the course.

PDwatch Portable system for Non-Intrusive Inspection of Gas Insulated Substations

Erection & Commissioning

Ref. K5329E



Destinated for

Supervisors, engineers, and senior technicians involved in the operation and maintenance of GIS. Basics in electrical and mechanicals, GIS knowledge



Required knowledge

None



Method

50% theory (lectures, case studies) / 50% practical (demonstration, use of hardware and digital tools, exercises)



Place

TIA/Site*

* see Practice condition



Number of participants

2 to 6 trainees



Duration

2 days



Objectives

- Describe and recognize the types of partial discharges in GIS
- Describe conventional and UHF methods and why they are used
- Detail the features of the PDwatch Portable
- Apply the PDwatch Portable installation principle
- Use the general acquisition and analysis functions of on-board software



Program

Partial discharges, what is it?

Insulation defects in GIS system
Different types of insulation defects
Physical and chemical phenomena due to partial discharges
Electromagnetic waves propagated in GIS system

Means of detection

Conventional method
UHF method
Procedure for sensors sensitivity checking (CIGRE)
UHF couplers using
Couplers used as capacitive voltage detectors
Synchronization solutions - by VT (inductive) or coupler (capacitive)
Noise discrimination
Analysis methodology

PDwatch Portable description

Hardware and architecture
PDwatch features
PDwatch Acquisition software presentation

Means of analysis

PDwatch Manager software presentation
Signals classification by types of insulation defects

In situ Study – Using the PDWatch portable*

Presentation and synchronization on real size GIS solution
PDWatch Portable commissioning
Simulations/Troubleshooting:

- Communication errors
- Sensor status error
- PD recognition

PDWatch Portable software tools

Safety information

Using of PDWatch Acquisition S/W

- General presentation
- Step by step use
- CIGRE format data recording
- Graphic data recording
- Data management

Using of PDwatch Manager S/W

- General presentation
- Step by step use
- Reports generation

GIS commissioning

Sensitivity checks of couplers by CIGRE method



Practice condition

TIA conditions:

- PDWatch Portable will be at your disposal for the practical works

Site conditions:

- PDWatch Portable must be at our disposal on site for the practical works
- A dedicated cell – preferably in live condition with gas – must be at our disposal on site for the practical works



Trainer

Experienced trainer with a strong field experience in GIS substations & associated Digital Products.



Evaluation

At the start of the course, participants will be asked to express their expectations in order to confirm the match between their knowledge, their individual objectives and those of the course.

These expectations will be considered during a round-table discussion to fine-tune the content and course of the course if necessary.

Learning and skills are assessed by means of a theory MCQ and a practical work grid, if applicable.

At the end of the course, each trainee must complete an on-the-spot evaluation. A certificate of attendance will be issued at the end of the session