Enter the network of expertise

The Siemens Power Academy TD course catalog
Your partner for Power Transmission, Distribution and Smart Grid training
Welcome to the academy of energy experts!

The ever-changing demands of a highly dynamic energy market and trends such as urbanization, the use of renewable energy, and the push to meet climate and environmental targets make it imperative that we keep our knowledge up to date. Having the right expertise is essential to ensuring that our energy grid is reliable and sustainable.

The experts at Siemens Power Academy TD have the knowledge to prepare you for these challenges. As specialists in training and continuing education in the fields of energy transmission and distribution (T&D), the commercial use of electrical energy, and Smart Grid technology we can help you broaden your capabilities, expand your knowledge, and help you lay the foundation for your future success.

In addition to our standard training portfolio found in this catalog, we also offer customized training that supports your organization’s need for competency development. By partnering with Siemens Power Academy TD programs, you can deepen your knowledge, improve productivity, and broaden your leadership potential by taking an active step in shaping your career.

Enter the network of expertise!

We look forward to welcoming you to our training network!

*Siemens Power Academy TD*
Content

- Siemens Power Academy TD – at a glance 10

Curricula

- Curriculum – our competence development program 12
- How to obtain certification 13

Primary Technology

Medium Voltage

- MV Switchgear – Technical Information (AIS & GIS) 15
- MV Switchgear – Technical Information (Switchgear-Specific) 15
- MV Switching Devices & Switchgear – Basics & Application 15
- MV – Assembly and Installation Training 16
- MV Equipments – Certification Program for Operation & Maintenance 16
- MV – Rural Electrification Techniques for Engineers & Technicians 16
- MV Power Supply Systems – Process-Oriented Engineering 17
- MV – Partial Discharges 17
- MVDC/SIPLINK – Benefits and Features 17
- MV Assembly and Installation Training – Refresher 17
- MV Switchgear – Maintenance 17
- MV Circuit Breakers – Maintenance 17
- MV – Cable Testing & Diagnostics 17

High Voltage

Fundamentals

- HV Switching Technology – General Information 18
- HVDC and FACTS – Benefits of Power Electronics 18
- HV Overhead Transmission Line Design – Fundamentals 18
- HVDC and FACTS – Workshop 20
- HV Substation Design – Basics 20
- HV Switchgear Design – Basics 20
- HV Switching Technology – Introduction 20
- Hydraulic Knowledge & Maintenance – Fundamentals 20
- HV Primary Test Performing and Test Equipment 20

Gas Insulated Switchgear (GIS)

- HV Switching Technology GIS – Technical Information 19
- Metal-Clad GIS – Current 8D Product Range – Operation & Maintenance – Intermediate 19
- Metal-Clad GIS – Current 8D Product Range – Operation and Maintenance – Advanced 20
- Metal-Clad GIS Current Product Range Presentation 20
- Metal-Clad GIS – Vintage Product Range – Operation & Maintenance – Advanced 20
- HV GIS Switchgear Reyrolle Type YG 420/550 kV 21
- HV GIS Circuit Breaker Reyrolle Type SPD2 420/550 kV 21

Circuit Breaker

- HV Circuit Breaker – Testing 21
- HV Switching Technology – 3A 21

Air Insulated Switchgear (AIS)

- HV AIS Circuit Breaker Reyrolle Type SPL2 420/550 kV 21
- AIS Vintage SB6 Product Range – Operation & Maintenance – Intermediate 21

Operation and Maintenance

- Vintage AIS Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced level 21
- Upgrading Oil Circuit Breakers – OP & MO Product Range – Advanced 21
- Hydraulic Knowledge & Maintenance – Intermediate 21
## Transformers
- Distribution Transformers – Basics and Operation 22
- Power Transformers – Basics and Operation 22
- Distribution Transformers – Grounding and Protection 22

## General
- EHV, HV and MV Substations Overview: Arrangement, Protection, Control and Communication System 23
- SF₆ Gas Awareness 23
- SF₆ Gas Competence 23
- SF₆ European Certification – Preparatory Course 23
- Metal-Clad GIS – SF₆ Gas Handling & Associated Treatment Operations – Advanced 23
- Substation Condition Monitoring System Operation 23
- UHF Partial Discharge Monitoring for GIS Substations 23

## Secondary Technology

### Protection

#### Fundamentals
- Protection Technology – Principles 24
- Protective Relaying – Fundamentals 24
- System Protection – Workshop on a Real Time Digital Simulator RTDS 24
- Basics for Protection Engineers 33
- System Protection Communication of Power Transmission and Distribution Networks 33

#### SIPROTEC 4&5
- SIPROTEC 4 – Application and Exercises 25
- SIPROTEC 4 – Protection Devices for Service Engineers 25
- Generator/Dynamics and Protection – Workshop on a Real Time Digital Simulator RTDS 25
- SIPROTEC 4 – Protection Engineering Complete: 10 Days Certification Program 26
- SIPROTEC 4 – Busbar Protection 7S5 26
- SIPROTEC 4 – Distance Protection 7SA 26
- SIPROTEC 4 – Machine/Motor Protection 7UM & 7VE 27
- SIPROTEC 4 – Application and Exercises of Generator/Motor Protection 27
- SIPROTEC 4 – Differential Protection 7SD 27
- SIPROTEC 5 – Distance & Line Differential Protection 7SL 28
- SIPROTEC 4 – Overcurrent Protection 7SJ 28
- SIPROTEC 4 – Transformer Differential Protection 7UT 28
- SIPROTEC 5 – Transformer Differential Protection 7UT 29
- SIPROTEC 4 – Power System Protection – Basics 33
- SIPROTEC 4 – Power System Protection – Advanced 33
- SIPROTEC 4 – Protection & Control System Engineering 33
- SIPROTEC 4 – MV Protection & Control 33
- SIPROTEC 4 – HV Protection & Control 33
- Protection Technology – Additional Functions 34
- Protection Systems – Accessory Equipment 34
- Current and Voltage Transformers – Intensive Course 34
- SIPROTEC 4 – Transformer Protection & Control 34
- SIPROTEC – Guided Exercises 34
<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIPROTEC Compact</td>
<td>29</td>
</tr>
<tr>
<td>Protection Testing</td>
<td></td>
</tr>
<tr>
<td>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC</td>
<td>29</td>
</tr>
<tr>
<td>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC – Basics</td>
<td>34</td>
</tr>
<tr>
<td>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC – Advanced</td>
<td>34</td>
</tr>
<tr>
<td>DIGSI 4</td>
<td></td>
</tr>
<tr>
<td>DIGSI 4 – Basics</td>
<td>30</td>
</tr>
<tr>
<td>DIGSI 4 – Advanced</td>
<td>30</td>
</tr>
<tr>
<td>DIGSI 4 – IEC61850 and GOOSE Configuration</td>
<td>31</td>
</tr>
<tr>
<td>DIGSI 4 – CFC</td>
<td>34</td>
</tr>
<tr>
<td>DIGSI 5</td>
<td></td>
</tr>
<tr>
<td>DIGSI 5 – Basics</td>
<td>31</td>
</tr>
<tr>
<td>DIGSI 5 – Systems</td>
<td>31</td>
</tr>
<tr>
<td>DIGSI 5 – IEC61850 and GOOSE Configuration</td>
<td>32</td>
</tr>
<tr>
<td>DIGSI 5 – CFC</td>
<td>34</td>
</tr>
<tr>
<td>Protection Schemes &amp; Settings</td>
<td></td>
</tr>
<tr>
<td>Protection of Oil and Gas Power Networks – Part 1</td>
<td>32</td>
</tr>
<tr>
<td>Protection of Oil and Gas Power Networks – Part 2</td>
<td>32</td>
</tr>
<tr>
<td>Generator/Motor Protection – Design and Settings</td>
<td>35</td>
</tr>
<tr>
<td>Protection Schemes for Power Generation and Industry – Design and Settings</td>
<td>35</td>
</tr>
<tr>
<td>System Protection – Design and Settings</td>
<td>35</td>
</tr>
<tr>
<td>System Protection – Design and Settings – Intensive</td>
<td>35</td>
</tr>
<tr>
<td>SIGRA</td>
<td></td>
</tr>
<tr>
<td>SIGRA 4 – Efficient Interpretation of Fault Records</td>
<td>34</td>
</tr>
<tr>
<td>REYROLLE</td>
<td></td>
</tr>
<tr>
<td>REYROLLE – DAD-N (High Impedance Schemes)</td>
<td>35</td>
</tr>
<tr>
<td>REYROLLE – RECLOSER-M CONTROLLER 7SR224</td>
<td>35</td>
</tr>
<tr>
<td>REYROLLE – ARGUS 1 – ARGUS 6</td>
<td>35</td>
</tr>
<tr>
<td>REYROLLE – Itinerary DUOBAIS</td>
<td>35</td>
</tr>
<tr>
<td>REYROLLE – SOLKOR Rf Schemes</td>
<td>35</td>
</tr>
<tr>
<td>REYROLLE – ARGUS-M 7SR21, 7SR22</td>
<td>35</td>
</tr>
<tr>
<td>REYROLLE – ARGUS-C 7SR11, 7SR12</td>
<td>35</td>
</tr>
</tbody>
</table>
Substation Automation

**SICAM PAS**
- SICAM PAS – Basics 36
- SICAM PAS – Parameterization 36
- SICAM PAS – Automation with CFC, ST and SFC 36
- SICAM PAS – System Diagnosis and Trouble Shooting 37
- SICAM SCC – Configuring an Operator Station 37
- SICAM PAS – Complete 37

**SICAM RTU**
- SICAM 1703 – Basics 38
- SICAM 1703 – Service 38
- SICAM 1703 – Engineering 38
- SICAM 1703 – CAEx plus 39
- SICAM 1703 – Complete 39
- SICAM 1703 – Power Week 39
- SICAM 1703 Workshop – Configuration IEC60870-5-103 Interface 40
- SICAM 1703 Workshop – Configuration IEC61850 Interface 40
- SICAM CMIC – Smart Grid Solutions 40
- SICAM EMIC – WebParameterization 41
- Substation Automation Equipments:
  - 10 days Certification Program for Installation & Commissioning 41
- Ax 1703 – Basics for AK/AM/AMC 42
- Ax 1703 – Service for AK/AM/AMC 42
- Ax 1703 – CAEx II Implementation 42
- Ax 1703 – CAEx II Configuration 42
- Ax 1703 – Configuration for AK/AM/AMC 42
- SICAM TOOLBOX II – Basics 42
- SICAM 1703 Workshop – Configuration IEC60870-5-101/104 Interface 42
- SICAM 1703 Workshop – Configuration Profibus & Modbus Interfaces 42
- SICAM 1703 Workshop – Configuration Transmission and Storage of Disturbance Records with SICAM DISTO 42
- SICAM 1703 Workshop – Configuration of SICAM BC 43

**SICAM 230**
- SICAM 230 – Configuration (latest version) 41
- SICAM 230 Workshop – Network Monitoring with SICAM 230 NWM 43

**Bay Controller**
- SIPROTEC 4 – Engineering of Bay Controllers 6MD66 with IEC61850 – GOOSE Communication 43

**Substation Information**
- IEC61850 – The Standard for Substation Automation 43
- IT Networks – Automation 43
- IT Security – Automation 44
- IT Networks – Basics 44
- IT Security – Basics 44
- Telecontrol and Automation – Fundamentals 44
- Numerical Communication in Substations – Basics & Trends 44
- Communication Networks – Application in Power Transmission & Distribution 44

**Power Quality**
- Power Quality – SICAM PQS and SICAM PQ Analyzer 44
- SICAM Q80 – Application and Practice 45
- SIPROTEC 7KE85 – Fault Recorder 45
- Power Quality in Industrial Networks 45
Power System Simulation Software

PSS®E
- PSS®E – Power Flow and Steady State Analysis Using PSS®E 56
- PSS®E – Advanced Power Flow Using PSS®E 56
- PSS®E – Reactive Power Planning Using PSS®E 56
- PSS®E – Voltage Control and Reactive Power Planning Methods 57
- PSS®E – Integrating Renewables Using PSS®E 57
- Power Electronics in Transmission Systems (PETS) 57
- PSS®E – Dynamic Simulation Using PSS®E 58
- PSS®E – Optimal Power Flow 58
- PSS®E – Using Python to Integrate PSS®E Workflow 58
- PSS®E – Transmission Reliability Studies Using PSS®E 60
- PSS®E – Advanced Dynamic Simulation for PSS®E 60
- PSS®E – Model Writing for User Defined Models (UDMs) in PSS®E 60
- PSS®E – Fault Analysis 61
- PSS®E – Advanced Transmission Planning 61

PSS®SINCAL
- PSS®SINCAL – Basics 59
- PSS®SINCAL – Basics for Distribution Companies 59
- PSS®SINCAL – Smart Grid 59
- PSS®SINCAL – Dynamic Smart Grid Studies for Off-Grid Solutions 59
- PSS®SINCAL – Dynamics 61
- PSS®SINCAL – Probabilistic Reliability Analysis 61
- PSS®SINCAL – Harmonic Analysis 61
- PSS®SINCAL – Protection Suite 61
- PSS®SINCAL – Application & Data Integration and Workflow Automation 61
- PSS®SINCAL – Optimal Network Structures and Cost Analysis 61
- PSS®SINCAL – Advanced Power Flow Applications for Network Planning 62
- PSS®SINCAL – Advanced for Distribution Companies 62

PSS®NETOMAC
- PSS®NETOMAC – Basics 62
- PSS®NETOMAC – Advanced 62

PSS®General
- PSS®MUST – Using System Transmission Data for Decision Making 61
- NEVA – Small-Signal Stability Analysis 62
- GMB – Graphical Model Builder 62

Others
- Transient Analysis Using EMTP/ATP 62

Power System Operation
- Anti Disaster Training I 63
- Anti Disaster Training Network Control for Management 63
- Understanding System Losses for Utility Management 63
- Market Operations and Power System Scheduling 63
- SCADA System – Spectrum Power CC – Basic Level 64
- SCADA System – Spectrum Power CC – Intermediate Level 64
- Electrical Power Issues in Nigeria for Bankers, Investors and Professionals 64
- SIGUARD PDP – Basics 64
- SIGUARD DSA – Basics 64
- SIGUARD PSA – Basics 64
- Wide-Area Measurement – Instrument-, Protection- and Control Technology of the Future 64
- Power System Dynamics – Stability and Oscillations 64

Course Index per region 2013 65
Elevate your expertise to the next level:
■ Leading experts certified as trainers
■ Small groups of students
■ Practice-oriented training courses
■ Real-world relevance
■ High-quality, comprehensive course materials

Siemens Power Academy TD – at a glance

Our offer
The Siemens Power Academy TD offers professional training in the areas of power transmission and distribution as well as industrial and commercial power consumption, including smart grids. Siemens Power Academy TD has modern training centers worldwide, with offices in Europe, the United States, South America, Asia, and Africa. Our objective is to provide our customers – regardless of location – with access to Siemens' expert knowledge and capabilities. Move ahead of the competition by entering our network of expertise! Thousands of participants from more than 90 countries have benefited from Siemens' more than 160 years of global experience.

Certified trainers from Siemens businesses employ the latest teaching methods to guarantee you learn practical skills quickly and retain what they learn over the long term.

To offer a superior educational experience, we place the utmost importance on ensuring ongoing quality control and constantly developing the quality and content of our training program.

Professionally prepared lecture notes, slides and course materials ensure that even after the training is complete, you will always have the key information at your fingertips.

Regular feedback from our participants is a core component of our quality control and the basis for a consistently high quality of continuing education.

Our strength: flexibility
■ Standard training
The ideal starting point: You benefit by learning alongside industry professionals from other companies on fixed dates for optimal cost-effectiveness.

■ Customized training
Maximum personalization: You define the content, the product version and the time and length of the sessions.

■ Practice-oriented workshops
For advance students: Expand your own basic knowledge of energy technology and learn to use specific products and systems.

■ Training programs (Curricula)
Certified knowledge: Follow an integrated concept to systematically build up your expertise in three levels (Associate, Advanced, Expert) and receive a certificate for each test you pass.

■ Combined technology and business learning
Highly practice-oriented: Interdisciplinary courses are the ideal preparation for applying what you have learned to your day-to-day work.

■ Personal consultation
Evaluate your level of knowledge: We will help you assess where you are now and which training program will benefit you the most.

■ Training development
For curriculum development: We will provide you with expert assistance in developing your own workshops.
Our powerful portfolio
Siemens Power Academy TD offers you a comprehensive training program covering General Power Engineering, primary and secondary technology, Software tools as well as various Smart Grid topics.
In addition to our standard training portfolio, which you can find in this catalog, we also offer customized training that will support you in all of your competence development needs. Please contact us and we will be happy to offer you more information.

<table>
<thead>
<tr>
<th>Training Portfolio</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Technology</strong></td>
<td>Medium &amp; High Voltage Technology, Transformers</td>
</tr>
<tr>
<td><strong>Secondary Technology</strong></td>
<td>Protection, Substation Automation &amp; Information, Power Quality</td>
</tr>
<tr>
<td><strong>Power System Engineering</strong></td>
<td>Network planning, Smart Grid, Renewable Integration</td>
</tr>
<tr>
<td><strong>Power System Simulation Software</strong></td>
<td>PSS®E, PSS®SINCAL</td>
</tr>
</tbody>
</table>

Our core competence
The right mix of theory and practice
In the Siemens Power Academy TD training programs, theory and practice go hand-in-hand. This means that theoretical approaches are always supplemented by practical exercises on real devices and systems. To make that possible, the training centers use original components, devices, and systems from the Transmission and Distribution product portfolio. This hands-on training principle guarantees a maximum learning effect.

Training portfolio of the Siemens Power Academy TD
Curriculum – our competence development program

Well-trained employees are vital for successful companies. Challenges such as the rapid transformation of economic, environmental and technological advancements require employees to contiguously and systematically improve skills and knowledge. To be a reliable resource and realize our potential, we all must take a personal stake in planning development activities that will contribute to our personal and organization’s success.

To help you and your organization in this effort, Siemens Power Academy TD has designed a competency-based development program to guide your learning plan.

In contrast to simply selecting individual training seminars, our curriculum provides you with incremental learning through a structured, logical combination of classes on a specific topic. This allows the necessary skills and abilities to be systematically developed.

Each curriculum consists of a progressive set of classes with three qualification levels: Associate, Advanced, and Expert. Each level concludes with a learning assessment to ensure that the training was successful.

We offer you a wide variety of curricula including Protection Systems, Substation Automation, Power Systems Technology, Distribution Systems Technology, and PSS® Network Planning and Analysis.

Please visit our website for an overview of our selection of curricula: siemens.com/poweracademy/curricula
How to obtain certification

Step 1
Selection of the required curriculum and qualification level
- Students and supervisors review and select the curriculum content and define the required qualification level. Siemens Power Academy TD is happy to assist with this process.
- Now you are ready to choose your classes. To register for a class, please visit www.siemens.com/poweracademy or contact your regional training center for assistance in booking your training.

Step 2
Participation in training
- Students attend all required classes.
- The order of courses within a qualification level is a recommendation only, and can be altered by the trainee.

Step 3
Testing
- Students register for and complete all tests for the selected level of the required curriculum
- The test can be completed online.
- Students who pass the e-test each certification program has a minimum achievement levels for e-tests. The qualification certificate can be printed out after the e-test.
- If the student is not able to achieve the required passing grade on their first attempt, they can contact their regional training center to re-test or re-take the course.

Step 4
Certification
- Once the student have completed the requirements for the certification, complete the certificate application form for a final evaluation. Siemens Power Academy TD staff members are available to assist.
- If all the criteria for the curriculum certification have been met, Siemens Power Academy TD issues the certificate. Product and software-based certifications are valid for a specified period of time before refresher courses are required for certification maintenance.

Our curricula
- Certificate in Power Systems Technology – Associate, Advanced and Expert
- Certificate in Network Planning and Analysis – Advanced and Expert
- Certificate in Distribution System Technology – Advanced and Expert
- SIPROTEC Protection – Service Power Transmission & Distribution
- SIPROTEC Protection – Service Power Generation and Industry
- SIPROTEC Protection – Planning Power Transmission & Distribution
- SIPROTEC Protection – Planning Power Generation and Industry
- SICAM PAS Substation Automation
- SICAM 1703 Substation Automation
- Engineering Substation Control Systems
- SICAM 230 SCADA
- SIPROTEC Bay Controller
Siemens Power Academy TD – Our course portfolio


For most of the courses you will find detailed information on learning objectives, content, and target audiences as well as prerequisites that participants should have in order to get maximum benefit from the training.

Additional courses are listed with brief descriptions. For more details on these as well as other courses, please visit our Web site at: siemens.com/poweracademy.

We are pleased to support you in your professional development, and to help you determine which training courses will be of the greatest value to you.

We look forward to meeting you at one of our training sessions!

Contact details:

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E-mail: poweracademy.ic-sg@siemens.com
Phone: +49 911 433 7415

USA:
E-mail: power-academy.us@siemens.com
Phone: +1 518 395 5005

Further local contact details you will find on page number 86 / 87.

Explanation of symbols

Part of a curriculum; e-test required for the certificate

Country

AT = Austria  CO = Colombia  DE = Germany  ES = Spain  FR = France  GB = United Kingdom  IN = India

NG = Nigeria  NL = Netherlands  NO = Norway  RU = Russia  TR = Turkey  US = United States

de = German  en = English  es = Spanish  fr = French  nl = Dutch  no = Norwegian  ru = Russian  tr = Turkish

MLFB-Number
Price:
Booking information
MV Switchgear – Technical Information (AIS & GIS)

Booking code: MV-INFO

Training objectives
The participants will get information about air-insulated and gas-insulated medium voltage circuit breaker switchgear and medium voltage ring-main units. It conciliates the most important technical knowledge concerning construction, operation and maintenance. Additionally a safe handling of the insulating medium SF6 will be pointed out.

Target audience
Operation and service personnel, installation and commissioning personnel, interested parties from sales and project processing.

Prerequisites
Knowledge of medium voltage technology.

Main features
- System philosophy
- Construction of products
- Operating sequences
- Commissioning and maintenance
- Locating and rectifying of faults
- Safety regulations
- Elaboration of knowledge through practical exercises on cubicles
- SF6 in the medium voltage switchgear

Notes
The training program can also be tailored to special customer needs if requested.

<table>
<thead>
<tr>
<th>Country</th>
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</tr>
</thead>
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<td>NG</td>
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<td>IN</td>
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<td>US</td>
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MV Switchgear – Technical Information (Switchgear-Specific)

Training objectives
The participants will understand the principles of air insulated medium voltage switchgear systems and will gain ability to operate and maintain in safe conditions.

Target audience
Operation and service personnel, interested parties from sales and project processing.

Prerequisites
Basic technical knowledge on MV Switchgear operation.

Main features
- Training on one of the products of SIMOPRIME, NXAIR World, 8BT1, 8BT2, 8BT3
- General information on AIS technology and IEC Standard
- Reading drawings, electrical diagrams
- Design and features of the components
- Design and features of product in question
- Operation instructions
- Maintenance and troubleshooting instructions
- Quality processes
- Practical application on panel

We offer trainings to the following circuit breaker switchgear:
- MV Switchgear – Recloser 3AD Product Training (TIC-RECLOS)
- NXAIR World (TIC-NXAIRW)
- NXAIR M World (TIC-NXAIM)
- NXAIR P (TIC-NXAIRP)
- SIMOPRIME World (TIC-SIMOP)
- 8BT1 (TIC-8BT1)
- 8BT2 (TIC-8BT2)
- 8BT3 (TIC-8BT3)
- MV Panel (8BK80) (TIC-8BK80)
- MV Panel (8BK80 Plus) (TIC-8BK80PL)
- MV Air Insulated Switchgear (TIC-AISGEN)
- MV Switchgear Type LMT/LMVP (TIC-LMTVP)
- MV Switchgear Type Hadrian (TIC-HADRIAN)
- MV Switchgear Reyrolle - Life Extension (TIC-REYROLL)

Notes
The training program will be tailored to special customer needs if requested. Please contact us!

Duration
Depends on type of switchgear

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<th>Country</th>
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MV Switching Devices & Switchgear – Basics & Application

Booking code: MV-SWITCH

Training objectives
The participant will be familiarized with functions and selection criteria of medium voltage devices as well as switchgear with standards, types and planning criteria.

Target audience
Technical staff involved in sales and project planning, for power distribution systems up to 36 kV.

Prerequisites
Basic technical knowledge.

Main features
- Medium voltage switching devices:
  - Design Function, fundamental characteristics
  - Selection criteria
  - Switching duties
- Medium voltage switchgear installations:
  - Planning of switchgear
  - Busbar systems
  - Building specifications
  - Personnel safety
  - Switchgear types
  - Circuit breaker switchgear
  - Load-break switchgear
  - Voltage detecting systems
  - Handling of SF6 Gas
  - Connection and termination systems
  - Safety accessories
- Visit to Siemens switchgear factory Frankfurt/Main (only courses held in Germany)
  - Along with the theoretical part, the training program also includes a tour of the Frankfurt manufacturing plant. This enables the participants to gain an insight into the production process and allows them to perform practical exercises on the switchgear.

Notes
The training program will be tailored to special customer needs if requested. Please contact us!

Duration
Depends on type of switchgear

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<tr>
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</tr>
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(Net prices)
MV – Assembly and Installation Training

Training objectives
The training imparts profound knowledge about the layout, operation, installation and attendance (current state – control) in the primary parts of the according switchgears. After successful completion of the course, the participants receive a certificate that authorizes them to work self-responsibly on switchgears (primary parts).

Target audience
Assembly and installation staff.

Prerequisites
Basic knowledge of assembly technique.

Main features
- Theory (ratings, typicals, layout, circuit breaker modules, switches)
- Operation (Operator controls, drive mechanism, operating procedures, interlocks)
- Installation (installation of panel/block interconnecting equipment, busbar installation; installation of the voltage transformer)

We offer trainings for the following switchgears:
- NXAIR M (MV-NXAIRM)
- NXPLUS C (MV-NXPLUSC)
- NXPLUS (MV-NXPLUS)
- NXAIR P (MV-NXAIRP)
- 8DA/8DB (MV-8DA8DB)
- 8DJ10 (MV-8DJ10)
- 8DH10 (MV-8DH10)
- 8DJH (MV-8DJH)
- SIMOSEC (MV-SIMOSEC)
- SIMOPRIME (MV-SIMOPRI)
- 8BT1 (MV-8BT1)
- 8BT2 (MV-8BT2)
- 8BT3 (MV-8BT3)
- NXAIR World (MV-NXAIRW)

Notes
This certificate is valid for 3 years.

Duration
1–4 days depending on the type of switchgear.

Price on request

MV Equipments – Certification Program for Operation & Maintenance

Booking code: MV-CERTIF

Training objectives
The participants will be familiarized with selection, engineering, operation and maintenance of Medium voltage switchgears and power transformers.

Target audience
Supervisors, engineers, field personal, technicians and specialists involved in operation, planning, design, maintenance and servicing of switchgears, transformers and protecting equipments from electric utilities and the industrial sector.

Prerequisites
Basic knowledge of electrical engineering and first relevant exposure to MV equipments.

Main features
- Technical information course for medium voltage switchgears and switching equipments: selection, planning and design functions, locating and rectifying faults, safety regulations, handling of SF6 gas
- Technical information course for operating personnel-power transformers: selection, planning and design functions, assembly and inspection, safety regulations
- Medium voltage switchgears- NSPLUSC, 8DA, operation and maintenance: fundamental functions and characteristics, installation, operation and maintenance of breaking devises, etc.
- Power and distribution transformers-technical workshop: operation and maintenance
- Technical workshop-life cycle management
- Protection of Transformers

Notes

525,000 NGN

MV – Rural Electrification Techniques for Engineers & Technicians

Booking code: MV-RURAL

Training objectives
The participants will gain knowledge of the commissioning and maintenance of distribution transformers, their cooling methods and block distribution stations. They will be able to, identify, use and maintain different types of cables, carry out cable jointing and cable termination, conduct tests on cables, carry out installation earthing. They will be able to install, commission and maintain basic supply and lighting units using Photovoltaic.

Target audience
Engineers, junior engineers, field personal and technicians involved in operation, planning, design, maintenance and servicing of rural electrification systems.

Prerequisites
Basic knowledge of electrical engineering.

Main features
- Transformer installation and maintenance,
- Block distribution stations/Ring Main Units (including different types of switchgears)
- Cable splicing and termination
- System and installation earthing
- Photo voltaic power supply and lighting units

Notes

525,000 NGN
MV Power Supply Systems – Process-Oriented Engineering

Training objectives
This course conciliates a basic knowledge of power systems and systems engineering enabling participants to work out reliable and cost-effective solutions to problems that are encountered in industrial processes.

MV – Partial Discharges

Booking code: MV-PARTIAL

Training objectives
In this theoretical - practical course, the participants will acquire the necessary knowledge for performing partial discharge test, as well as understanding basic concepts necessary for interpretation and analysis of the results obtained in the tests, tending to the development of a suitable diagnosis of equipment condition.

MV Switchgear – Maintenance

Training objectives
The participants receive a fundamental training course in our training centers or directly on-site, especially created for your circuit breaker installation.

Target audience
The training course is designed for maintenance technicians, technical department foremen and engineers.

Prerequisites
Technical fundamental knowledge in operation of switchgears.

Main features
- Switchgear: 
  - Ratings, typicals, layout
  - Operator controls, drive mechanism, operating procedures
  - General visibility control of circuit breakers
  - Mechanical and electronic function control
  - Verification of circuit breakers and its driver
  - Control of all bolted connections and its contact system
  - Lubrication according to operating instructions
  - Recognizing damaged drive components
- Substation:
  - Rotational maintenance work according to manufacturer information

Notes
This course is arranged according to your switchgear devices and previous knowledge. Please contact us!

MV – Cable Testing & Diagnostics

Booking code: MV-CABLE

Training objectives
In this theoretical – practical course, the participants will acquire the necessary knowledge for performing diagnostic cable tests, as well as understanding basic concepts necessary for interpretation and analysis of the results obtained in the tests and locating incipient faults.

Notes
This course is arranged according to your switchgear devices and previous knowledge. Please contact us!

MV Assembly and Installation Training – Refresher

Training objectives
This training offers knowledge about the most up-to-date development of different switchgears: NXPLUS C (MV-RPLUSC) NXPLUS (MV-RPLUS) 8DA/8DB (MV-R8DAB10)
High Voltage – Fundamentals

HV Switching Technology – General Information

Booking code: HV-INFO

Training objectives
This training informs on construction, function, service and maintenance of Siemens SF₆-switchgear and equipment. It is basically tailored for those who need a technical overview on circuit breakers and gas insulated switchgear (GIS) but don’t need to assemble/maintain.

Target audience
Persons involved in planning, application engineering, coordination and purchasing etc., i.e. persons who need general knowledge of performance and operation of the circuit breakers or system components of SF₆-insulated switchgear, but who do not personally carry out any work on this equipment.

Prerequisites
General knowledge of electrical engineering and mechanical engineering in addition to basic breaker and switchgear functions.

Main features
- Individual modules of switchgear Interaction of modules
- Basic mode of operation of the circuit breaker interrupter unit (puffer/selfcompression) and the functions of the individual components
- Basic mode of operation of the drive systems and its components (Hydraulic/spring mechanism)
- Control and monitoring of the switchgear
- Limit values and their backgrounds
- Environmental protection
- It is also scheduled that the participants become familiar with the production plants

HVDC and FACTS – Benefits of Power Electronics

Booking code: HVDC/FACTS

Training objectives
The participant will understand power electronics in high voltage and medium voltage systems with a focus on HVDC and FACTS and their applications. Information on the technical features of different solutions, HVDC and FACTS system behavior, design of components, operation and maintenance requirements will be given.

Target audience
Engineers and managers in utilities, administration, transmission companies, power producers, consultants, design institutes and equipment manufacturers who are responsible for sales and marketing, consulting, planning and design of transmission projects, and all technically interested people in general.

Prerequisites
Basic knowledge of electrical and power engineering.

Main features
- Trends in power systems
- Understanding power transmission
- Power quality – terms and definitions
- Trends in AC and DC transmission
- Introduction in power electronic solutions
- HVDC and FACTS – basics and trends
- VSC Technology for HVDC, FACTS and tractions supplies
- Power electronics for distributions and industrial systems
- Costs of high voltage transmission
- Projects, studies and applications
- Outlook: PEBBs, GIS/HIS, GIL, H 2 and HTSC
- Training on computer and real-time simulator
- Blackouts 2003 – “Lessons Learned?”

HV Overhead Transmission Line Design – Fundamentals

Booking code: HV-OVHDLIN

Training objectives
The participant will understand the design aspects of 69-765 kV transmission lines with special emphasis on component parts of lines and their functions, insulation, electrical environmental effects of fields and noise, selection of conductors and structures, and integration into an overall design.

Target audience
Electrical, mechanical and civil engineers who need to understanding of the design of 69-765 kV transmission lines including the basics of component parts of lines and their functions, insulation, electrical environmental effects of fields and noise, selection of conductors and structures, and integration into an overall design.

Main features
- Line design overview
- Power system constraints
- Environmental effects
- Voltage stresses
- Insulation coordination
- Conductor vibrations
- Catenaries
- NESC overview, design criteria and thermal ratings
- Insulators and hardware
- Structures/Foundations
- Radio and TV interference, tower grounding, noise
- Project management of line design and construction
- Voltage uprating
- Thermal uprating
- Power lines and pipeline

<table>
<thead>
<tr>
<th>Booking Code</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>9CA4130-0HE00-0DA1</td>
<td>HV Switching Technology – General Information</td>
<td>1,200 EUR</td>
</tr>
<tr>
<td>9CA4110-0NE00-0DF7</td>
<td>HVDC and FACTS – Benefits of Power Electronics</td>
<td>2,300 EUR</td>
</tr>
<tr>
<td>9CA4110-0NE00-0DF7</td>
<td>HV Overhead Transmission Line Design – Fundamentals</td>
<td>2,825 USD</td>
</tr>
</tbody>
</table>
HV Switching Technology GIS – Technical Information

Booking code: HV-GIS

Training objectives
By covering the most important technical knowledge on high voltage gas-insulated switchgear, the participant will be able to describe possible faults on SF₆-insulated switchgear and to establish their causes.

Target audience
Persons who participate, should be familiar with switchgear technology would be advanta-

Main features
Conveying detailed knowledge of the technology of specific switchgear types
– 8D-type
– The different types of switchgear
– The basic mode of operation of the spring drive system
– Control and monitoring of the switchgear
– (The limit values and background)
– The interlocking system of the modules
– Maintenance and service aspects of the Switchgear
– Environmental protection aspects of SF₆

Metal-Clad GIS – Current 8D Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OMGIS

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the above mentioned metal-clad switchgear, in compliance with safety regulations. The trainee will be capable of preventive product-related maintenance without executing operations. He will be familiar with the product and tools and will be capable of interpreting data (circuit breaker response time, gas analysis, etc.).

Target audience
The training course is designed for maintenance technicians, technical department foremen and high voltage engineers.

Prerequisites
Major knowledge of power engineering. Experience with switchgear technology would be advanta-
geous.

Main features
– Conveying detailed knowledge of the technology of specific switchgear types
– SF₆ gas
  – General information, properties
  – Pressure, density switches
  – Compartmenting, compartment treatment
  – Seal-tightness and hygrometry
  – Environment and safety

– Circuit breaker design and operation
  – Earthing switches
  – Disconnectors, instrument transformers
  – Insulators, busbar, connectors
  – Breaking chamber
  – Cable box
  – Workshop
    – Operations (local, remote and manual)
    – The various alarms (SF₆, hydraulic, electric)
  – Product training
    – Training on one of the 8D product range: 8DN9-0, 8DQ1, 8DN8-2, 8DN8-4

AIS Current 3AP – 3AQ Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OM3AP/Q

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and mainte-

Target audience
The training course is designed for maintenance technicians, technical department foremen and high voltage engineers.

Prerequisites
The candidate must have acquired basic maintenance skills (i.e. identify equipment technology and structures). He must also be aware of safety-related risks and be capable of answering technical questions.

Main features
– Review of AIS switchgear technology
– SF₆ gas:
  – General information, properties
  – Seal-tightness and hygrometry
  – Environment and safety
  – Pressure, density switches
– Circuit breaker design and operation:
  – Operating mechanisms
  – Earthing switches
  – Disconnectors, instrument transformers
  – Breaking chamber
  – Principles and operation of hydraulic operating mechanisms
– Workshop:
  – Operation of the SF₆ filling kit
  – Leakage detection
– Product Training:
  – Training on one of the products of the 3AP – 3AQ product range: 3AP1-72.5, 3AP1-245, 3AQ
## Further High Voltage Trainings

### HVDC and FACTS – Workshop
<table>
<thead>
<tr>
<th>Booking code: HVDC-WS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>The participant will understand power electronics in high voltage and medium voltage systems with a focus on HVDC and FACTS and their applications. Information on the technical features of different solutions, HVDC and FACTS system behavior, design of components, operation and maintenance requirements.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
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<tr>
<td>650 EUR</td>
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</tbody>
</table>

### HV Substation Design – Basics
<table>
<thead>
<tr>
<th>Booking code: HV-SUBST</th>
</tr>
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<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>The participants will get a basic understanding of all aspects of substation design by covering fundamental aspects as a basis for further detailed study in any specific topic associated with substation design.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
</tr>
<tr>
<td>485 GBP</td>
</tr>
</tbody>
</table>

### HV Switchgear Design – Basics
<table>
<thead>
<tr>
<th>Booking code: HV-SWITCH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>The participants will get a basic understanding of all aspects of switchgear design by covering fundamental aspects as a basis for further detailed study in any specific topic associated with switchgear design.</td>
</tr>
<tr>
<td><strong>Prices</strong></td>
</tr>
<tr>
<td>1,140 GBP</td>
</tr>
<tr>
<td>10,000 INR</td>
</tr>
<tr>
<td>1,825 USD</td>
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</tbody>
</table>

### HV Switching Technology – Introduction
<table>
<thead>
<tr>
<th>Booking code: HV-INTRO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>The participant will gain knowledge in HV Switching Technology and become familiar with switching devices, use and applications.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
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<tr>
<td>1,825 USD</td>
</tr>
</tbody>
</table>

### Hydraulic Knowledge & Maintenance – Fundamentals
<table>
<thead>
<tr>
<th>Booking code: HV-HYDRAUF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>To study the various types of hydraulic operating mechanisms with which AIS and vintage GIS circuit breakers are equipped and become familiar with the function of each hydraulic component and the adapted maintenance.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
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<tr>
<td>Price on request</td>
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</table>

### HV Primary Test Performing and Test Equipment
<table>
<thead>
<tr>
<th>Booking code: HV-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>In this theoretical – practical course, the participants will acquire the necessary knowledge for performing power primary equipment diagnosis, commissioning and maintenance test as well as understanding basic concepts necessary for interpretation and analysis of the results obtained in the tests, tending to the development of a suitable diagnosis of equipment condition.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
</tr>
<tr>
<td>1,300,000 COP</td>
</tr>
</tbody>
</table>

### Metal-Clad GIS – Vintage Product Range – Operation & Maintenance – Intermediate
<table>
<thead>
<tr>
<th>Booking code: HV-OMMGISV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>Acquisition of the &quot;intermediate level&quot; technical knowledge required for operation and maintenance of the vintage GIS switchgear product range, in compliance with safety regulations.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
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<tr>
<td>Price on request</td>
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</tbody>
</table>

### Metal-Clad GIS – Current Product Range – Operation and Maintenance – Advanced
<table>
<thead>
<tr>
<th>Booking code: HV-OMMGOS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>Acquisition of the &quot;advanced level&quot; technical knowledge required for operation and maintenance of the above mentioned metal-clad switchgear, in compliance with safety regulations.</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td>To be defined after consultation.</td>
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<tr>
<td><strong>Price</strong></td>
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<tr>
<td>Price on request</td>
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</tbody>
</table>

### Metal-Clad GIS – Current BD Product Range – Presentation
<table>
<thead>
<tr>
<th>Booking code: HV-PRESENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>To present new equipment to operation and maintenance personnel. Acquire the knowledge relating to its specificities, main characteristics and metal-clad switchgear maintenance program.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
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<tr>
<td>Price on request</td>
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</tbody>
</table>

### Metal-Clad GIS – Vintage Product Range – Operation & Maintenance – Advanced
<table>
<thead>
<tr>
<th>Booking code: HV-OMGISVI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training objectives</strong></td>
</tr>
<tr>
<td>Acquisition of the &quot;advanced level&quot; technical knowledge required for the operation and maintenance of the above mentioned metal-clad switchgear, in compliance with safety regulations.</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td>To be defined after consultation.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
</tr>
<tr>
<td>Price on request</td>
</tr>
</tbody>
</table>
HV GIS Switchgear Reyrolle Type YG 420/550 kV

Booking code: HV-YG

Training objectives
The participant will get a thorough understanding of YG 420/550 kV gas-insulated switchgear.

2,140 GBP

HV GIS Circuit Breaker Reyrolle Type SPD2 420/550kV

Booking code: HV-SPD2

Training objectives
The participants will get a thorough understanding of SPD2 420/550 kV SF₆ circuit breaker.

1,400 GBP

HV Switching Technology – 3A

Booking code: HV-3A

Training objectives
By covering the most important technical knowledge on high voltage gas-insulated switchgear (Type 3A), the participant will be able to describe possible faults on SF₆-insulated switchgear and to establish their causes.

9CA4130-0HE00-0DA4
2,800 EUR

HV AIS Circuit Breaker Reyrolle Type SPL2 420/550kV

Booking code: HV-SPL2

Training objectives
The participants will get a thorough understanding of SPL2 420/550 kV SF₆ circuit breaker.

850 GBP

AIS Vintage SB6 Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OMAIS

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the SB6 AIS circuit breakers, in compliance with safety regulations.

Duration
To be defined after consultation.

Price on request

Price on request

Price on request


Booking code: HV-OMAISVI

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of FA AIS circuit breakers range, in compliance with safety regulations.

Price on request

Price on request

Price on request

Price on request

AIS Vintage SB6 Product Range – OP & MO Product Range – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the “advanced level” technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Price on request

Price on request

Price on request

Price on request

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAUI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques.

Price on request

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced

Booking code: HV-VINTAGE

Training objectives
Acquisition of the “advanced level” technical knowledge required for operation and maintenance of FA AIS circuit breakers range, in compliance with safety regulations.

Price on request

Price on request

Price on request

Price on request


Booking code: HV-OMAIS

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the SB6 AIS circuit breakers, in compliance with safety regulations.

Duration
To be defined after consultation.

Price on request

Price on request

Price on request

Price on request

AIS Vintage SB6 Product Range – Operation & Maintenance – Intermediate

Booking code: HV-OMAIS

Training objectives
Acquisition of the “intermediate level” technical knowledge required for operation and maintenance of the SB6 AIS circuit breakers, in compliance with safety regulations.

Duration
To be defined after consultation.

Price on request

Price on request

Price on request

Price on request

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAUI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques.

Price on request

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the “advanced level” technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Price on request

Price on request

Price on request

Price on request

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAUI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques.

Price on request

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the “advanced level” technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Price on request

Price on request

Price on request

Price on request

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAUI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques.

Price on request

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the “advanced level” technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Price on request

Price on request

Price on request

Price on request

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAUI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques.

Price on request

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the “advanced level” technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Price on request

Price on request

Price on request

Price on request

Hydraulic Knowledge & Maintenance – Intermediate

Booking code: HV-HYDRAUI

Training objectives
To study a method enabling hydraulic failure detection on maintenance circuit breakers. Learn to replace standard hydraulic components. Study and execute functional circuit breaker tests. Acquire basic stainless steel tube bending techniques.

Price on request

Price on request

Price on request

Price on request

Upgrading Oil Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation & Maintenance – Advanced

Booking code: HV-UPGR

Training objectives
Acquisition of the “advanced level” technical knowledge required to execute corrective sealtightness operations on minimum oil circuit breakers (MOCB). At the end of the training course, the candidate will be capable of participating in a disassembly operation, of the corrective maintenance type, with some autonomy.

Price on request

Price on request

Price on request

Price on request
**Distribution Transformers – Basics and Operation**

**Booking code:** TR-DT

**Training objectives**
This course supplies a basic understanding of a transformer. Presentations, training exercises and experiments carefully illustrate the characteristic properties of transformers, examples on distribution transformers (DT).

**Target audience**
Employees who would like to be informed about general knowledge of functionality and operation of a transformer.

**Prerequisites**

**Main features**
- General transformer overview
  - Transformers and reactors in transmission and distribution networks
  - Transformer standards
  - Transformer technology
  - Electrical basic design, explained on a single phase transformer, measuring and calculation ratio
  - Introduction to 3 phase transformers
  - Mechanical design of a power transformers
- Transformer components
  - Voltage regulation with tap changers
  - External connections
  - Introduction to cooling equipment
  - Overview control and protection devices
- Transformer in service
  - Introduction to safety policies
  - Transport and checking after delivery
  - Overview of electrical measurements during commissioning
  - Maintenance
  - Condition assessment and on-site diagnostics
  - Oil regeneration and drying

900,000 COP

9CA4130-0TE00-0DA4

1,200 EUR

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**Power Transformers – Basics and Operation**

**Booking code:** TR-PT

**Training objectives**
This course supplies a furthermore understanding of a transformer. Presentations, training exercises and experiments carefully illustrate the characteristic properties of transformers.

**Target audience**
Employees who would like to be informed about further knowledge of functionality and operation of a transformer.

**Prerequisites**
Basic knowledge of electrical engineering. Fundamentals of AC and DC circuits. Extended knowledge to measuring electrical variables.

**Main features**
- General transformer overview
  - Transformers and reactors in transmission and distribution networks – final exercises
  - Transformer technology
  - advanced electrical design, measuring winding resistance and no load response
  - Autotransformers
  - Vector groups
  - Advanced electrical design, response under load condition
  - Short circuit characteristics
  - Efficiency and transformer loss
  - Measuring on different vector groups
- Transformer components
  - Voltage regulation with tap changers – final questions
  - Cooling equipment, troubleshooting using circuit diagrams
  - Working with control and protection devices
- Transformer in service
  - Safety policies – final questions
  - Installing
  - Oil analysis
  - Oil filling
  - Commissioning
  - Insulation tests
  - Dielectric tests
  - Maintenance and troubleshooting
  - Inspection tasks
  - Advanced condition assessment and fault scenarios
  - Overload and emergency operation

2,399 USD

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**Distribution Transformers – Grounding and Protection**

**Booking code:** TR-DGRDPRO

**Training objectives**
The primary objective of this class is to improve the participants understanding of the distribution system including primary and secondary systems, allowable connections, connections to be avoided, distribution system grounding types and overcurrent protection devices and applications.

**Target audience**
Employees who would like to be informed about further knowledge of functionality and operation of a transformer.

**Prerequisites**
Basic knowledge of electrical engineering. Fundamentals of AC and DC circuits. Extended knowledge to measuring electrical variables.

**Main features**
- General transformer overview
  - Transformers and reactors in transmission and distribution networks – final exercises
  - Transformer technology
  - advanced electrical design, measuring winding resistance and no load response
  - Autotransformers
  - Vector groups
  - Advanced electrical design, response under load condition
  - Short circuit characteristics
  - Efficiency and transformer loss
  - Measuring on different vector groups
- Transformer components
  - Voltage regulation with tap changers – final questions
  - Cooling equipment, troubleshooting using circuit diagrams
  - Working with control and protection devices
- Transformer in service
  - Safety policies – final questions
  - Installing
  - Oil analysis
  - Oil filling
  - Commissioning
  - Insulation tests
  - Dielectric tests
  - Maintenance and troubleshooting
  - Inspection tasks
  - Advanced condition assessment and fault scenarios
  - Overload and emergency operation

1,300,000 COP

9CA4130-0TE00-0DA5

1,200 EUR

(Net prices)
# EHV, HV and MV Substations

**Overview: Arrangement, Protection, Control and Communication System**

**Booking code:** SUB-SCHEME

**Training objectives**

To present the different types of High, Extra-High and Medium voltage electrical substations, configuration schemes used in power generation, transmission and distribution, application and technical – economic comparison.

| 1,300,000 COP |

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# SF₆ Gas Awareness

**Booking code:** SF6-AW

**Training objectives**

Participants will receive a basic level of SF₆ awareness as required for those personnel who have some involvement with SF₆ filled equipment, or operate in areas where SF₆ in containers or SF₆ filled equipment is present. The personnel are not directly involved in ‘gas handling’ or operation of the equipment.

| 225 GBP |
| 215 EUR |

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# SF₆ Gas Competence

**Booking code:** SF6-COMP

**Training objectives**

Participants will receive the operational training which complies with EC 305/2008 and is accredited by "Energy & Utility Skills" the UK sector skills council. The training includes the full requirements of those involved in the installation, operation and maintenance of SF₆ gas filled high voltage switchgear.

**Notes**

Modules can be tailored to specific customer requirements.

| 920 GBP |
| 1,250 EUR |

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# SF₆ European Certification – Preparatory Course

**Booking code:** SF6-PREP

**Training objectives**

Train the participants, in compliance with the European decrees in EC305/2008, to acquire the authorization required to handle SF₆ gas during SF₆ treatment operations. Theoretical and practical training. Training Center is accredited by Ministry of the Sustainable Development and Industry.

**Notes**

Modules can be tailored to specific customer requirements.

| Price on request |

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# Metal-Clad GIS – SF₆ Gas Handling & Associated Treatment Operations – Advanced

**Booking code:** SF6-GIS

**Training objectives**

Acquisition of "advanced level" in the treatment operations of the SF₆ compartments of high voltage metal-clad equipment.

**Notes**

Modules can be tailored to specific customer requirements.

| Price on request |

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# SF₆ European Certification – Preparatory Course

**Booking code:** GIS-UHF

**Training objectives**

The course will give a thorough understanding of the theory and application of Ultra High Frequency monitoring of GIS equipment and the operation of either portable or continuous monitoring systems.

| 980 GBP |

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# Substation Condition Monitoring System Operation

**Booking code:** COND-NONIT

**Training objectives**

Participants will be trained in operation and application of Siemens substation monitoring systems.

| 520 GBP |

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# (Net prices)
Protection – Fundamentals

Protection Technology – Principles

Booking code: PR-PRIN

Training objectives
The participants will learn about basics of possible applications, principles of operation and the overall concept of the most important protection devices.

Target audience
Employees of power supply utilities and the industrial sector who are familiar with the planning, commissioning and maintenance of power system protection equipment.

Prerequisites
Basic knowledge of electrical engineering.

Main features
- Protection principles
- Earth fault
- Current transformer dimensioning
- Overcurrent-time protection
- Distance protection
- Line and transformer differential protection
- Busbar protection
- Frequency protection
- Motor protection

Scopes of work

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Protective Relaying – Fundamentals

Booking code: PR-FUNDA

Training objectives
The participants interested in understanding of protective devices related to protection in generation, transmission, sub-transmission or distribution systems will benefit from this course. Topics include protection principles, physical and operating characteristics of protective devices, and protective relaying applications for generation, transmission and distribution systems.

Target audience
Recommended for engineers seeking an understanding of protection fundamentals, the course would also be a valuable resource for engineers just entering the system protection field.

Prerequisites
Fundamentals of power system engineering and the basic mathematical skills, such as trigonometry, complex numbers, matrix algebra, and applied calculus.

Main features
- Protection fundamentals and applications
- Protective relay operational characteristics
- Relay input sources (CTs and PTs)
- Generator protection
- Protection applications
- Transformer protection
- Bus protection
- Transmission line protection
- Over-current and distance relay
- Blinders on distance relay
- Out-of step relay
- Loss of excitation relay
- Relay coordination and over-current relays
- Instantaneous setting procedure
- Distribution overcurrent protection
- Relays, fuses, reclosers, and sectionalizers
- Coordination of devices

Scopes of work

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System Protection – Workshop on a Real Time Digital Simulator RTDS

Booking code: RTDS-PS

Training objectives
The participants will learn about complex fault situations with a transient network analyzer, considering different network and protection systems.

Target audience
Experts for relay applications from utilities and industry.

Prerequisites
Expert knowledge of protection technology.

Main features
Instead of viewing prepared slides, the basis of this workshop are the questions and problems of the participants, exchange of experience and practical work with protection devices, using DIGSI/SIGRA. The location is the place of employment of the trainer. Normally, he is testing new firmware versions during the development. Also customer acceptance tests are done for critical network configurations, where exchange of experience and transient optimization of the settings are the main topics. For the practical work, a real time digital simulator RTDS is available. This RTDS can simulate networks with up to 100 single phase nodes, including lines, cables, sources, generators, CTs, CVTs, breakers, series capacitors and shunt reactors.

Scopes of work

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## Protection – SIPROTEC

### SIPROTEC 4 – Application and Exercises

**Booking code:** SIP4-SYS

**Training objectives**
The participants will become familiar with the concept and principle of operation of the digital network protection systems SIPROTEC 4.

**Target audience**
Power system protection experts who have been assigned to plan, commission and maintain digital protection systems.

**Prerequisites**
Basic knowledge of power system protection.

**Course “Protection Technology – Principles (PR-PRIN)” or comparable knowledge.**

**Course “DIGSI 4 – Basics (DIGSI4-B)” or comparable knowledge.**

**Main features**
- General properties of SIPROTEC 4
- Operation of protection relays with DIGSI 4
- Devices in practical operation:
  - Overcurrent protection 7SJ
  - Distance protection 7SA
  - Transformer differential protection 7UT
  - Differential protection 7SD
  - Busbar protection 7SS
- SIPROTEC hardware
- Hardware, jumpers, interfaces, electrostatic sensitive devices, firmware

**Notes**
Duration in Turkey is 1– 4.5 days depending on the protection device.

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### SIPROTEC 4 – Protection Devices for Service Engineers

**Booking code:** SIP4-SERV

**Training objectives**
The participants will have a deeper understanding of the nature of numerical protection devices. They will understand the meaning of bountiful settings and how to analyze malfunctions and know remedies thereof.

**Target audience**
Engineers of power supply utilities and industry who deal with the planning, configuration, commissioning, maintenance and operation of numeric protection systems.

**Prerequisites**
Basic knowledge of protection technology.

**Main features**
- Principles and virtues of numerical protection devices
- Hardware of numerical protection and settings thereof
- Operating software DIGSI by the scenario
- Numerical protection: What has to be tested of it?
- Exercises accordingly and more with:
  - O/C protection 7SJ
  - Impedance protection 7SA
  - Transformer differential protection 7UT
  - Cable and line differential protection 7SD
  - Busbar differential protection 7SS
- Quality assurance/repair forms

**Notes**
Duration in Turkey is 1– 4.5 days depending on the protection device.

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### Generator/Dynamics and Protection – Workshop on a Real Time Digital Simulator RTDS

**Booking code:** RTDS-GEN

**Training objectives**
The participants will learn about complex fault situations with a transient network analyzer, considering different network and protection systems.

**Target audience**
Experts for relay applications from utilities and industry.

**Prerequisite**
Expert knowledge of protection and generator technology.

**Main features**
- Theory of generators in steady state and transient conditions
- Simulation of generators
- Generator stability and power swing
- Generator protection device 7UM
- Setting calculation
- Analysis of fault records and protocols
- Exchange of expert experience

**Notes**
Duration in Turkey is 1– 4.5 days depending on the protection device.

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(Net prices)
SIPROTEC 4 – Protection Engineering Complete: 10 Days Certification Program

Booking code: SIP4-CERTI

Training objectives
The participants will be familiarized with selection, commissioning, operation and maintenance of protection schemes and system protection equipments. They will get to know the softwares used to operate, to analyze faults and to test the numerical relays.

Target audience
Supervisors, Engineers, field personal, technicians and Specialists involved in operation, planning, design, maintenance and servicing of switchgears, transformers and protecting equipments from electric utilities and the industrial sector.

Prerequisites
Basic knowledge of electrical engineering and first relevant exposure to power system protection.

Main features
- Principles of Numerical Protection Technology
- DIGSI 4 – Basics of Protection And Control Functions
- SIGRA 4 – Efficient interpretation of fault records of SIPROTEC-devices
- SIPROTEC 4 – Protection Devices for Service Engineers
- SIPROTEC 4 – Secondary Relay Testing with the OMICRON Test System

Price: 525,000 NGN

SIPROTEC 4 – Busbar Protection 7SS

Booking code: SIP4-7SS

Training objectives
The participants become familiar with the principles, the application, the operation, and functions of the distributed busbar protection 7SS.

Target audience
Employees from utilities or industry involved in the planning, commissioning and maintenance of busbar protection systems.

Prerequisites
Good knowledge of busbar protection technology.

Main features
- Introduction to busbar production 7SS
- Function overview
- Hardware and function splitting
- Communication and configuration
- Security measures
- Protection algorithms
- Recommendations for settings
- Practical exercises with decentralized busbar 7SS and CMC of OMICRON
- High impedance – Low impedance – A comparison

Price: 1,300,000 COP

SIPROTEC 4 – Distance Protection 7SA

Booking code: SIP4-7SA

Training objectives
The participants will deepen their knowledge of the use and functional test of the impedance protection devices 7SA5/7SA6.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of distance protection.

Main features
- Basics of numerical Impedance protection (information on protection functions)
- Fault detection and distance measurement
- Zone settings
- Signal comparison protection
- Demands on current- and voltage transformers
- Distance protection on parallel lines
- Distance protection on tapped lines
- Teed feeder protection
- Parallel line
- Power swing detection
- Application with serial compensation
- Operation and testing of a 7SA with secondary test-kit CMC of OMICRON
- Fault analysis with SIGRA

Price: 1,300,000 COP

(Net prices)
SIPROTEC 4 – Machine/Motor Protection 7UM & 7VE

Booking code: SIP4-7UMVE

Training objectives
The participants will learn about the principle of operation and functions of generator block protection and synchronization.

Target audience
Users from power supply utilities and industrial enterprises who deal with the testing, commissioning and maintenance of generator protection systems.

Prerequisites
Good knowledge of generator protection technology.

Main features
- Generator block protection application example
- Explanation of protection functions and parameters
- Generator capability curve
- Synchronization
- WEB Monitor
- RTD box
- Presentation of the generator model
- Selection of protection functions
- Configuration and operation of SIPROTEC 4 7UM
- Configuration and operation of SIPROTEC 4 7UT
- Configuration and operation of SIPROTEC 4 7VE
- Test of protection functions and synchronization with secondary test equipment
- Connection of protection devices to the generator model
- Operation of the synchronous generator
- Measurements and operational indications
- Tripping on faults by generating faults
- Analysis of fault records and fault indications

Booking code: SIP4-7UMVE

Training objectives
The participants will gain knowledge of the mode of operation, applications and configuration of numerical unit and auxiliary protection systems.

Target audience
Employees from utilities and that sector of industry concerned with planning, maintenance and testing of machine protection equipment.

Prerequisites
Course “DIGSI 4 – Basics (DIGSI4-B)” or comparable knowledge.

Main features
- Introduction to the principles of machine protection
- SIPROTEC 4 – machine protection
- Short-circuit protection
- Differential protection
- Recommendations on CT coordination
- Rotor earth fault protection
- Undervoltage protection
- Principles of stator earth fault protection
- Engineering of stator earth fault protection
- Configuration examples
- Practical exercises
- 7UM as motor protection
- Synchronisation device 7VE

SIPROTEC 4 – Application and Exercises of Generator/Motor Protection

Booking code: SIP4-MOTOR

Training objectives
The participants will gain knowledge of the use and functional test of the line differential protection devices 7SD.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of line differential protection.

Main features
- Basics of numerical line differential protection
- Information on protection functions
- Demand on current transformer
- Multiple topologies
- Protection of transformer and line as a unit
- Numerical Differential protection communication: Basics, interfaces, network technology, GPS synchronization
- Application of the WEB Monitor
- Operation and testing of a 7SD topology with secondary test-kit CMC of OMICRON at hand of a multitude of tasks
SIPROTEC 5 – Distance & Line Differential Protection 7SL

Booking code: SIP5-7SL

Training objectives
The participants will deepen their knowledge of the use and functional test of the distance and line differential protection devices SIPROTEC 5 7SL.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of distance and line differential protection.

Main features
- Properties of SIPROTEC 5 7SL devices
- Requirements on current and voltage transformers
- Basics of numerical impedance protection
- Fault detection and distance measurement
- Zone settings
- Signal comparison protection
- Distance protection on parallel lines
- Distance protection on tapped lines
- Power swing detection
- Automatic reclosing
- Basics of numerical line differential protection
- Multiple topologies
- Protection of transformer and line as a unit
- Differential protection communication: Basics, interfaces, network technology, GPS synchronization
- Setting of device with DIGSI 5
- Operation and testing of a SIPROTEC 5 7SL relays with secondary test-kit CMC of OMICRON
- Double sided fault locator
- Commissioning and maintenance
- Fault analysis with SIGRA

SIPROTEC 4 – Overcurrent Protection 7SJ

Booking code: SIP4-7SJ

Training objectives
The participants will deepen their knowledge of the use and functional test of the definite-time/inverse-time overcurrent protection devices 7SJ.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of overcurrent protection.

Main features
- Definite-time/inverse-time characteristics
- Pickup value increase when switching in a transformer/motor
- Thermal overload protection
- Motor startup monitoring
- Restart blocking for motor

Price on request

SIPROTEC 4 – Transformer Differential Protection 7UT

Booking code: SIP4-7UT

Training objectives
The participants will deepen their knowledge of the use and functional test of the transformer differential protection devices 7UT6.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of transformer differential protection.

Main features
- Basics of numerical transformer differential protection
- Adaptation of ratio, vector group and impact of tap-changer
- Stability during inrush and overexcitation
- Demand on Current transformers
- Application examples (busbar protection, auto transformer, multi-winding transformer)
- Earth-differential protection (REF) for for faults near starpoint
- Setting of device with DIGSI
- Operation and testing of a 7UT with secondary test-kit
- CMC of Omicron
- Transformer tap adjustment
- Application of the WEB Monitor
- Fault analysis with SIGRA
SIPROTEC 5 – Transformer Differential Protection 7UT

Booking code: SIP5-7UT

Training objectives
The participants will deepen their knowledge of the use and functional test of the transformer differential protection devices SIPROTEC 5 7UT.

Target audience
Users from the field of power transmission and distribution who deal with the testing, commissioning and maintenance of protection systems.

Prerequisites
Good knowledge of transformer differential protection.

Main features
- Properties of SIPROTEC 5 7UT devices
- Basics of numerical transformer differential protection
- Adaption of ratio, vector group and impact of tap-changer
- Stability during inrush and overexcitation
- Demand on Current transformers
- Application examples (busbar protection, auto transformer, multi-winding transformer)
- Earth-differential protection (REF)
- Setting of device with DIGSI 5
- Operation and testing of a SIPROTEC 5 7UT with secondary test-kit CMC of OMICRON
- Commissioning and maintenance
- Fault analysis with SIGRA

SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC

Booking code: SIP4-CMC

Training objectives
The participants will gain practical knowledge of essential relay parameters and their secondary testing. The course focuses on hands-on creation of test documents for distance, cable and transformer differential protection in medium and high voltage grids.

Target audience
Engineers and technicians of power utilities and industries who deal with commissioning and periodic testing of protective relays.

Prerequisites
Basic knowledge in protection technology.

Main features
- Introduction to the OMICRON test system
- Creating test documents (OCC-files) for overcurrent, distance and differential protection:
  - Testing the starting functions
  - Testing tripping characteristic
  - Testing harmonic stabilisation (inrush and overexcitation)
  - Testing switch-onto-fault (SOTF)
  - Testing the automatic reclosure function
  - Earth fault detection in non-earthed systems
  - Practical application of the created test documents on SIPROTEC relays

SIPROTEC – Compact (7SJ80, 7SK80, 7RW89, 7SD80)

Booking code: SIP-COMPA

Training objectives
The participants will learn about hardware, setting values and using of the SIPROTEC 4 Compact devices. Additionally, basic functions of DIGSI 4.8 software will also be trained.

Target audience
User from power transmission and distribution medium voltage networks, dealing with planning, testing or commissioning.

Prerequisites
Basic knowledge in protection technology.

Main features
- Hardware, terminals, connections
- Protection settings and data analyse with DIGSI 4.8
- Testing of protection functions with Omicron-CMC
- test equipment

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**DIGSI 4 – Basics**

**Booking code:** DIGSI4-B

**Training objectives**
The participants will get to know the DIGSI operating program. They will learn how to adjust, manage, operate and analyze faults of SIPROTEC devices using the DIGSI operating program. They will use DIGSI program to configure and perform their own functions and control tasks.

**Target audience**
Users from electric utilities and the industrial sector who are working for design, for parameterization and for commissioning, as well as for maintenance and operation of SIPROTEC 4 devices.

**Prerequisites**
Basic knowledge of electrical engineering.

**Main features**
- Introduction of SIPROTEC 4 and DIGSI 4
- Process of parameterization of SIPROTEC-devices.
  - Start from the design documentation on an example of a single busbar configuration, over the protection settings and test of the SIPROTEC 4-devices up to DIGSI 4 project and device management
- Configuring of protection settings of SIPROTEC devices:
  - Data management, parameter assignment and project planning
- Commissioning phase of SIPROTEC:
  - Checking inputs/outputs and simulating of fault records
- Control of switching devices:
  - Interlocked/not interlocked control
    - Local/Remote control
- Graphical configuring of logic functions and interlocks with the CFC logic editor
- Graphical configuring of the default and control display with the display editor
- Introduction of substation control centre-communication with IEC 103, Profibus DP and IEC61850 (Ethernet) and Web-Monitor for SIPROTEC
- Introduction of fault evaluation with SIGRA
- Practical exercises

**DIGSI 4 – Advanced**

**Booking code:** DIGSI4-A

**Training objectives**
The participants will not only learn to implement the knowledge in course DIGSI4 – Basic in a typical project application, but also learn about extended functionality of the CFC and the display editor. Participants will be able to create and test user-specific functions, and design a protection coordination concept. They will be familiar with several protection-principles and setting of SIPROTEC 4.

**Target audience**
Professionals from power supply utilities and industry dealing with the design, configuration, commissioning, maintenance and operation of SIPROTEC devices.

**Prerequisites**
Course “DIGSI 4 – Basics (DIGSI4-B)” or comparable knowledge.

**Main features**
- Design of protection-concept on hand
- Process of parameterization of SIPROTEC 4-devices on the example of a double busbar configuration (NXPLUS) with typicals
- Learning extended functionality of the display editor and further CFC blocks
- Parameterization of bay and substation interlocking with logic-editor CFC
- Bay-related switching sequences
- Testing of the run sequences of logic modules in online mode, with LED’s & fault recording
- Displaying transformer tap position
- Working with message texts, status information and interlocking texts
- Calculation of short circuit current on hand
- Parameterization of protection settings for transformer-backup protection 7SJ, transformer differential protection 7UT and distance protection 7SA
- Transfer of settings to secondary test equipment with RIO/XRIO-format
- Transfer of parameter with excel addin and XML for protection-replacement new for old and for take over the settings from old protection relays to SIPROTEC 4 devices
- Practical exercises

**CO**
1,300,000 COP

**DE**
9CA4140-05E00-0AD1
2,250 EUR

**AT**
9CA4140-05E00-0AD1
1,300,000 COP

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**RU**
53,400 RUB

**TR**
3,000 TRY

(Net prices)
Protection – DIGSI 5

DIGSI 4 – IEC61850 and GOOSE Configuration

Booking code: DIGSI4-I

Training objectives
The participants will gain essential knowledge in substation communication based on Ethernet and IEC61850. Participants will be familiar with the concept and configuration of device communication via the IEC61850 protocol on the basis of data exchange between the devices belonging to the bay or station level and connected on Ethernet bus. The following topics will also be presented in the course: the basics of the Ethernet communication profile, the application of diverse communication topologies and the basics of testing Ethernet compliant with IEC61850. The participants will realize a GOOSE Communication between Eberle-tapchanger and SIPROTEC 4.

Target audience
Professional users of power supply utilities and industry who deal with the planning, configuration, commissioning, maintenance and operation of numeric bay and station automation systems with commissioning, maintenance and operation of SIPROTEC 5 devices.

Prerequisites
Basic knowledge of electrical engineering.

Main features
■ Basic knowledge of electrical engineering and control function
■ Simple example of GOOSE Communication with SIPROTEC 4
■ Configuring of reverse interlocking for protection function points
■ Station interlocking with ethernet-substations
■ GOOSE Communication between SIPROTEC 4 and 3rd party-devices (Eberle-Tapchanger; Time-Server)
■ Commissioning, testing and diagnostic of IEC61850 communication networks
■ Practical exercises

DIGSI 5 – Basics

Booking code: DIGSI5-B

Training objectives
The participants will be familiar with the DIGSI 5 operating program and learn how to adjust, manage and operate the SIPROTEC 5 devices using the DIGSI 5 operating program. The participants will use DIGSI 5 program to configure and perform their own functions and control tasks.

Target audience
Users from electric utilities and the industrial sector who are working for design, for parameterization and for commissioning, as well as for maintenance and operation of SIPROTEC 5 devices.

Prerequisites
Basic knowledge of electrical engineering.

Main features
■ Design of protection/control- and monitor-concept on the basis of high voltage switchgear 8DN8
■ Introduction of Hardware- and Function group-concept of SIPROTEC 5
■ The modularity of HW, SW, protection function and control function
■ Operating and Working with SIPROTEC 5
■ Create the scope of supply and Order number with SIPROTEC 5 Online-Configurator

Introduction:
DIGSI 5 one Tool for all working processes.
– Start with the Design of Single Line Diagram for the switchgear project. Design the protection and control functions for a HV single busbar configuration for SIPROTEC 5 devices.
– Implementation of protection settings and allocation of binary inputs and outputs and analogue measurements inputs for SIP 5.
– Creating of display pages and user log lists. Creating of logic functions with CFC and test of the logics.
– Online-test for Commissioning of the SIPROTEC 5-devices. Checking inputs/outputs and simulating of fault records.
– Operating phase of SIPROTEC 5: Get information and retrieve logs and fault records from the SIPROTEC 5 device. Control of switching devices, Interlocked/not interlocked control, Local/Remote control.

Flexibility of protection functions of SIPROTEC 5:
■ Expansion of protection function points
■ Simple GOOSE Communication between SIPROTEC 5 devices with IEC61850 protocol
■ Practical exercises with helpful DIGSI 5 guide

Notes
Theory/Praxis: 30/70.

DIGSI 5 – Systems

Booking code: DIGSI5-S

Training objectives
The participants will enhance their knowledge of SIPROTEC 5/DIGSI 5 in the context of a typical HV application. The basic knowledge will be deepened by learning extended functionality of the CFC and the display editor and Simulation of measurement test sequences for SIPROTEC 5 tests with DIGSI 5.

Target audience
Users from electric utilities and the industrial sector who are working for design, for parameterization and for commissioning, as well as for maintenance and operation of SIPROTEC 5 and SIPROTEC 4 devices.

Prerequisites
Basic knowledge of electrical engineering and Course “DIGSI 5 – Basics (DIGSI5-B)” or comparable knowledge.

Main features
■ Design of protection/control- and monitor-concept on hand of expanded high voltage switchgear with SIP 5 and SIP 4 devices.
■ Learning extended functionality of the display editor and further CFC blocks.
■ Tracing of CFC-logic with DIGSI 5
■ Simple GOOSE Communication between SIPROTEC 4 and SIPROTEC 5
■ Expansion of SIPROTEC 5 project with SIPROTEC 4 devices.
■ Simple GOOSE Communication between SIPROTEC 4 and SIPROTEC 5.
■ Automatic Setting Group Changing with using of SIPROTEC 4 and SIPROTEC 5 – Goose Communication.
■ Communication of SIPROTEC 4 and SIPROTEC 5 to SICAM PAS System via IEC61850 protocol.
■ Simulation of analogue and binary process parameter with DIGSI 5 Test Suite.
■ Using the DIGSI 5 Online Expert Mode.
■ Practical exercises with helpful DIGSI 5 guide

Notes
Theory/Praxis: 30/70.
DIGSI 5 – IEC61850 and GOOSE Configuration

Training objectives
The participants will gain essential knowledge in substation communication based on Ethernet and IEC61850. Participants will be familiar with the concept and configuration of device communication via IEC61850 Protocol on the basis of data exchange between the devices belonging to the bay or station level and connected on Ethernet bus. The basics of the Ethernet communication profile and the application of diverse communication topologies will be presented. The basics of testing Ethernet compliant with IEC61850 will be presented. The participants will realize a GOOSE Communication between SIPROTEC 5 devices as well as between SIPROTEC 5 and SIPROTEC 4 devices.

Target audience
Professional users of power supply utilities and industry who deal with the planning, configuration, commissioning, maintenance and operation of SIPROTEC 5 and SIPROTEC 4 as well as to Station Automation Systems with IEC61850-Communication Systems.

Prerequisites
Basic knowledge of electrical engineering and course "DIGSI 5 – Basics (DIGSI5-B)" or comparable knowledge.

Main features
- Basics of communication networks and systems in substations with Ethernet and IEC61850 (TCP/IP; OSI/IEC61850 Model)
- Overview of IEC61850 Edition 2
- Structure of the substation communication bus IEC61850 profile
- Structure of Ethernet communication networks (topology, architecture, components, addressing)
- Implementation of IEC61850 with DIGSI 5
- Simple example of GOOSE Communication with SIPROTEC 5
- Configuring of reverse interlocking for protection with GOOSE Communication
- Station interlocking with Ethernet-substations-bus
- Transfer of displays to neighbour-feeder between SIPROTEC 5 devices with GOOSE
- GOOSE Communication between SIPROTEC 4 and SIPROTEC 5
- Communication of SIPROTEC 4 and SIPROTEC 5 to SICAM PAS System via IEC61850 protocol
- Commissioning, testing und diagnostic of IEC61850 communication networks
- Practical exercises with helpful DIGSI 5 guide

Protection of Oil and Gas Power Networks – Part 1

Booking code: PR-OG1

Training objectives
Characteristics of a typical oil and gas network and topics of load flow, short circuit, motor start, voltage and frequency stability, protection settings coordination, and typical setting report will be discussed. Based on a real-life example, industrial network design topics like network structure, reliability of supply, protection concept, contingency analysis, and load shedding analysis are presented in order to provide a proper response to minimize consequences of faults. Calculation tools are used to simulate short circuits, motor starts, motor reacceleration etc.

Target audience
This course is directed at plant protection engineers, who would like to increase their analytical and practical skills for system protection.

Prerequisites
University degree in protection engineering

Main features
- Power supply reliability
- Network structures
- Load flow and contingencies analysis
- Short circuit analysis for phase and earth faults
- Current transformer dimensioning
- Over current-time protection
- Distance protection
- Differential protection
- Frequency protection
- Motor protection
- Transformer protection
- Cable and overhead line protection
- IEC61850/GOOSE Theory basics such as data model and services

Protection of Oil and Gas Power Networks – Part 2

Booking code: PR-OG2

Training objectives
In the second part of the training practical exercises with Siemens’ over current and differential protection relays for line, trans-former and motor equipment within the real-life industrial network example are executed. The trainees are taught to interpret and analyze an incident by using available fault records.

Target audience
This course is directed at plant protection engineers, who would like to increase their analytical and practical skills for system protection.

Prerequisites
University degree in protection engineering.

Course "Protection of Oil and Gas Power Networks – Part 1 (PR-OG1)".

Main features
- DIGSI 4 operating and evaluation software:
  - How to set up a project structure in Project Manager
  - How to get and set a relay parameters in Device Manager
  - How to go online and work online
  - How to change settings – with DIGSI and relay front port
  - How to feed back setting changes to the planning department
  - How to do maintenance with DIGSI
- Over current protection device 7SJ relay:
  - Ordering information and accessories
  - Scope of functions
  - Overall operation hardware and connections
  - Doing sample settings and settings discussion
  - Information configuration matrix for input/output/internal signals
  - Measurement supervision, fault interpretation by using SIGRA
  - Hands-on training with 7SJ relays, DIGSI, SIGRA with using secondary test equipment (e. g. omicron) to produce faults as single phase, two phase and three phase faults (short circuits) with low and with high current.
  - Hands-on training with 7SJ relays, DIGSI, SIGRA with using secondary test equipment (e. g. OMI-CRON) to produce faults like: motor start (rotor blocked, starting time supervision), overloaded motor and cable.
## Basics for Protection Engineers

**Booking code:** PR-BASIC

**Training objectives**
The participants will learn about the design, equipment and special events in electrical grids for a better understanding of requirements and functions of protecting devices.

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## System Protection Communication of Power Transmission and Distribution Networks

**Booking code:** PR-COM

**Training objectives**
The participants will become familiar with the basics of communication technology. There will be an overview of the various ways in which communication components and protocols can be used and are able to specify requirements for modern communications systems.

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## SIPROTEC 4 – Protection & Control System Engineering

**Booking code:** SIP4-ENGIN

**Training objectives**
The participants will learn about the process of protection and control system engineering.

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## SIPROTEC 4 – MV Protection & Control

**Booking code:** SIP4-MV

**Training objectives**
The participants will understand the principles of medium voltage protection and control and knows how to apply it in practice.

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## SIPROTEC 4 – HV Protection & Control

**Booking code:** SIP4-HV

**Training objectives**
The participants will understand the principles of high voltage protection and control and knows how to apply it in practice.

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## SIPROTEC 4 – Power System Protection – Basics

**Booking code:** SIP4-BASIC

**Training objectives**
The participants will become familiar with the fundamentals of power system protection and protection schemes.

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## SIPROTEC 4 – Power System Protection – Advanced

**Booking code:** SIP4-ADVAN

**Training objectives**
The participants will know how to conceive complex protection schemes and be familiar with the special requirements for the protection of high voltage systems.

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# Further Protection Trainings

## Protection Technology – Additional Functions

**Booking code:** SIP4-ADDIT

**Training objectives**
The participants will learn about the most commonly used additional functions of power system protection and their use.

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## Protection Systems – Accessory Equipment

**Booking code:** SIP4-ACCES

**Training objectives**
The participants will learn about the main additional devices of power system protection and their function and use.

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## Current and Voltage Transformers – Intensive Course

**Booking code:** SIP-VTI

**Training objectives**
The participants will gain in-depth insight into the physical behavior of current transformers. The training will focus on the dimensioning of current transformers and their practical application in power system protection. Aside from the current transformer dimensioning conforming to standards, the proper collaboration of current transformer and protection device and future trends in current transformer technology will also be discussed.

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## SIPROTEC – Guided Exercises

**Booking code:** WS-GUIDE

**Training objectives**
The participants will gain knowledge of the mode of operation and basic functions of SIPROTEC protection devices. They will be able to operate the protective equipment.

**Notes**
The participants work predominantly on their own. The trainees define their own pace of work, the protection device and the functions upon their interest. The trainer is giving initial help concerning the choice of topics and exercises. For questions or for help the trainer is readily available. SIPROTEC devices with operating software are obtainable for the practical exercises. The duration varies from 1 to 10 days according to the request.

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## SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC – Basics

**Booking code:** SIP4-TESTB

**Training objectives**
The participants will gain practical knowledge of essential relay parameters and their secondary testing. The course focuses on hands-on creation of test documents for distance, cable and transformer differential protection in medium and high voltage grids.

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## SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC – Advanced

**Booking code:** SIP4-TESTA

**Training objectives**
The participants will gain practical knowledge of essential relay parameters and their secondary testing. The course focuses on hands-on creation of test documents for distance, cable and transformer differential protection in medium and high voltage grids.

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## DIGSI 4 – CFC

**Booking code:** DIGSI4-C

**Training objectives**
The participants will discuss and work on the realization of their protection and control instrumentation automation requirements. They will get useful tips all around the subject of graphic configuring of automation tasks. Furthermore, they will become familiar with the CFC blocks in detail.

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## DIGSI 5 – CFC

**Booking code:** DIGSI5-C

**Training objectives**
The participants will enhance their knowledge of SIPROTEC 5/DIGSI 5 in the context of their application. The participants will work on and discuss the realization of their protection and control instrumentation automation requirements. They will get useful tips all around the subject of graphic configuring of automation tasks. Furthermore, they will become familiar with the CFC blocks in detail. The CFC logs will be tested with DIGSI 5 and with the corresponding SIPROTEC 5 devices.

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## SIGRA 4 – Efficient Interpretation of Fault Records

**Booking code:** SIP4-SIGRA

**Training objectives**
The participants will be able to apply SIGRA 4 efficiently, to analyze fault records presented in the Comtrade format to understand the protection's behavior. The course includes the views and diagrams of SIGRA and the ways of fault record analysis. The participants will also analyze fault records and extensively discuss the results. The analysis emphasizes timings, variations of current and voltages, determination of impedances, fault location and the analysis for harmonics.

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<th>Language</th>
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## Generator/Motor Protection – Design and Settings

Booking code: PR-DSMP

**Training objectives**
The participants will be trained on detailed preparation of SIPROTEC setting values for electrical machines.

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## REYROLLE – DAD-N (High Impedance Schemes)

Booking code: REY-HIGH

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the REYROLLE protection device DAD-N providing numeric high impedance protection and its application schemes to protect bus bars and other equipment.

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## Protection Schemes for Power Generation and Industry – Design and Settings

Booking code: PR-DSIN

**Training objectives**
The participants will have an in-depth knowledge of protection of public distribution networks. They will know the special requirements for the protection of medium voltage distribution networks.

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## System Protection – Design and Settings

Booking code: PR-DSPS

**Training objectives**
The participants will acquire detailed knowledge of the protection methods in power grids and become familiar with the special requirements for the protection of high voltage systems and power systems for very high voltages. The course will focus on the practical implementation of different philosophies for the development of protection concepts. It will also focus on the practical determination of optimum setting values.

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## System Protection – Design and Settings – Intensive

Booking code: PR-DSPSI

**Training objectives**
The participants will gain a detailed insight into the protection methods used for power grids. Equipment protection will be an essential part of the training. The course will also focus on the procedure and calculation methods for optimum collaboration of entire protection systems in transnational power grids.

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## REYROLLE – RECLOSER-M CONTROLLER 7SR224

Booking code: REY-RECLO

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the REYROLLE protection device RECLOSER-M CONTROLLER protection device providing Auto-Reclose Overcurrent protection.

**Notes**
The course will take the form of a PowerPoint presentation and practical demonstration of the RECLOSER-M CONTROLLER relay.

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## REYROLLE – ARGUS 1 – ARGUS 6

Booking code: REY-ARGUS

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the REYROLLE protection device ARGUS providing overcurrent protection (nondirectional and directional).

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## REYROLLE – Itinerary DUOBAIS

Booking code: REY-DUOBAI

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the REYROLLE protection device DUOBAIS providing differential protection for transformers.

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## REYROLLE – SOLKOR Rf Schemes

Booking code: REY-SOLKOR

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the REYROLLE protection device SOLKOR Rf providing classical line differential protection via pilot wires and its application schemes with pilot wire supervision and injection intertrip.

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## REYROLLE – ARGUS-M 7SR21, 7SR22

Booking code: REY-ARGUSM

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the ARGUS-M Overcurrent (7SR21) and Directional Overcurrent (7SR22) Relay.

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## REYROLLE – ARGUS-C 7SR11, 7SR12

Booking code: REY-ARGUSC

**Training objectives**
This course provides participants with an understanding of the use, application and installation of the ARGUS-C Overcurrent (7SR11) and Directional Overcurrent (7SR12) Relay.

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Substation Automation – SICAM PAS

SICAM PAS – Basics

Booking code: PAS-B

Training objectives
The participants will learn how to use SICAM PAS V7 system and its basic knowledge. They will learn about the operation and will find out how to use this in the system management.

Target audience
Customers from power utilities and industry responsible for operating a SICAM PAS system.

Prerequisites
Fundamentals of telecontrol and automation.

Main features
- Introduction to SICAM PAS total system
- System functions
- Intro to PQS functions – System components
- Licensing – SICAM PAS UI – User Interface
- PAS Runtime System Control with UI Operation
- Test and diagnostic tool SICAM Value Viewer
- Basics of telecommunication – Interface test program
- Siemens serial hub
- Local HMI system SICAM SCC
- IEC61850
- Communication Standard for Switchgears
- SICAM Station Unit
- PAS Redundancy concept
- Configuration Examples

Notes
Theory/Praxis: 40/60.

SICAM PAS – Parameterization

Booking code: PAS-P

Training objectives
The participants will be able to independently set up a SICAM PAS V7 configuration.

Target audience
Customers from power utilities and industry who wish to do user specific parameterization or changing of parameterization.

Prerequisites
Course “SICAM PAS – Parameterization (PAS-P)”.

Main features
- Summary of basics of SICAM PAS
- Setting up SICAM PAS software
- Starting parameterization
- Telecommunication with IEC101/104
- Interface to local operator station SICAM SCC
- Communication with bay units by IEC103
- CFC logic programming
- Communication with IEC61850
- SNMP monitoring – Redundancy
- Practical Exercises

Notes
Theory/Praxis: 50/50.

SICAM PAS – Automation with CFC, ST and SFC

Booking code: PAS-C

Training objectives
The participants will be familiar with the most important CFC blocks and how to use them. Furthermore, they learn about the advantages of the programming language ST (Structured Text), which was especially developed for automation systems. Both of these tools will be used to parameterize and program examples for various applications.

Target audience
Customers who are in charge of parameterization and programming of logic functions in a SICAM PAS system.

Prerequisites
Course “SICAM PAS – Parameterization (PAS-P)”.

Main features
- Introduction to PAS automation
- Frequently used CFC blocks
- Application of CFC in various examples
- Basics of programming language ST
- Primary use of ST and CFC
- Writing programs/functions/ function blocks with ST
- Combinations of CFC and ST
- SFC – sequential function chart for switching sequences

Notes
Theory/Praxis: 50/50.

(Net prices)
**SICAM PAS – System Diagnosis and Trouble Shooting**

Booking code: PAS-SYS

**Training objectives**
The course provides systematical diagnosis and fault analysis in the entire substation automation. It imparts profound detailed information out of different components.

**Target audience**
Users in parameterization and commissioning of SICAM PAS.

**Prerequisites**
Knowledge in substation automation, remote control, network and communication.

**Main features**
- IEC101/104 Protocol description, Test-Tools
- Protocol analysis with "ethereal"/wireshark
- Systematical approach to identify communication problems
- RuggedCom settings, IP, SMNP, configuration concepts, Diagnosis
- Hirschmann Switches/Siemens Scalance Switches
- Remote access for diagnosis
- Customer Support Center
- Voltage regulators A-eyerle
- Interoperability
- IEC61850
- Diagnosis Tools
  - IEC Browser
  - Netview
  - Networkview
  - GOOSE Inspector
- Fault analysis for serial protocols
- SICAM PAS General Information
- DSITest
- CI/TeTestAndDiagnosisUI
- Redundancy
- Time Synchronisation
- Power Quality
- Soft PLC
- SICAM PAS Station Unit
- WinCC
  - Diagnostic Tools
  - Scripting
  - Archiving

**Notes**
Theory/Praxis: 70/30.

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**SICAM SCC – Configuring an Operator Station**

Booking code: PAS-S

**Training objectives**
The participants will be able to configure a graphical operator station with PAS CC V7.

**Target audience**
Customers from power utilities and industry who wish to be able to design or modify the graphical user interface.

**Prerequisites**
Basic knowledge of SICAM PAS.

**Main features**
- System overview of SICAM SCC
- Installing SICAM SCC software
- PAS Interface to SCC
- Devising a project
- Graphics Designer
- Compatibility Key
- Switching Authority
- User Administrator
- Bay and Telecontrol Blocking
- Message lists
- Practical exercises

**Notes**
Theory/Praxis: 30/70.

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**SICAM PAS – Complete**

Booking code: PAS-COM

**Training objectives**
The participants will gain a basic knowledge of the entire SICAM PAS system. They will be able to independently set up a SICAM PAS configuration and to configure a graphical operator station with SICAM SCC.

**Target audience**
Customers from power utilities and industry responsible for operating a SICAM PAS system, who wish to do user specific parameterization and to be able to modify the graphical user interface.

**Prerequisites**
Fundamentals of telecontrol and automation.

**Main features**
- This course combines following 3 single training courses:
  - SICAM PAS – Basics
  - SICAM PAS – Parameterization
  - SICAM SCC – Configuring an Operator Station

**Notes**
Theory/Praxis: 50/50.

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Substation Automation – SICAM RTU

SICAM 1703 – Basics
Booking code: RTU-BASICS

Training objectives
The participants will develop an understanding for the productivity of the scalable automation unit SICAM 1703; gain an overview of the construction of SICAM 1703; understand the most important functions; and know the basic working of SICAM 1703.

Target audience
Employees from sales and engineering departments.

Prerequisites
Knowledge of the most important terms in telecontrol technology as trained in the course “Telecontrol and Automation – Fundamentals (SAS-TELE)”.

Main features
■ Product families at a glance
■ The scalable automation concept SICAM 1703
■ The features of the different automation units:
  – SICAM AK automation module
  – SICAM TM automation module
  – SICAM BC automation module
  – SICAM EMIC automation module
  – SICAM CMIC automation module
■ The mode of operation of SICAM 1703 – from data acquisition to data output
■ Diagnosis and test

9CA4140-0A00-0AD3
570 EUR

SICAM 1703 – Service
Booking code: RTU-SERVIC

Training objectives
Service technicians involved in the maintenance of SICAM 1703 systems. Technicians involved in the engineering of SICAM 1703 automation systems.

Target audience
The participants gains the knowledge required to carry out the maintenance of the scalable automation system SICAM 1703 (SICAM AK, SICAM TM, SICAM EMIC, SICAM BC) with the supplied system related tools. The procedures for changes/extensions are not given here.

Prerequisites
Course “SICAM 1703 – Basics (RTU-BASICS)”.

Main features
■ System architecture and hardware overview
■ SICAM TOOLBOX II – handling in principle
■ Diagnosis options
■ How to change system elements
■ Connection system, mechanical system
■ Remote maintenance
■ Practical exercises with SICAM TOOLBOX II and SICAM AK, SICAM TM, SICAM BC, SICAM EMIC

9CA4140-0A00-0AD4
600 EUR

SICAM 1703 – Engineering
Booking code: RTU-ENG

Training objectives
The participants will be able to set up a SICAM 1703 automation system based on pre configured templates; create process signals in the engineering tool OPM II; and use process signals in a function block diagram. They will also learn how to apply and test communication connections to other SICAM 1703 devices and/or SCADA systems; and configure the data flow routing from data acquisition to data output within the system SICAM 1703.

Target audience
Technicians, who want to realize complete solutions with the automation system SICAM 1703.

Prerequisites
Course “SICAM 1703 – Basics (RTU-BASICS)”. Course “SICAM 1703 – Service (RTU-SERVIC)”.

Main features
■ Overview of functions within SICAM 1703
■ Compile an addressing concept in accordance with IEC60870-5
■ Automatic data flow routing
■ Parametrization of the communication
  – Test and simulation practicabilities with the SICAM TOOLBOX II
  – Extension and adjustment of the configuration with OPM II and CAEx plus
  – Practical exercises with the SICAM TOOLBOX II and a SICAM AK, SICAM TM, SICAM BC or SICAM EMIC
  – Parameter administration with the SICAM TOOLBOX II: Import/export/Backup

9CA4140-0A00-0AD5
3,000 EUR
SICAM 1703 – CAEx plus

Booking code: RTU-CAEX

Training objectives
The participants will master the operation and creation of a steering task in destination system SICAM 1703 with use of CAEx plus. They will learn the IEC 61131 conform programming language emphasising FBD (Functional-Block-Diagram) and its use.

Target audience
Automation technicians for SICAM 1703 automation systems.

Prerequisites
Basic knowledge of digital circuit technology.
Basic knowledge of SICAM 1703 automation system.
OPM II basic knowledge – see course “SICAM TOOLBOX II – Basics (TOOLBOX)”.

Main features
- Overview of norm IEC 61131
- Creation of data module for CAEx plus with OPM II
- Handling of Functional-Block-Diagram
- Creation and structuring of a steering task
- Loading into destination system SICAM 1703
- Use of tests (OFFLINE, ONLINE oscilloscope)
- Creation of a documentation with CAEx plus

Notes
This course is part of the course “SICAM 1703 – Complete”. But it is also an optimal completion to the course “SICAM 1703 – Power Week”.

SICAM 1703 – Complete

Booking code: RTU-1703

Training objectives
The participants will be able to configured a complete station by using the automation system SICAM 1703 including a control task (CAEx plus) within 10 days. They will gain consolidated knowledge with theoretical foundations.

Target audience
Technicians who want to create complete solutions with the automation system SICAM 1703.

Prerequisites
Knowledge of the most important terms of telecontrol technology as trained in the course “Telecontrol and Automation – Fundamentals (SAS-TELE)”.

Main features
- Overview of SICAM 1703 product line
- Basic concepts
- SICAM TOOLBOX II and OPM basic facts
- Testing, simulation and error analysis
- Data routing
- Process communication to other units of the SICAM 1703 product line

SICAM 1703 – Power Week

Booking code: RTU-WEEK

Training objectives
This course focuses on practical exercises and has specifically been designed for technicians who quickly need to become familiar with the SICAM 1703 world.

Target audience
This course focuses on practical exercises and has specifically been designed for technicians who quickly need to become familiar with the SICAM 1703 world.

Prerequisites
Knowledge of the most important terms of telecontrol technology as trained in the course “Telecontrol and Automation – Fundamentals (SAS-TELE)”

Experiences in telecontrol and automation systems.

Main features
- Overview of SICAM 1703 product line
- Basic concepts
- SICAM TOOLBOX II and OPM basic facts
- Testing, simulation and error analysis
- Data routing
- Process communication to other units of the SICAM 1703 product line

9CA4140-0AE00-0AD1
5,400 EUR

9CA4140-0AE00-0AD2
3,300 EUR
SICAM 1703 Workshop – Configuration IEC60870-5-103 Interface

Training objectives
The participants will acquire the skills necessary to configure an IEC60870-5-103 interface in the SICAM 1703 system. In the course, both master and slave, are first configured and then tested with the training unit.

Target audience
Engineers who work with SICAM 1703 as a substation automation system.

Prerequisites
Knowledge of SICAM 1703.

Main features
- IEC60870-5-103: overview of standards and reference to practical application
- Configuration with OPM II
- Commissioning and testing with SICAM TOOLBOX II
- Analysis with the protocol test system

Booking code: RTU-IEC103

SICAM 1703 Workshop – Configuration IEC61850 Interface

Training objectives
The participants gain the skills necessary to configure an IEC61850 interface in the system SICAM 1703. In the course, both client and server, are first configured and then tested with a training unit. The course illustrates how a SIPROTEC protection device can be coupled with an SICAM 1703 unit and how the data model is embedded in OPM II via SCL-File.

Target audience
Engineers who work with SICAM 1703 and use it as a substation automation system.

Prerequisites
Knowledge of SICAM 1703 and practical experience.

Main features
- Configuration of an IEC61850 interface in SICAM 1703
- Connection to a SIPROTEC device (import of Datamodel via SCL-File)
- Commissioning and testing with SICAM TOOLBOX II

Booking code: RTU-IEC61

SICAM CMIC – Smart Grid Solutions

Training objectives
A possible smart grid application in a medium voltage substation will be the example for becoming familiar with the handling and parameterization of SICAM CMIC.

Target audience
Engineers who work with SICAM 1703 and use it as a substation automation system.

Prerequisites
Knowledge of SICAM 1703 and practical experience.

Main features
- The new hardware
- Parameterization
- Application fields

Booking code: RTU-CMIC

(Net prices)
SICAM EMIC – WebParameterization

Booking code: RTU-EMIC

Training objectives
The participants will learn about the concepts, performance characteristics and possible applications (e.g.: Speed monitor) of the systems SICAM MIC and SICAM EMIC. They will be able to parametrize and make diagnosis on both systems over a Webbrowser.

Target audience
Technicians, who use SICAM EMIC systems in their plants, and would like to parametrize the system with a browser.

Prerequisites
Course "SICAM 1703 – Basics (RTU-BASIC)".

Main features
- Overview of the required hardware
- Initial operation
- Interface configuration
- Hardware data point configuration
- Documentation

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Substation Automation Equipments: 10 days Certification Program for Installation & Commissioning

Booking code: RTU-CERTIF

Training objectives
The participants will be familiarized with installation and commissioning of substation automation system and equipments. Especially the eRTU system and power link equipment.

Target audience
Supervisors, Engineers, field personal, technicians and Specialists involved in planning, design, installation, commissioning and servicing of substation automation systems (especially eRTU and power link) from electric utilities and the industrial sector.

Prerequisites
Fundamental of telecontrol and automation.

Main features
- SICAM eRTU and SICAM diamond, systems
  - Introduction, parameterization, configuration, Project creation, Display construction, Graphical topology, communication, Installation and commissioning
  - Network communication solution
  - Power link equipments

| 525,000 NGN | en |

SICAM 230 – Configuration (latest version)

Booking code: 230-CONFI

Training objectives
The participants will be able to work with the Designer (Editor) of the latest SICAM 230 version. They will carry out SICAM 230 project changes and expansions themselves. A new SICAM 230 project will be started during the course, and therefore the major features of SICAM 230 will be explained. The new functional project will be realized, and the interface to SICAM 1703 will be explained. This project may serve as the basis for the participants’ respective projects.

Target audience
Engineers who want to parametrize the SCADA system SICAM 230.

Prerequisites
Course "SICAM TOOLBOX II – Basics (TOOLBOX)".

Main features
- Overview of SICAM 230
- The new Designer (Editor)
- Project creation
- Data point parameterisation
- Display construction
- Alarm function
- Practical exercises
- Use of user documentation
- Graphical Topology
- Communication Interface via IEC60870-5-101/104 and IEC61850

| 2,400 EUR | en |

(Net prices)
Further Substation Automation Trainings

Ax 1703 – Basics for AK/AM/AMC
Booking code: AX-BASIC
Training objectives
The participants will develop an understanding of the performance of the scaleable Ax 1703 automation system, and they will comprehend the structure, major functions, and basic operating principle of Ax 1703.

Ax 1703 – CAEx II Configuration
Booking code: AX-CAEXP
Training objectives
Computer-aided configuration of automated sequences in technological processes with the software package CAEx. The participants will learn to master CAEx, basic principles of sequence control, logic control and controller configurations.

Ax 1703 – Service for AK/AM/AMC
Booking code: AX-SERV
Training objectives
The participants will learn about how to carry out the maintenance of the scaleable automation system Ax 1703 (AK 1703/AM 1703/AMC 1703) by using the corresponding system tools. The course does not teach how to make modifications/expansions.

Ax 1703 – Configuration for AK/AM/AMC
Booking code: AX-PROJ
Training objectives
The participants will be familiar with the configuration steps for an Ax 1703 automation system (AK 1703, AM 1703, AMC 1703), from the definition of the system-specific layout to the test. The course does not include the planning of system configurations. The course focuses on the automation component AK 1703; but it also contains the parameterisation steps which are common to the Ax – system family for AM/AMC 1703.

Ax 1703 – CAEx II Implementation
Booking code: AX-CAEXI
Training objectives
The participants will learn to create a control program that is executable on the system component AK 1703.

SICAM 1703 Workshop – Configuration IEC60870-5-101/104 Interface
Booking code: RTU-IEC104
Training objectives
The participants will acquire the skills necessary to configure an IEC60870-5-101/104 interface in the SICAM 1703 system.

SICAM 1703 Workshop – Configuration Profibus & Modbus Interfaces
Booking code: RTU-MODBUS
Training objectives
The participants will know how to configure MODBUS and PROFIBUS protocols which are applicable in the target system SICAM 1703. In this course the configuration is parameterised and tested with a course unit. Thereby the participant becomes familiar with the characteristics of the protocols.

SICAM TOOLBOX II – Basics
Booking code: TOOLBOX
Training objectives
The participants will understand the fundamental concepts of the SICAM TOOLBOX II with the central engineering tool the OPM II (object-oriented process data managers). They will have the knowledge to cooperate in an existing database.

SICAM 1703 Workshop – Configuration Transmission and Storage of Disturbance Records with SICAM DISTO
Booking code: RTU-DISTO
Training objectives
Disturbance records of any protection device which is coupled to a SICAM 1703 telecontrol network via IEC60870-5-103 can be read out with SICAM DISTO disturbance records disposal. This course provides the basic concepts and system functions. The participants will be able to configure the data flow of the SICAM 1703 components in order to transmit disturbance records via a telecontrol network of several SICAM 1703 components.
**SICAM 1703 Workshop – Configuration of SICAM BC**

**Booking code:** RTU-BC1703

**Training objectives**
At SICAM BC protection and control are autonomous. The system uses a display. The course emphasizes the parameterization of this display. The configuration of the control CPU is shown in the course "SICAM 1703 – Engineering". The participants will master the parameterization of pictures for the local display on the SICAM BC.

**SICAM 230 Workshop – Network Monitoring with SICAM 230 NWM**

**Booking code:** 230-MONIT

**Training objectives**
In the course the participant learns the practical application of the network manager. First part of the course gives an overview of the necessity, requirements and performance characteristics of integrated network management in automation. Second part of the course is about practical knowledge of configuring a network management system.

**SIPROTEC 4 – Engineering of Bay Controllers 6MD66 with IEC61850 – GOOSE Communication**

**Booking code:** SIP4-6MD66

**Training objectives**
The participants will learn how to adjust, manage and operate 6MD66 devices using the DIGSI 4 operating program. The user will parameterize and test the exchange of information between bay controllers among each other and to foreign-devices with IEC61850 GOOSE Communication.

**IEC61850 – The Standard for Substation Automation**

**Booking code:** SIT-IEC

**Training objectives**
The participants will learn the concept of the multivendor object model of the norm IEC61850. They will understand how the communication between substation automation units (bay control units, protective devices, switches, transformers etc.) works.

**Target audience**
Engineers which are working with substation automation systems.

**Prerequisites**
Basic knowledge of digital communication technology.

**Main features**
- General parts:
  - Part 1: Introduction and Overview
  - Part 2: Glossary
  - Part 3: General requirements
  - Part 4: System and project management
  - Part 5: Communication requirements for functions and device models
- Engineering part:
  - Part 6: Substation automation configuration description language
- Modelling parts
  (object model for communication services):
  - Part 7-1: Principles and models
  - Part 7-2: Abstract communication service interface ACSI
  - Part 7-3: Common data classes
  - Part 7-4: Compatible logical node classes and data classes
- Specific communication service mapping SCSM for the communication between substation automation units:
  - Part 8-1: Projection onto MMS (ISO/IEC 9506 parts 1 and 2 via ISO 8802-3)
- Specific communication service mapping SCSM for connecting primary technology:
  - Part 9-1: serial unidirectional multidrop point to point link
  - Part 9-2: for process bus
- Test-related part:
  - Part 10: conformity tests

**IT Networks – Automation**

**Booking code:** SIT-NETW2

**Training objectives**
The participants learn to understand the distinctive features of a network in an automation system and the specific requirements it has to fulfill. The participants will also build a typical network, which consists of automation units (SIPROTEC, SICAM BC), a control system (SICAM 230) and an Industrial Layer2/3 Ethernet network (Ruggedcom Layer2, CISCO Layer3).

**Target audience**
Engineers and project leaders who are involved in the design of automation systems.

**Prerequisites**
Basic knowledge of network technology is necessary, which can be gained by attending our course "IT Networks – Basics (SIT-NETW1)."

**Main features**
- Requirements automation networks have to fulfil
  - Environment
  - Availability (redundancy)
  - Specific protocol standards (e.g. IEC61850)
- Design of an automation network
  - Topology
  - Layer 2/3
  - Performance and bandwidth
  - Product choice
- Network management
- Practical application – automation network
  - Industrial network substation
  - Standard network central station
  - Network management
- Handling internal and external network operators
  - Service level (SLAs)
  - Interface choice
  - Security requirements
Substation Information

IT Security – Automation

Booking code: SIT-SECU1

Training objectives
The participants will work out security solutions which specifically focus on automation technology. The participants will also check the security measures of a typical automation network consisting of automation units (Siprotec, SICAM BC), a control system (SICAM 230), office PCs, etc., and also expand parts of the network.

Target audience
Engineers and project leaders who are involved into the design of automation systems.

Prerequisites
Basic knowledge of network technology and security is recommended, which can be gained by attending our course “IT Networks – Basics (SIT-NETW1)” and course “IT Security – Basics (SIT-SECU1)”.

Main features
- Concepts and approaches
- Availability
- Redundancy
- Security perimeters (DMZ, etc.)
- Organisational measures
- Security policy
- Technical measures
- Implementation of technologies like firewalls, etc.
- Device protection

1,200 EUR

IT Networks – Basics

Booking code: SIT-NETW1

Training objectives
The participants become familiar with state-of-the-art LAN network types and media, they will deal with protocol structures (TCP/IP), learn to understand terms like Ethernet, switching, IP-routing and IP-addressing. Moreover, the participants gain a basic understanding of network design. Such knowledge enables them to design simple networks and offers a sound basis for understanding more complex networks.

1,800 EUR

Telecontrol and Automation – Fundamentals

Booking code: SAS-TELE

Training objectives
The participants will be familiar with the terms and problem definitions of the automatic control engineering. They will also gain the basic knowledge to further attend the product-related training courses.

1,140 EUR

Numerical Communication in Substations – Basics & Trends

Booking code: SIT-NUMER

Training objectives
The participants receive basic knowledge of communication inside substations based on serial data transfer, PROFIBUS and Ethernet. The basics of communication technology are being taught, current and future norms, as well as trends will be introduced.

1,400 EUR

Communication Networks – Application in Power Transmission & Distribution

Booking code: SIT-COMPT

Training objectives
The participants will receive basic knowledge of communication networks (LAN/WAN) and the application in power systems of transmission and distribution grids.

1,400 EUR

Power Quality – SICAM PQS and SICAM PQ Analyzer

Booking code: PQ-SICAMPQ

Training objectives
The participants will acquire extensive insight of Disturbance evaluation and Power Quality monitoring with SICAM PQS and SICAM PQ Analyzer. They will learn handling and operating of the related tools and devices on the basis of typical application examples. After the course the participants will be able to configure such systems including disturbance recorders and power quality devices and how to get that information you need for your daily operation.

Target audience
Service/maintenance, operation, commissioning, engineering.

Prerequisites
Basics of electrical engineering, Basics of Power Quality, PC know-how.

Main features
- Introduction Power Quality (PQ) Monitoring and Disturbance Recording
- Current field solution for Disturbance-, Power Quality Monitoring and Substation Automation
- Introduction Substation automation system SICAM PAS in order to operate SICAM PQS
- Introduction of disturbance recorder SIMEAS R-PQ/-PMU
- Introduction of Power quality recorder SICAM Q80
- Overview SICAM PQS (Power Quality System): device hardware and architecture, software licenses, scope of functions, communication, commissioning and complete parameterization, time synchronization
- User Interface Configuration: Configuration, Mapping, Topology, Templates, Reports, Grid Codes
- User Interface Operation: Overview of system components and their operating state
- Overview PQ Analyzer
- Applications of PQ Analyzer
- Practical exercises

Notes
Theory/Praxis: 60/40.
SICAM Q80 – Application and Practice

Booking code: PQ-Q80

Training objectives
The participants will acquire extensive knowledge of the systems SIMEAS Q, as well as power meter SIMEAS P and measurement transducer system SIMEAS T. They will learn to evaluate and interpret the indicated power system data on the basis of typical application examples.

Target audience
Employees in power generation, transmission and industrial operations, and technically interested people.

Prerequisites
Basics of electrical engineering.

Main features
- “Power Quality” in Europe – Standard EN 50160
- Different use of fault recorders and average-value recorders in industrial applications
- Monitoring the power system voltage with average value recorders
- Use of compact recorders to monitor power system quality
- Operation and parameterizing with the systems SIMEAS T, SIMEAS P, SIMEAS Q and application of evaluation software SICARO PQ

Power Quality in Industrial Networks

Booking code: PQ-INDUST

Training objectives
Understanding of interaction between power network and load, knowing electric power quality diagnostic methods and improving the user-network interaction. The participants will gain theoretical knowledge of developments about electric power quality and learn problem solving strategies from case studies.

Target audience
Electricity distribution and industry companies employees responsible for planning, engineering and operation of electrical networks.

Prerequisites
Fundamentals of electricity.

Main features
- Basics
- Major disruption
- Supply quality
- Standards and regulations
- Measurement technology
- Concepts of reactive power
- Solutions
- Case studies
- Practical measurements
- Modeling based on computational tools
- Filter design

SIPROTEC 7KE85 – Fault Recorder

Booking code: PQ-7KE85

Training objectives
The participants will acquire extensive basic knowledge of the digital fault recorder SIPROTEC 7KE85 in combination with DIGSI 5, SIGRA and SICAM PQ/SICAM PQ Analyzer for parameterization and evaluation. They will learn the issues of system indications and power system quality and will know the corresponding recording systems. Furthermore, they will learn to evaluate and interpret the indicated data on the basis of typical application examples.

Target audience
Service/maintenance, operation, commissioning, engineering.

Prerequisites
Basics of electrical engineering.

Main features
- Introduction
- Communication and Time Synchronization Concept
- Functional Overview
- Parameterization and evaluation with DIGSI 5
- 7KE85 in combination with the Power Quality System SICAM PQ/SICAM PQ Analyzer
- Practice in typical workflows in parameterization and evaluation of the 7KE85
**Transmission and Distribution Networks – Basics Part I**

**Booking code:** PE-TDNET1

**Training objectives**
The participants will obtain extensive basic knowledge of electrical power transmission and distribution systems. The correlations between the individual components of an electrical power supply system will be explained. The participants will be provided with information that is important when configuring and using switchgear and learn the basic principles of the power system protection system.

**Target audience**
Employees of power plants, power supply utilities/industrial sector and individuals interested in technical fields who want to obtain a basic understanding of processes in electrical supply systems or refresh their technical knowledge.

**Prerequisites**
Basic knowledge of physics, preferably electrical engineering.

**Main features**
- Transmission and Distribution of Electrical Energy – Network Planning Issues
- Short Circuit Calculations and Symmetrical Components
- Methods of Star Point Earthing
- Power System Protection – An Overview

**Notes**
This training course is intended exclusively for Energy Sector employees.

**Prices**
- 9CA4110-0NE00-0DA1
  - 1,750 EUR
  - 10,000 INR
  - 150,000 NGN
  - 3,000 TRY

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**Transmission and Distribution Networks – Basics Part II**

**Booking code:** PE-TDNET2

**Training objectives**
The participants will deepen the basic knowledge of electrical power systems and the correlations between the individual power transmission and distribution components obtained in Part 1. They will learn about the tasks of power system components such as generators, transformers, motors, lines, cables and busbars. We will provide in-depth information on the configuration and application of components of an electrical power supply system and the tasks and basic principles of power system protection.

**Target audience**
Employees of power plants, power supply utilities/industrial sector and individuals interested in technical fields who want to obtain a basic understanding of processes in electrical supply systems or refresh their technical knowledge.

**Prerequisites**
Basic knowledge of physics, preferably electrical engineering, course “Transmission and Distribution Networks – Basics Part I (PE-TDNET1)”.

**Main features**
- Cables and lines for power transmission and distribution
- Transformers and their characteristic data, connection symbols, grounding principles, voltage control and tap changers,
- Generator, motor – basic principles
- Circuit breaker types, vacuum-switching technique and SF6 switching systems, switching operations, arc extinction principles
- Air- and gas-insulated switchgear
- Reactive power management; shunt and series compensation
- FACTS and high voltage direct current transmission systems (HVDC)
- Voltage and current measurement for protection, control and metering
- Principles and types of power system protection, design of protection systems, protection principles for transmission and distribution systems
- Calculation examples consolidate the gained knowledge and help understand the correlations

**Prices**
- 9CA4110-0NE00-0DA2
  - 1,750 EUR
  - 15,000 INR
  - 150,000 NGN
  - 3,000 TRY

(Net prices)
Electrical Energy Installations – Basics

Booking code: PE-INSTAL

Training objectives
To give the participants a better understanding of the basic principles of Electrical Energy Installations and help them to understand the main components of the power grid by using different software simulation programs to explain these principles. These simulation programs are a part of the course material.

Target audience
People who are involved in operating power installations and want to have a good knowledge of the power grid basics.

Prerequisites
Basics of electrical engineering knowledge.

Main features
- Electrical and magnetic fields
- Behavior of a sinus (current and voltage) in single and three phase networks
- Behavior of a coil and capacitor
- The difference between active and reactive power
- Calculations using coils, resistors and capacitors
- Principal of rotating fields in synchron and asynchron motors and generators
- Transformer principles and simulating schematics
- Effects of different load on the power grid
- Circulating currents at parallel switching of transformers
- The working diagram of the generator on the basis generator specifications company and associated company of generators
- The behavior of generators in the isolated or coupled operation

Notes
During the training simulating programs will be used to visualize electrical behavior. With a minimum on calculation you learn to verify several grid simulations and verify with your personal expectations. Simulation programs are part of the course materials.

950 EUR

Power Distribution Engineering – Introduction

Booking code: PE-DISTENG

Training objectives
The main objective of this course is to improve the participant’s understanding of power circuit analysis and distribution systems. The participant will take away the ability to analyze common power circuit problems. The participant will also have a stronger understanding of distribution system problems and equipment applications.

Target audience
A great course for new engineers, technicians from industrial applications, operations or Smart Grid application engineers who need to better understand the distribution system components, limits and risks.

Prerequisites
It is assumed that participants have college level geometry, trigonometry, matrix algebra, and physics. A background in electric power systems is not required.

Main features
- The course reviews the fundamental methods used in the steady-state analysis of AC circuits as applied to power distribution systems including:
  - Complex numbers, phasors and vectors
  - Ohm’s law for resistive, capacitive and inductive linear circuit elements
  - Real and reactive power in AC circuits (kVA, kW and kvar)
  - Kirchoff’s laws and the fundamentals of circuit analysis
  - Matrices and network solution methods
  - Three-phase power systems
  - The per unit system
  - Symmetrical components
  - Fault currents and Thevenin and Norton equivalents
  - Overview of the power delivery systems
  - Introduction to reliability and power quality
  - Distribution system configuration
  - Distribution equipment
  - Voltage drop
  - Voltage regulation
  - Load types: lighting, motors and load cycles
  - Power factor correction and capacitor applications

2,399 USD

Substation – Engineering and Operations

Booking code: PE-SUBENG

Training objectives
This course will introduce participants to aspects of substation engineering and operations.

Target audience
Engineers interested in topics that include design parameters, bus arrangements, drawings, specifications, electrical clearances, structures, foundations, grounding design, conduit design, protection, monitoring, and maintenance.

Prerequisites
The structure of the course is intended for engineers who want to get an overview of the substation engineering and operation process.

Main features
- Introduction
- General design parameters
- Electrical engineering and design
- Construction, commissioning and startup
- Maintenance

2,399 USD
Main features
- Basic knowledge of electrical engineering.

Prerequisites
- Basic knowledge of electrical engineering.

Main features
- Smart Grids – the requirements for a modern distribution network
- Smart Metering – terms, concepts, solutions
- AMIS – automatic meter and information infrastructure
  - Data concentrators
  - Meter and switching devices
- Transmission capacity increase
- New supply structures, e.g. microgrids
- Smart generation
  - Virtual power plants (VPP)
  - Decentralized energy management
  - Electric vehicles
  - Battery storage systems
- Smart consumption
  - Smart metering
  - Load management
  - Building automation/building management systems
- Information and communication technology (ICT)
- Experiences from pilot applications and projects

Target audience
- Engineers and managers who are engaged in smart metering and who are interested in a complete (smart metering and automation) solution.

Prerequisites
- Basic knowledge of electrical engineering.

Main features
- Smart Grids – the requirements for a modern distribution network
- Smart Metering – terms, concepts, solutions
- AMIS – automatic meter and information infrastructure
  - Data concentrators
  - Meter and switching devices
- Transmission capacity increase
- New supply structures, e.g. microgrids
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- AMIS – automatic meter and information infrastructure
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Prerequisites
- Basic knowledge of electrical engineering.

Main features
- Smart Grids – the requirements for a modern distribution network
- Smart Metering – terms, concepts, solutions
- AMIS – automatic meter and information infrastructure
  - Data concentrators
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- New supply structures, e.g. microgrids
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  - Battery storage systems
- Smart consumption
  - Smart metering
  - Load management
  - Building automation/building management systems
- Information and communication technology (ICT)
- Experiences from pilot applications and projects

Target audience
- Engineers and managers who are engaged in smart metering and who are interested in a complete (smart metering and automation) solution.

Prerequisites
- Basic knowledge of electrical engineering.
The Smart Grid Professionals Series
Booking code: SG-PROF

Training objectives
Developing a Smart Grid strategy is a complex endeavor. It is even harder when you do not know what developing a smarter grid really entails. This course is the latest addition to our professional workshop series, the Siemens Smart GRID Professionals Series (SGPS) provides participants with an assessment of the critical infrastructure and the associated decisions required to make a smarter grid a reality.

Target audience
Whether you are in development, customer service, finance, project management or a transitioning civil or mechanical engineer, understanding the concept of a Smart Grid will enable you to provide valuable contributions to your organization.

Prerequisite
Basic knowledge of the electrical industry or SEPS 400.

Main features
- Defining Smart Grid Objectives, a Needs Assessment
  - Grid Challenges – social, environment and political drivers and impacts, reliability issues, changes in generation and technology improvements
- Understanding Distribution Systems and Grid Performance
  - Understanding performance measures and challenges – reliability indices, cost of reliability, electric vehicles, distributed generation, outages and losses
- Current and Future Distribution System Equipment
  - Distributed Generation – PV, Wind, fossil generation and CHP
- Smart Grid Solutions – sensors, distribution automation, DG with energy storage, demand response, EV charging and Microgrids
- Communications, IT and Data Management
- Smart Grid ROI – Weighing the Costs and Benefits to Stakeholders
- PSS®SINCAL – planning software tool for demonstration of smart grid solutions

Power System Planning – Principles
Booking code: NET-PRINC

Training objectives
The participants will receive general information about technical-economical solutions of power-transmission and distribution in industry and other supply utilities.

Target audience
Siemens employees as well as other employees from utilities and industry with their main field of work in planning and operation of power systems.

Prerequisites
Basic knowledge of physics, preferably electrical engineering.

Main features
- Power system configuration and extension planning of high voltage, medium voltage and low voltage power systems, substation and component design
- Neutral grounding, project planning of earthing systems, interference of power supply installations
- Power system analysis and calculations (load flow and short circuit)
- Instrument transformer dimensioning, design and coordination of protection systems
- Operating and dynamic behavior of industrial systems with numerous use of machinery
- Switching operations, overvoltage protection and isolation coordination
- Harmonics and filter circuits, system perturbations
- Behavior of HVDC converter stations, static var compensators and controlled series compensation
- Accompanying practical instructions in questions of power system calculation, current transformer dimensioning and protection coordination

Circuit Diagrams and Reference Systems – Basics
Booking code: NET-CIRCUI

Training objectives
The participants will learn how to use documentation for electrical high- and medium voltage installations. They will learn about the different types of documents used to document an electrical installation, old and new reference systems, cross-references between different circuit diagrams, etc.

Target audience
Users from electric utilities and industry.

Prerequisites
Basic knowledge of electrical engineering.

Main features
- Introduction
- Single-line diagrams
- Functional diagrams
- Reference system
- Circuit diagrams
- Connection tables
- Cables
- Fault localization
- Practical application of all topics

1,750 EUR
150,000 NGN
15,000 INR

12,000 NOK
**Network Planning**

**Overvoltages and Insulation Coordination**

Booking code: NET-INSUL

**Training objectives**
This course will improve the participants’ understanding of power system transient and overvoltage events such as faults, switching and lightning surges.

**Target audience**
The training is structured for electrical engineers that have some familiarity with electric power system analysis.

**Prerequisites**
Basic knowledge of electrical engineering.

**Main features**
- Rated voltage stresses
- Overvoltages from faults and Ferranti rise
- Backfeeding
- First order transients
- Second order transients
- Capacitor switching
- Circuit breaker transient recovery voltage
- Fault current asymmetry
- Transformer inrush currents
- Ferroresonance
- Blackstart
- Traveling waves
- Switching surges from line energizing
- Lightning surges on transmission lines
- Surge arrester behavior
- Surge arrester construction
- Surge arrester applications
- Protective margins and insulation coordination

1,300,000 COP

**Power Flow Analysis with Applications – Introduction**

Booking code: NET-PFLOW

**Training objectives**
Utility, IPP, ISO and other organizations in the electric power industry need engineers who have a solid comprehension of power flow behavior. This course aims to provide participants with an education in steady-state power flow analysis of electric power systems.

**Target audience**
A great introduction for operators and engineers alike as it addresses power flow techniques for power system steady state analysis with an emphasis on current practices and applications.

**Prerequisites**
The structure of the course presumes that participants are engineers with knowledge in basic electrical circuit theory. No prior experience with power flow simulation is required.

**Main features**
- Review of voltage, current and power in balanced three-phased systems
- Generating plant models
- Electrical characteristics of transmission lines and cables
- Two- and three-winding transformer models
- Load tap changing transformers
- Modeling of non-conventional devices: (FACTS, PV and Wind)
- Iterative methods for solving the power flow problem
- Solving difficult power flow cases
- Contingency analysis

2,825 USD

**Power Flow Analysis with Applications – Fundamentals**

Booking code: NET-POWER

**Training objectives**
The participants will learn about the fundamental theory of steady-state power flow, network modeling and solution methods, along with various applications such as contingency and transfer limit analysis, reactive power and voltage control.

**Target audience**
The participants for this training seek an education in steadystate power flow analysis of electric power systems.

**Prerequisites**
An engineering degree with knowledge of basic electrical circuit theory is desirable. No prior experience with power flow simulation is required.

**Main features**
- Review of voltage, current and power in balanced three-phased Systems
- The per unit system
- Generating plant models
- Load models
- Introduction to PSS®E
- Electrical characteristics of transmission lines and cables
- Line model
- Power and car transfer on a line
- Reactive compensation of lines and cables
- Power factor correction
- Transformer ratings
- Two and three winding transformer models
- Load tap changing transformers
- Phase-angle regulators
- Modeling of non-conventional devices: (FACTS and Wind farms)
- Iterative methods for solving the power flow problem
- DC and AC solutions
- Gauss-Seidel and Newton-Raphson solution methods
- Solving difficult power flow cases
- Inertial and governing power flow solutions
- Reactive power flow and voltage control
- Contingency analysis
- Performance indexes
- Network sensitivity factors
- Power transfer limit analysis
- Voltage collapse
- Network models

**Notes**
The most recent version of Siemens PTI’s PSS®E Power Flow Program will be used for the class examples and problems.

Location: Manchester or clients site.

Price on request

(Net prices)
Power Transmission & Distribution Systems – Load and Short Circuit Calculation

Booking code: NET-CALCU

Training objectives
The participants will receive information about the actual status of standard power system calculation methods, recognizing weak spots in the power system and searching for remedies.

Target audience
Engineers and service technicians from power supply utilities and industry in operation, planning, design and servicing of switchgear.

Main features
- Symmetrical components
- Model of the network components
- Mathematical methods of the network calculation
- Short-circuit
- Application: Overcurrent protection coordination
- What is the purpose of load-flow and short-circuit current calculation?
- Power system structures and star point handling
- Characteristic equipment values
- Theory of calculating electrical power supply systems
- Modeling the most important electrical equipment (generator, transformer, line and load)
- Load-flow calculation, current iteration and Newton Raphson methods
- Short-circuit calculation, regeneration methods, standards
- Selectivity of time-graded protection facilities (overcurrent-time and distance protection)
- Small examples calculation relating to the above-mentioned methods
- Calculating really existing power systems with the aid of interactive calculation programs on a PC or workstation to verify manually determined values
- Interpreting the results
- Possibilities of remodeling weak spots in the network

Industrial Networks – Load and Short Circuit Calculations (MV/LV)

Booking code: NET-MVLV

Training objectives
Gaining calculation techniques to establish short circuit consistent low and medium voltage electrical installations taking into account the terminal and dynamical endurance during life cycle of the installation.

Target audience
Persons involved in managing electrical installations for Low and Medium Voltage and want to gain insight in the calculations as basis for developing electrical installations.

Main features
- IEC60909, short-circuit current calculations in three-phase networks
- Examples of calculations for industrial and public low-and medium voltage networks
- Practical assignments for the preparation of load flow and short-circuit current calculations
- Working with short-circuit current and load flow calculation software including Vision, Simaris Design and Gaia
- A calculation model for preparing an electrical installation with low and medium voltage substation, with transformers, own generation and larger drives
- Short circuit current calculations in weak networks
- Load flow calculation at startup of motors
- The basic principles of computing with symmetric components and the application to asymmetric net situations

2,825 USD

Power System Dynamics – Introduction

Booking code: NET-PSDUS

Training objectives
Engineers in operations will gain an understanding of dynamic effects encountered in daily operation of the system and necessary in planning contingencies.

Target audience
This training is recommended for engineers seeking to understand methods in modeling a dynamic system, the classical control techniques to determine control system stability and the relationship between system relative stability and calculated indices.

Main features
- Overview of power system dynamics
- Power system models for generation control
- Power system stability concepts
- System design for stability
- Frequency response techniques
- Synchronous machine models
- Load flow criteria in system design
- Reactive support – condensers and static
- Induction machines
- Series capacitors
- Sub-synchronous oscillations
- Shaft torques
- DC transmission
- Load characteristics
- Voltage collapse
- Out-of-step protection

1,350 EUR

(Net prices)
Renewables Integration

Wind Power – Power System Studies for Integration

Booking code: REN-WPPSS

Training objectives
The primary objective of this course is to provide the participant with an overview of the technical challenges and benefits for integrating large amounts of wind turbine generation into the power system, and the Power System Studies that need to be conducted.

Target audience
This course is for power system engineers, planners and developers who need to understand the growing role of wind energy in the power supply and the operational impacts of integrating wind resources.

Prerequisites
The course requires no specialized background in power system engineering, but does presume a general understanding of the power and transmission systems.

Main features
- Technical considerations for integrating large amounts of wind turbine generation into the power system
- Wind turbine generation interconnection requirements, as well as current practices and industry trends
- Wind turbine generator types and technical capabilities for participating in the active power and ancillary services markets.
- Industry trends; generator sizes, technology and location (off shore versus on shore)
- Modeling of wind turbine generators for steady-state and stability analyses
- Steady-state and voltage stability impacts of integrating large amounts of wind turbine generation
- Dynamic studies required for the integration of wind turbine generation
- Wind integration operational impacts; frequency regulation (AGC and spinning reserve), load following (economic dispatch), and unit commitment
- Market impacts of wind integration; forecasting, day-ahead, hour-ahead markets

Price on request

2,825 USD

Wind Power – Grid Connection Feasibility for Onshore Wind Farms

Booking code: REN-WPGC

Training objectives
The training will provide participants with an understanding of the issues relating to connecting onshore windfarms to the electricity network.

Target audience
Engineers with an interest in planning, design, engineering and operation of onshore windfarms.

Prerequisites
Basic knowledge of solar systems.

Main features
- Overview of grid connection process Network connection issues
  - Geographical
  - Environmental
  - Electrical
  - Social/political
- Grid connection studies
  - Fault level
  - Reactive power
  - Load flow
- Feasibility study process Case studies

Price on request

1,100 EUR

Solar Plants Monitoring – Module 1 (Communications)

Booking code: REN-SOL1

Training objectives
The participant will deepen their knowledge of acquisition and communication technologies in industrial environment, focused in solar plants remote control and monitoring.

Target audience
Engineers and/or technicians working at plants, distribution companies and industry facilities. Planning and operation of power systems responsible personnel.

Prerequisites
Basic knowledge of solar systems.

Main features
- Data acquisition technologies
- Data types
- Sensors and actuators
- Data concentration systems at plant
- SCADA Systems
- Communication technologies
- OSI Model
- Physic layer protocols
- Net protocols
- Communications safety
- Remote control and monitoring introduction
- Monitoring and remote monitoring
- Monitoring functions
- Data management systems
- Quality service improvement

Price on request

1,100 EUR
**Solar Plants Monitoring – Module 2**  
(Thermal Solar Power Plants)

Booking code: REN-SOL2

**Training objectives**
The participants will deepen their knowledge of acquisition and communication technologies in industrial environment, focused on solar plants remote control and monitoring.

**Target audience**
Engineers and/or technicians working at plants, distribution companies and industry facilities. Planning and operation of power systems responsible personnel.

**Prerequisites**
Basic knowledge of solar systems.

**Main features**
- Thermal Solar power plants
- Thermal Solar power plants history
- Working principles
- Thermal Solar power plants kinds
- Design basic criteria
- Monitoring and introduction to thermal solar power plants control
- Monitoring and remote measurement
- Monitoring levels
- Remote control
- Plant improvement

**(Net prices)**

1,100 EUR

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**Solar Plants Monitoring – Module 3**  
(Solar Plants for Water Heating)

Booking code: REN-SOL3

**Training objectives**
The participants will deepen their knowledge of acquisition and communication technologies in industrial environment, focused on solar plants remote control and monitoring.

**Target audience**
Engineers and/or technicians working at plants, distribution companies and industry facilities. Planning and operation of power systems responsible personnel.

**Prerequisites**
Basic knowledge of solar systems.

**Main features**
- Solar heating systems
- Basic layouts
- Basic working principles
- Solar heating functions
- Plant components
- Working layout
- Design basic criteria
- Construction and maintenance
- Solar heating plants monitoring
- Control and monitoring systems
- Solar accumulator charge and discharge control
- Solar heating remote management systems
- Control components: sensors and actuators
- Control and monitoring needing – legal issues

**(Net prices)**

1,100 EUR

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**Solar Plants Monitoring – Module 4**  
(Solar Photovoltaic Plants)

Booking code: REN-SOL4

**Training objectives**
The participants will deepen their knowledge of acquisition and communication technologies in industrial environment, focused on solar plants remote control and monitoring.

**Target audience**
Engineers and/or technicians working at plants, distribution companies and industry facilities. Planning and operation of power systems responsible personnel.

**Prerequisites**
Basic knowledge of solar systems.

**Main features**
- Photovoltaic systems
- Photovoltaic systems uses
- Plant components
- Working layout
- Design criteria
- Operation and maintenance
- Photovoltaic plants monitoring
- Components monitoring
- Plant data connections
- Monitoring systems
- Remote control
- Effect on operation and maintenance

**(Net prices)**

1,100 EUR
Further Power Engineering Trainings

**Division Smart Grid – Technology at a Glance**
Booking code: GEN-SG

Training objectives
The participants will learn about the impact of electrical engineering and will get an overview about the utilization and applications of power plants and solutions in the field of power transmission and distribution.

Notes
This training course is intended exclusively for Energy Sector employees.

**Oil and Gas Industry – Fundamentals**
Booking code: PE-OILGAS

Training objectives
The participants will have a compact, basic knowledge of the oil and gas industry. They will know "how it works" and will be able to understand their colleagues and customers.

**Power Distribution and Industry Networks – System Planning and Quality**
Booking code: NET-DISTRI

Training objectives
The participants are given detailed information about problems and technically economical power distribution solutions for public power supply networks, industry and other power supply facilities.

**Division Smart Grid – Technology at a Glance for Non Technical Employees**
Booking code: GEN-SGNT

Training objectives
The participants will get an overview about the impact of responsibilities, organization and technology within the Smart Grid Division. They will be able to network with new colleagues.

**Electromobility – Introduction and Status**
Booking code: SG-ELECT

Training objectives
The participants will be provided with an overview of the design, developments and potentials of electromobility. Effects on the power system depending on different charging strategies will be discussed.

**Power Transmission Networks – System Planning and Quality**
Booking code: NET-TRANS

Training objectives
The participants will receive detailed information about problems and technically economical power transmission solutions for public power supply networks.

**Siemens Energy Program for Graduates and Young Engineers (3 Months)**
Booking code: ENERGY-NIG

Training objectives
On completion of the training, the participant could apply for a licence as electrical expert, work as electrical technician for a power utility or in an industrial set up, or work as a self employed Electrical Technician capable of performing installation, operation and maintenance jobs on electrical installations (utility, domestic and industrial networks).

**AMIS – How it Works**
Booking code: SG-AMIS

Training objectives
At the end of this training the participants will have basic knowledge of the smart metering solution AMIS. They will know the necessary products (Counters, Data concentrator, Transaction Server, ...) and their technical details. They will be able to install a complete AMIS solution by their own.

**High and Low Voltage Installations – Earthing and Interference**
Booking code: NET-EARTH

Training objectives
The participants will be able to use basic knowledge about protective earthing in high voltage installations, electromagnetic interference, lightning protection and selection of low voltage systems in their work environment.

**Medium and Low Voltage Installations – Design Criteria**
Booking code: PE-LMV

Training objectives
To give the participants an understanding of the principals of Electrical Installations, dimension of the Power Installation and explanation of the design of a low-medium voltage installation.

**Low Voltage Networks – Theory and Practical Applications**
Booking code: NET-LV

Training objectives
In this course, participants will learn about network system design, protection and operations. Topics include network relay characteristics and settings, fuse and cable limiter characteristics and coordination, primary system grounding and relaying, application of primary side fuses, overvoltages during capacitive backfeed, arcing fault characteristics and protection schemes for 480-volt spot networks, cogeneration and closed transition load transfers on spot networks, and network protector test sets for relay and protector testing.
Distribution Power Systems – Reliability Analysis
Booking code: NET-RELIAB

Training objectives
Participants will gain practical knowledge for reliability calculations of high- and medium voltage power systems of the public and industrial utilities. Based on mathematical principles for reliability calculations, the participants will receive detailed information about modeling and associated facts to do the calculations and to evaluate the results. Accompanying practical tuition at hand of feasible example power systems will deepen the knowledge.

Notes
Theory/Practice: 50/50.

Power Distribution Systems – Management and Automation – Basics
Booking code: NET-AUTOM

Training objectives
The participants will understand the customer process regarding Distribution Network Structures and Management, with a focal point on Distribution Automation. They will be able to express the most important benefits of a Distribution Management System, and they will understand the general use of the IT Systems in relation to Electricity Distribution.

Dynamic Network – Phenomena, Simulation and Analysis
Booking code: NET-DYNAM

Training objectives
The participants will acquire basic knowledge on how to simulate dynamic networks and how to analyze the results. Main field of application will be "Protection Technology". The participants will learn about the essential usage of a dynamic network simulation program and carry out basic simulations on topics load flow, stability and transients.

Notes
Theory/Practice: 50/50.

Power System – Reliability
Booking code: NET-PSREL

Training objectives
This course will provide participants with an organized review of the power system fundamentals, defining the reliability relationship, and discussing traditional and modern methods to improve reliability.

Wind power – Network Integration
Booking code: REN-WIND

Training objectives
The participants will receive basic knowledge of power systems and systems engineering and will work out reliable and cost-effective solutions as required for the planning and design of wind power plants.

Notes
Theory/Practice: 50/50.

Wind Power – Introduction to Grid Compliance for Onshore Wind Farms
Booking code: REN-WPGCOM

Training objectives
The training will provide participants with an understanding of Grid Compliance issues relating to connecting Onshore Windfarms to the electricity network.

Distributed and Renewable Power Generation – Integration
Booking code: REN-DIS

Training objectives
The participants will be provided with an objective overview of the design and use of distributed generation technologies and technologies that are based on renewable energy sources, their effects on the power system and aspects that must be considered when integrating these plants into existing network structures.

Distributed Generation – Energy Storage Applications on Power Systems
Booking code: REN-STORAG

Training objectives
This course provides a thorough overview of Distributed Generation (DG) technologies, applications, and system analysis methods. The student will gain an understanding of DG technologies, DG interconnection practices/requirements and DG impacts on the power system.
PSS®E – Power Flow and Steady State Analysis Using PSS®E

Booking code: PSSE-PFSS

Training objectives
Interpret power flow results (convergence, divergence, non-convergence), understand the causes and event sequence of voltage collapse and apply data checking functions in PSS®E to identify power flow modeling issues. This course provides the fundamental PSS®E software training to help novice users navigate the interface and gain hands-on experience. Topics include power flow modeling data, one-line diagrams, power flow solutions and reports, program automation, response files and Python™, contingency and transfer limit analysis and more.

Target audience
New users who wish to become familiar with the power flow and fault analysis sections of the PSS®E program.

Prerequisites
This course assumes participants are familiar with computers, electric network modeling fundamentals (course “Power Flow Analysis with Applications – Introduction (NET-PIFLOW)”), symmetrical component theory of poly-phase systems (course “Power Distribution Engineering – Introduction (PE-DISTENG)”), and power system analysis methods.

Main features
- Introduction to PSS®E
- Basic power flow modeling data
- Creating one-line diagrams
- Power flow solution and reports
- Data addition and modification
- Features of the new interface
- Data checking
- Program automation
- Contingency and transfer limit analyses
- Balanced switching
- Fault analysis
- Line properties calculator
- Data management
- Network reduction
- Special applications

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GB 1,295 GBP

PSS®E – Advanced Power Flow Using PSS®E

Booking code: PSSE-ADVPF

Training objectives
This training provides experienced PSS®E users with instruction in the use of PSS®E at an advanced level. The training is structured to include lecture sessions and hands-on exercises for selected topics.

Target audience
Experienced PSS®E users.

Prerequisites
Participants should be experienced with power flow of power systems and should have completed the course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)”. 

Main features
- What’s new in the latest PSS®E version
- Load Flow and Short Circuit Interface
- Transformer Modeling
- Fault Analysis Applications
- Modeling of FACTS Devices
- Voltage Analysis
- Introduction to Optimal Power Flow
- Contingency Analysis
- PV and PQ Analysis
- Program Automation

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GB 1,295 GBP

PSS®E – Reactive Power Planning Using PSS®E

Booking code: PSSE-REACP

Training objectives
Utility engineers who conduct studies with PSS®E must understand the fundamental concepts of power system behavior, as well as how to execute the many complications routines within the program. This course provides experienced PSS®E users with instruction in the use of PSS®E at an advanced level for the analysis of voltage control issues (voltage collapse, reactive power compensation, dynamic voltage recovery, etc.).

Target audience
This course is great for the experienced PSS®E user who needs to increase his/her analytical skills related to voltage control issues in steady state and dynamic simulation.

Prerequisite
Course “PSS®E – Dynamic Simulation Using PSS®E (PSSE-DYNSI)”.

Main features
- Voltage Criteria Voltage Collapse Steady State Assessment
- Contingency analysis
- PV analyses
- QV analyses Optimal power flow
- Capacitor placement
- Load curtailment Reactive compensation
- Shunt capacitors
- TSC & TCR
- SVC
- STATCOM
- Synchronous condensers
- Series capacitors
- Modeling in PSS®E Load characteristics
- Induction motors
- Load damping
- Under voltage load shedding Dynamic voltage recovery study
- Long-term simulation
- Excitation limiters
- Load tap changers

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GB 1,295 GBP

(Net prices)
PSS®E – Voltage Control and Reactive Power Planning Methods

Booking code: PSSE-VCONT

Training objectives
Training objectives of this course are to provide a thorough coverage of today's voltage and reactive power planning issues, and of the tools and procedures that are most effective in studying them.

Target audience
Power system planner or operator concerned with voltage stability.

Prerequisites
This training is most beneficial to those who have had at least a year of experience in power system design, planning, or operation. Power flow analysis experience is recommended but not essential.

Main features
- Overview
- Equipment voltage characteristics
- Analytical tools
- Analytical methods
- Voltage characteristics
- Bulk system voltage characteristics
- Reactive power planning
- Review and closing discussion

Price on request
12,000 NOK
2,825 USD

PSS®E – Integrating Renewables Using PSS®E

Booking code: PSSE-RPSIN

Training objectives
This training will cover a wide range of topics related to modeling and application of renewables including wind and solar power.

Target audience
Planning engineers who are interested in modeling renewables into the system design and operation.

Prerequisites
Participants should have either setup or operating experience with power flow and dynamic simulation of power systems or should have completed the course "PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)" and "PSS®E – Dynamic Simulation Using PSS®E (PSSE-DYNSI)".

Main features
- General concepts
- Modeling wind farms and turbines for load flow studies
- Modeling wind farms and turbines for stability studies
- PSS®E wind and solar power software packages
- Utility/application issues
- Hands-on: Setting up load flow and dynamics with wind farms employing different wind turbines and PV arrays
- A general summary of specific wind turbine model packages developed by Siemens PTI for PSS®E will be given to highlight the latest developments and increase awareness of model contents and availability.

1,295 GBP
2,399 USD

Power Electronics in Transmission Systems (PETS)

Booking code: PSSE-PETS

Training objectives
To provide engineers with a comprehensive understanding of HVDC systems, FACTS devices, and alternative energy sources as well as technical problems that may be encountered when installing these elements in an existing power system. The training presents operating and control fundamentals along with discussing modeling principles and advanced analytical tools available. Emphasis on use of the PSS®E software is made and detailed hands-on examples are used to better understand power electronics performance.

Target audience
The structure of the course presumes that participants have a degree in electrical engineering and are familiar with load flow and/or dynamic calculations. Experience in using PSS®E is strongly encouraged.

Prerequisites
Fundamentals of power system engineering and the basic mathematical skills, such as trigonometry, complex numbers, matrix algebra and applied calculus.

Main features
- Introduction
- Conventional HVDC systems
- Latest HVDC technologies
- FACTS technologies
- Alternative energy sources
- Wind turbines and plants

2,825 USD
PSS®E – Dynamic Simulation Using PSS®E

Booking code: PSSE-DYNSSI

Training objectives
This 4.5 day intensive hands-on PSS®E course will help understand different types of disturbances can cause systems to behave in certain ways through analysis of system response outputs from PSS®E dynamic simulations.

Target audience
Power System Engineers interested in learning PSS®E Dynamics.

Prerequisites
Instructors assume participants have attended the course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)” and are familiar with generator, turbine control and network protection models course “Power System Dynamics – Introduction (NET-PSDUS)”. Participants should also be conversant with differential equations and Laplace transformers. For locations other than Schenectady, NY, students should bring their company issued laptop with software preinstalled. Loaner computers are available for a fee. Instructions for software downloads will be emailed 2–3 weeks in advance of the course.

Main features
- PSS®E Power flow and dynamic simulation data
- Running PSS®E and dynamic simulation approach
- Steady state analysis setup
- Initialization
- Setup documentation
- Running PSS®E
- Running dynamics simulations
- Examining results
- Model library overview
- Sanity checking
- Response tests
- Setup modifications
- Model writing introduction

2,399 USD

1,295 GBP

2,825 USD

PSS®E – Optimal Power Flow

Booking code: PSSE-OPF

Training objectives
This training will provides participants with an understanding of the capabilities of the PSS®E OPF program and introduces them to the many applications and uses for which it has proven to be most beneficial.

Target audience
Engineers and service technicians who work in operation, planning and design of power systems.

Prerequisites
Participants should be familiar with the basic operation of the PSS®E load flow program. Knowledge of optimal power flow theory is not required.

Main features
- Overview and Introduction
- Theory and applications
- Special OPF applications

2,399 USD

1,295 GBP

2,825 USD

PSS®E – Using Python to Integrate PSS®E Workflow

Booking code: PSSE-PSCRI

Training objectives
To teach participants to develop and apply Python programs and to enhance their capabilities and efficiency when conducting PSS®E load flow, short circuit, and dynamics studies.

Target audience
PSS®E users who would like to increase his/her productivity and efficiency through the use of this modern scripting language will benefit from this course.

Prerequisites
PSS®E program knowledge and a basic background in programming and scripting languages.

Main features
- Python language overview
- Input/output processing
- Variables and data structures
- Flow control
- Functions and objects
- Interface with PSS®E
- Accessing PSS®E data
- Looping through buses and branches
- Load flow applications and control
- IPLAN programming in Python
- Plotting and graphics
- Interacting with the host operating system
- Text parsing and customized I/O
- Putting it all together: a complete PSS®E- Python load flow analysis example

2,399 USD

1,295 GBP

2,825 USD

(Net prices)
**PSS®SINCAL – Basics**

*Booking code: SINCAL-BAS*

**Training objectives**
The participants will acquire basic knowledge on how to use the network planning program PSS®SINCAL. They will learn to use the software for basic calculations on topics related to load flow and shortcircuit.

**Target audience**
Engineers and service technicians from power supply utilities and industry in operation, planning and design of power systems.

**Prerequisites**
Basics knowledge of electrical engineering, electrical networks and protection technology.

**Main features**
- User interface (window technologies, indications, characteristics)
- Basic functions (create and edit network elements)
- Masks (functionality, manipulation of standardized types)
- Exposition of results (tables, protocols, graphics)
- Filters for demonstration
- Table editor (design, operation, prints)
- Establishing of networks (import, export of data)
- Graphic editor (formatting, evaluation, objects)
- Electrical elements and methods
- Macros, variants, catalogues
- Network planning toolbox
- Calculation Methods:
  - Power flow balanced and unbalanced, Load Profiles
  - Short Circuit incl. Multiple Fault and Line Constants
  - Exercises how to apply PSS®SINCAL with some case studies

**Main features**
- Introduction to PSS®SINCAL
- User interface (window technologies, indications, characteristics)
- Menus and submenus
- Extras-Options menu
- Modeling (create and edit network elements)
- Masks (functionality, manipulation of standardized types)
- Filters for demonstration
- Table editor (design, operation, reporting, prints)
- Establishing of networks (import, export of data)
- Graphic editor (formatting, evaluation, layers, objects)
- Electrical elements and methods
- Topology and Network Browser
- Macros, variants, catalogues
- Exposition of results (tables, protocols, graphics, diagrams)
- Load flow analysis
- Short circuit analysis
- Various examples on real system

**PSS®SINCAL – Basics for Distribution Companies**

*Booking code: SINCAL-BAD*

**Training objectives**
The participants will acquire basic knowledge on how to use the network planning program PSS®SINCAL for distribution networks. They will learn to use the software for basic calculations on topics related to load flow, short-circuit with real system examples.

**Target audience**
Engineers and service technicians from power distribution companies in the fields of operation, planning, design of network and its components.

**Prerequisites**
Basic knowledge of electrical engineering and electrical networks.

**Main features**
- Introduction to PSS®SINCAL
- User interface (window technologies, indications, characteristics)
- Menus and submenus
- Extras-Options menu
- Modeling (create and edit network elements)
- Masks (functionality, manipulation of standardized types)
- Filters for demonstration
- Table editor (design, operation, reporting, prints)
- Establishing of networks (import, export of data)
- Graphic editor (formatting, evaluation, layers, objects)
- Electrical elements and methods
- Topology and Network Browser
- Macros, variants, catalogues
- Exposition of results (tables, protocols, graphics, diagrams)
- Load flow analysis
- Short circuit analysis
- Various examples on real system

**PSS®SINCAL – Smart Grid**

*Booking code: SINCAL-SG*

**Training objectives**
The participants will acquire knowledge of challenges and solutions for integrating a high share of renewable energy sources into distribution grids. This knowledge is transferred via practical training by analyzing a distribution network in PSS®SINCAL.

**Target audience**
Engineering, Distribution System Operators.

**Prerequisites**
Basics of electrical power systems.

**Main features**
- Introduction Trends in electrical power supply
  - Overview and impact of Renewable Energy Sources (RES) Current situation at Distribution System Operators in Germany
  - Exercise: Setting up a network in PSS®SINCAL
- Challenges due to a High Share of Renewable Energy in Low Voltage or Medium Voltage Networks
  - Exercise: Practical Example in PSS®SINCAL
  - Exercise: Calculation of impact of distributed generation on LV and MV networks (steady-state analysis)
- Overview of solutions like
  - Conventional network expansion
  - Controllable or smart generation
  - Smart components like regulated transformers
  - Battery storage
  - Load management
  - Exercise: Implementation of different solutions in PSS®SINCAL
  - Exercise: Analysis of impact on network performance
- Protection Concepts in networks with a high share of renewable energy

**PSS®SINCAL – Dynamic Smart Grid Studies for Off-Grid Solutions**

*Booking code: SINCAL-SGD*

**Training objectives**
The participants will acquire detailed knowledge of the operation and control of microgrids and off-grid solutions. The course focuses on the calculation and simulation of the Microgrid behaviour for steady-state and dynamic calculations in PSS®SINCAL.

**PSS®SINCAL**

- Price on request
- 4,000 TRY
- 1,750 EUR
- 9CA4120-0NE00-0DD8
- 1,500 EUR
- 9CA4120-0NE00-0DD5
- 3,000 TRY
- 48,800 RUB
- 1,825 USD
- 9CA4120-0NE00-0DD6

(Net prices)
Further Software Trainings

**PSS®E – Transmission Reliability Studies Using PSS®E**

*Booking code: PSSE-TRANS*

**Training objectives**
This training is intended for anyone dealing with reliability concepts and their application and is valuable to all who are involved with transmission systems in the emerging deregulated environment and those who plan, operate, design or use transmission systems.

**Prerequisites**
Participants should have completed course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)”.

**Contents**
- Overview of transmission reliability
- Basic concepts and methods
- Deterministic assessment of bulk transmission reliability
- Addressing reactive power problems
- Transfer capability assessment
- Reliability must-run generation
- Probabilistic assessment of bulk transmission reliability

| GB  | 2,399 GBP |
| US  | 2,399 USD |

**PSS®E – Advanced Dynamic Simulation for PSS®E**

*Booking code: PSSE-ADVDY*

**Training objectives**
This training provides experienced PSS®E users with instruction in the use of PSS®E at an advanced level. The training is structured to include lecture sessions and hands-on exercises for selected topics.

**Target audience**
This is a challenging course designed for more experienced engineers and is designed to focus on aspects of dynamic modeling such as synchronous generators, excitation systems, prime movers, wind turbines, HVDC and FACTS devices, and loads.

**Prerequisites**
Participants should either have setup and operating experience with power flow and dynamic simulation of power systems or should have completed the course “PSS®E – Power Flow and Steady State Analysis Using PSS®E (PSSE-PFSS)” and “PSS®E – Dynamic Simulation Using PSS®E (PSSE-DYNSI)”.

**Main features**
- Review of newest features for PSS®E Dynamics
- Dynamic analysis tools
  - Transfer functions, block diagrams, feedback control system concepts, and controller turning and bode plots
  - Dynamic Overview
    - Disturbance chronology, review of PSS®E stability activities
- Modeling
  - Synchronous machines, excitation systems, turbine/speed governor, wind generation, HVDC systems, and SVC – FACTS Modeling (cont.)
  - Loads-induction motors, characteristics, modeling, USE of IMD, load damping and NETFRQ, and breakers (line and load relays)
- Data checking and controller tuning
  - Excitation systems, governor models, PSS (Power System Stabilizers), SVC (Static Var Compensators)
- Topics on User-Written Models
  - Basics of model writing and Graphical Model Builder (GMB)
  - Incorporating user-written models into a simulation
- Program Automation PSAS
- Simulating complex disturbances
  - Stuck breakers, single-pole switching, and motor starting
- Extended term dynamics
- Small-signal stability introduction (NEVA)
- Hands-on examples

| GB  | 1,295 GBP |
| US  | 1,295 USD |

| GB  | 2,825 GBP |
| US  | 2,399 USD |

**PSS®E – Model Writing for User Defined Models (UDMs) in PSS®E**

*Booking code: PSSE-UDM*

**Training objectives**
This training provides participants with an understanding of the practical and theoretical aspects of dynamic modeling using the latest power system simulation tools. Students will have an opportunity to write computer subroutines by using PSS®E Power System Simulator Program to perform customized functions.

**Target audience**
An advanced training course for PSS®E users who want to write their own PSS®E dynamic models or customize an existing model.

**Prerequisites**
Participants should either have setup or operating experience with power flow and dynamic simulation of power systems or should have completed all introductory courses in PSS®E.

**Main features**
- PSS®E – Program Structure
- Block Diagrams
- FLECS and FORTRAN
- Equipment Models (Excitation Systems, Governors and PSS)
- Structuring the Model
- Advanced Uses of Conec and Conet
- Inputting Data for User Models
- Current Injection Models
- Modeling Special Protection Schemes (SPS or RAS)
- Model Testing
- Extended Term Simulation
- Introduction in Graphical Model Builder

| GB  | 1,295 GBP |
| US  | 2,399 USD |

| GB  | 2,825 GBP |
| US  | 2,399 USD |
**PSS®E – Fault Analysis**
Booking code: PSSE-ANALY

Training objectives
PSS®E users will be acquainted with program functions in sufficient detail for them to begin study work relevant to fault analysis and transmission line sequence impedance evaluation.

**Price on request**

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**PSS®SINCAL – Probabilistic Reliability Analysis**
Booking code: SINCAL-REL

Training objectives
The participants will acquire basic knowledge on how to use the network planning program PSS®SINCAL with respect to reliability calculations, and interpret the results.

**9CA4120-ONE00-ODC3**
2,750 EUR

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**PSS®SINCAL – Application & Data Integration and Workflow Automation**
Booking code: SINCAL-AUT

Training objectives
The participants will acquire basic knowledge on how to develop and apply scripts or programs to integrate PSS®SINCAL in their workflow or even other applications.

**9CA4120-ONE00-ODD1**
1,500 EUR

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**PSS®E – Advanced Transmission Planning**
Booking code: PSSE-ADVTR

Training objectives
This training provides transmission planners, designers and operators with concepts, tools and methodologies essential to address modern-day issues of competition, open access, wheeling and new technology in transmission planning.

**2,825 USD**

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**PSS®SINCAL – Harmonic Analysis**
Booking code: SINCAL-HAR

Training objectives
The participants will acquire basic knowledge on performing harmonic studies with the network planning program PSS®SINCAL.

**9CA4120-ONE00-ODD4**
750 EUR

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**PSS®SINCAL – Optimal Network Structures and Cost Analysis**
Booking code: SINCAL-OPT

Training objectives
The participants will acquire knowledge on how to use the network planning program PSS®SINCAL for optimal Network structures and cost optimization.

**9CA4120-ONE00-ODD2**
750 EUR

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**PSS®SINCAL – Dynamics**
Booking code: SINCAL-DYN

Training objectives
The participants will acquire basic knowledge on how to use the network planning program PSS®SINCAL for analysis of dynamic phenomena. They will learn to use the software for basic calculations on topics stability, transients, graphical model building and small signal stability (Eigenvalues).

**9CA4120-ONE00-ODC4**
2,150 EUR

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**PSS®SINCAL – Protection Suite**
Booking code: SINCAL-PRO

Training objectives
The participants will acquire basic knowledge on how to use the protective-relaying-modules in networker planning tool PSS®SINCAL. They will learn to use the software for time overcurrent protection – as well as applications with distance protection.

**9CA4120-ONE00-ODC2**
1,500 EUR

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**PSS®SINCAL – Using System Transmission Data for Decision Making**
Booking code: PSS-MUST1

Training objectives
Participants of this course will gain an understanding of how to efficiently calculate first contingency incremental transfer capacity (FCITC), and the sensitivity of the FCITC to uncertainties, forming a quantitative basis for OASIS postings using PSS®MUST.

**2,399 USD**

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*(Net prices)*
Further Software Trainings

**PSS®SINCAL – Advanced for Distribution Companies**
Booking code: SINCAL-ADD

Training objectives
The participants will acquire advanced knowledge on how to use the network planning program PSS®SINCAL for distribution networks. They will learn to use the software for advanced calculations on topics related to load flow, short-circuit and load development.

4,000 TRY

**PSS®NETOMAC – Basics**
Booking code: NETO-BASIC

Training objectives
The participants will acquire basic knowledge on how to use the network planning program PSS®NETOMAC. They will learn to use the software for basic calculations on topics load flow, stability and transients.

2,440 EUR

**PSS®NETOMAC – Advanced**
Booking code: NETO-ADVAN

Training objectives
The basic knowledge gained during the PSS®NETOMAC Basic course will be deepened. In PSS®NETOMAC modeling of regulations and controls is carried out using BOSL (Block-Oriented Simulation Language), Eigenvalue- and modal analysis.

1,700 EUR

**PSS®SINCAL – Advanced Power Flow Applications for Network Planning**
Booking code: SINCAL-FLO

Training objectives
The participants will acquire advanced knowledge on how to use the network planning program PSS®SINCAL for all kinds of simulations around the Load Flow.

9,000 COP

**NEVA – Small-Signal Stability Analysis**
Booking code: PSS-SMALL

Training objectives
The participants will acquire basic knowledge on how to use the Eigenvalue and Modal Analysis module NEVA for all products of the PSS® suite (PSS®NETOMAC, PSS®SINCAL, PSS®E). They will learn to use the software for analyzing of power systems and determining locations for power oscillation damping equipment.

9,000 COP

**GMB – Graphical Model Builder**
Booking code: PSS-GRAPH

Training objectives
In this course, the knowledge gained in the basic PSS® product courses will be deepened and the trainee learns modeling using a Block-Oriented Simulation Language (BOSL) and the MS VISIO based Graphical Model Builder (NETCAD/GMB).

1,700 EUR

**Transient Analysis Using EMTP/ATP**
Booking code: PSS-EMTP

Training objectives
The training is focused on the transient analysis in power systems using EMTP/ATP software. The participant will obtain experience in EMTP/ATP’s use and a better understanding of such as transitory phenomena due to maneuvers and electrical atmospheric discharges, transformer energizing and capacitor banks commutation.

900,000 COP
Power System Operation

**Anti Disaster Training I**

Booking code: PSO-AHT1

Training objectives
User, switchgear employees, operator, management of substations (distribution network).

Target audience
This course provides users and monitors of electric network with essential knowledge. The focus is on the control and handling in operational breakdowns especially in electric supply network. The course consists of lecture, practical exercises on fault detection and elimination as well as discussion.

Prerequisites
Basic knowledge in the power supply operation management and the system of substation equipments.

Main features
- Hardware construction of substation equipments
- Fault simulation in substation hardware components (practical exercises)
- Fault simulation in electrical power supply network (practical exercises)
- Stress handling/stress reduction
- Causes for blackouts in the power supply
- Emergency plan
- Quality management
- Service and maintenance strategy

Notes
Theory/Praxis: 40/60.

**Anti Disaster Training – Network Control for Management**

Booking code: PSO-AHTM

Training objectives
Management of electronic network based on substation equipments (distribution network).

Target audience
This course provides management of users, monitoring and switchgear employers with essential knowledge to minimize or avoid preventive fault and emergency situation and to effectively handle power supply operation management tasks in electric network. The focus is on the control and handling for power supply operation management employees and internal process especially in fault and emergency situations.

Prerequisites
Basic knowledge in the management of electric network. Extensive knowledge of constructing electric power installations including substation. Basic knowledge in personal management.

Main features
- Evaluation of previous anti disaster trainings (from operator overview)
- Technical and human influence factor on the network operation management
- Earth fault and star point handling
- Network fault simulation 50 Hz (practical exercises)
- Stress handling and stress reduction
- Blackouts in the power supply
- Difficult network management situation
- Emergency plan

Notes
Theory/Praxis: 50/50.

**Understanding System Losses for Utility Management**

Booking code: MO-LOSSES

Training objectives
This course provides participants with an understanding of the nature and characteristics of electric system demand and energy losses, and teaches methods for effectively modeling, analyzing, allocating and reducing these losses. (PDEC 563)

Target audience
This course provides transmission and distribution planning engineers, rate design engineers from utilities, and regulatory commissioners with methods for effectively modeling, analyzing, allocating and reducing losses.

Main features
- Discuss the nature of electric system losses and the impact on the power system operation
- Roles and responsibility of utilities regarding losses and how they are paid for in the marketplace
- Concepts of active and reactive power and how they relate to system frequency and voltage; understand how power calculation and its impact on losses
- Approaches used to calculate transmission losses, transformer losses, primary and secondary distribution losses and electric meters
- Overview of the parameters used in transformer purchase calculations; describe the solution method for the transformer purchase problem
- Understand equipment purchasing parameters that can impact losses

**Market Operations and Power System Scheduling**

Booking code: MO-MRKTOPS

Training objectives
Participants of this course will be introduced to the techniques used in the electric utility industry for market operations and power system scheduling and control.

Target audience
Engineers, operators and those involved in electric regulation, policy and planning.

Prerequisites
An engineering degree with basic knowledge of electric utility systems is desirable.

Main features
- Training Overview Characteristics of Generating Units Economic Dispatch Unit Commitment Generation Control Interchange Evaluations and Power Pools Operating Security State Estimation

(Net prices)
SIGUARD PDP – Basics
Booking code: SIGUARDPDP
Training objectives
SIGUARD PDP, the phasor data processor, uses PMUs – a cutting-edge phasor-measurement technology – to observe the actual state of the power system. It monitors system variables and informs about critical system states. Scope and content of the SIGUARD DSA course will be designed based on your individual demand.

| Price on request | 9CA4110-ONE00-0DD6 |

SIGUARD DSA – Basics
Booking code: SIGUARDDSA
Training objectives
SIGUARD DSA, the dynamic security assessment, analyzes possible contingencies and assesses the system stability. It provides the operator with an overview of the current and near-future state of system stability. Scope and content of the SIGUARD DSA course will be designed based on your individual demand.

| Price on request | 9CA4110-ONE00-0DD4 |

SIGUARD PSA – Basics
Booking code: SIGUARDPSA
Training objectives
SIGUARD PSA, the protection security assessment, analyzes the selectivity, sensitivity, and speed of the entire protection system. It enables a rigorous protection system performance audit. Scope and content of the SIGUARD PSA course will be designed based on your individual demand.

| Price on request | 9CA4110-ONE00-0DD5 |

Booking code: NET-WAM
Training objectives
The participants adopt black out causes and experience counteractive measures. One measure is the improvement of system monitoring by use of “phase measurement units” (PMUs) and the erection of “wide area” meter systems. Worldwide development trends of these measurement systems are presented and their implementation is part of discussion.

| 1,450 EUR | 9CA4110-ONE00-0DC6 |

Power System Dynamics – Stability and Oscillations
Booking code: NET-PSDSTA
Training objectives
The participant will receive essential knowledge on system dynamics, system oscillations and damping and countermeasures in transmission systems and at the generators.

| 1,450 EUR | 9CA4110-ONE00-0DC3 |

Electrical Power Issues in Nigeria for Bankers, Investors and Professionals
Booking code: POWER-NIG
Training objectives
Participants will leave the course with a thorough practical understanding of: How lenders analyse power projects – from both a qualitative and a quantitative perspective, how project financings are sized and tailored to the cash flow of a specific project, the loan documents which govern a financing and how they interface with the other project documents such as power sales agreements, EPC contracts, supply agreements and insurance arrangements.

| 250,000 NGN | 9CA4110-ONE00-0DD2 |

SCADA System – Spectrum Power CC – Basic Level
Booking code: SPECTRUMBC
Training objectives
Participants will understand the basic architecture of a control center (SCADA), how to design it, and how to engineer the SCADA Siemens Spectrum Power CC.

| 900,000 COP | 9CA4110-0UE00-0DA1 |

SCADA System – Spectrum Power CC – Intermediate Level
Booking code: SPECTRUMBI
Training objectives
This training will deepen the knowledge of advanced tools SCADA Siemens Spectrum Power CC.

| 1,300,000 COP | 9CA4110-0NE00-0DD6 |

SCADA System – Spectrum Power CC – Basic Level
Booking code: SPECTRUMBC
Training objectives
Participants will understand the basic architecture of a control center (SCADA), how to design it, and how to engineer the SCADA Siemens Spectrum Power CC.

| 900,000 COP | 9CA4110-0UE00-0DA1 |

SCADA System – Spectrum Power CC – Intermediate Level
Booking code: SPECTRUMBI
Training objectives
This training will deepen the knowledge of advanced tools SCADA Siemens Spectrum Power CC.

| 1,300,000 COP | 9CA4110-0NE00-0DD4 |

Electrical Power Issues in Nigeria for Bankers, Investors and Professionals
Booking code: POWER-NIG
Training objectives
Participants will leave the course with a thorough practical understanding of: How lenders analyse power projects – from both a qualitative and a quantitative perspective, how project financings are sized and tailored to the cash flow of a specific project, the loan documents which govern a financing and how they interface with the other project documents such as power sales agreements, EPC contracts, supply agreements and insurance arrangements.

| 250,000 NGN | 9CA4110-0DD1 |

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| 250,000 NGN | 9CA4110-0DD1 |
### Austria / AT

#### Secondary Technology

##### Protection

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basics for Protection Engineers</td>
<td>01.–02. Jul. / VIE</td>
<td>PR-BASIC</td>
<td>33</td>
</tr>
<tr>
<td>DIGSI 4 – IEC61850 and GOOSE Configuration</td>
<td>08.–10. Jul. / VIE</td>
<td>DIGSI4-I</td>
<td>31</td>
</tr>
</tbody>
</table>

##### Substation Automation

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax 1703 – Basics for AK/AM/AMC</td>
<td>On request / VIE</td>
<td>AX-BASIC</td>
<td>42</td>
</tr>
<tr>
<td>Ax 1703 – CAEx II Configuration</td>
<td>On request / VIE</td>
<td>AX-CAEXP</td>
<td>42</td>
</tr>
<tr>
<td>Ax 1703 – CAEx II Implementation</td>
<td>On request / VIE</td>
<td>AX-CAEXI</td>
<td>42</td>
</tr>
<tr>
<td>Ax 1703 – Configuration for AK/AM/AMC</td>
<td>On request / VIE</td>
<td>AX-PROJ</td>
<td>42</td>
</tr>
<tr>
<td>Ax 1703 – Service for AK/AM/AMC</td>
<td>On request / VIE</td>
<td>AX-SERV</td>
<td>42</td>
</tr>
<tr>
<td>SICAM 230 Workshop – Network Monitoring with SICAM 230 NWM</td>
<td>On request / VIE</td>
<td>230-MONIT</td>
<td>43</td>
</tr>
<tr>
<td>Course Index per region 2013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
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<tr>
<td>SICAM 1703 Workshop – Configuration IEC60870-5-101/104 Interface</td>
<td>On request / VIE</td>
<td>RTU-IEC104</td>
<td>42</td>
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<td>SICAM 1703 Workshop – Configuration IEC60870-5-103 Interface</td>
<td>On request / VIE</td>
<td>RTU-IEC103</td>
<td>40</td>
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<tr>
<td>SICAM 1703 Workshop – Configuration of SICAM BC</td>
<td>On request / VIE</td>
<td>RTU-BC1703</td>
<td>43</td>
</tr>
<tr>
<td>SICAM 1703 Workshop – Configuration Profibus &amp; Modbus Interfaces</td>
<td>On request / VIE</td>
<td>RTU-MODBUS</td>
<td>42</td>
</tr>
<tr>
<td>SICAM 1703 Workshop – Configuration Transmission and Storage of Disturbance Records with SICAM DISTO</td>
<td>On request / VIE</td>
<td>RTU-DISTO</td>
<td>42</td>
</tr>
<tr>
<td>SICAM TOOLBOX II – Basics</td>
<td>On request / VIE</td>
<td>TOOLBOX</td>
<td>42</td>
</tr>
</tbody>
</table>

**Substation Information**

# Power System Engineering

## Power Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Gas Industry – Fundamentals</td>
<td>22.–26. Apr. / VIE</td>
<td>PE-OILGAS 54</td>
</tr>
<tr>
<td></td>
<td>21.–25. Oct. / VIE</td>
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</table>

## Smart Grid

<table>
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<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
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<tbody>
<tr>
<td></td>
<td>22.–23. Jul. / VIE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19.–20. Nov. / VIE</td>
<td></td>
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<tbody>
<tr>
<td>Smart Metering – Basis for Smart Grids</td>
<td>15. Jul. / VIE</td>
<td>SG-METER 48</td>
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## Colombia / CO

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<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
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<td>Primary Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MV – Assembly and Installation Training</td>
<td>See Webshop</td>
<td>16</td>
</tr>
<tr>
<td>MV – Partial Discharges</td>
<td>07.–08. Feb. / BOG</td>
<td>MV-PARTIAL 17</td>
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<td>High Voltage</td>
<td></td>
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<tr>
<td>AIS Current 3AP – 3AQ Product Range – Operation &amp; Maintenance</td>
<td>05.–06. Sep. / BOG</td>
<td>HV-OM3AP/Q 19</td>
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<tr>
<td>Distribution Transformers – Basics and Operation</td>
<td>18.–19. Apr. / BOG</td>
<td>TR-DT 22</td>
</tr>
<tr>
<td>HV Primary Test Performing and Test Equipment</td>
<td>22.–24. May / BOG</td>
<td>HV-TEST 20</td>
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<td>General</td>
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<td>Secondary Technology</td>
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<td>Protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIGSI 4 – Advanced</td>
<td>20.–22. Mar. / BOG</td>
<td>DIGSI4-A 30</td>
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<td>DIGSI 4 – Basics</td>
<td>06.–08. Mar. / BOG</td>
<td>DIGSI4-B 30</td>
</tr>
<tr>
<td>DIGSI 4 – CFC</td>
<td>30.–31. May / BOG</td>
<td>DIGSI4-C 34</td>
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<td>DIGSI 5 – Basics</td>
<td>09.–16. Jul. / BOG</td>
<td>DIGSI5-B 31</td>
</tr>
<tr>
<td>SIGRA 4 – Efficient Interpretation of Fault Records</td>
<td>22.–23. Apr. / BOG</td>
<td>SIP4-SIGRA 34</td>
</tr>
<tr>
<td>SIPROTEC 4 – Application and Exercises of Generator/Motor Protection</td>
<td>30. Jan.–01. Feb. / BOG</td>
<td>SIP4-MOTOR 27</td>
</tr>
<tr>
<td>SIPROTEC 4 – Busbar Protection 7SS</td>
<td>27.–29. Nov. / BOG</td>
<td>SIP4-7SS 26</td>
</tr>
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<td>SIPROTEC 4 – Differential Protection 7SD</td>
<td>08.–10. Apr. / BOG</td>
<td>SIP4-7SD 27</td>
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<td>Course Index per region 2013</td>
<td></td>
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</tr>
<tr>
<td>------------------------------</td>
<td></td>
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<tr>
<td><strong>Substation Automation</strong></td>
<td></td>
<td></td>
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<td>SIPROTEC 4 – Distance Protection 7SA</td>
<td>11.–15. Apr. / BOG</td>
<td>SIP4-7SA</td>
</tr>
<tr>
<td>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC</td>
<td>24.–26. Apr. / BOG</td>
<td>SIP4-CMC</td>
</tr>
<tr>
<td><strong>Power Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Quality in Industrial Networks</td>
<td>22.–23. Aug. / BOG</td>
<td>PQ-INDUST</td>
</tr>
<tr>
<td><strong>Power System Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Grid – Introduction</td>
<td>15. Mar. / BOG</td>
<td>SG-INTRO</td>
</tr>
<tr>
<td><strong>Network Planning</strong></td>
<td></td>
<td></td>
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<tr>
<td>Overvoltages and Insulation Coordination</td>
<td>27. Feb.–01. Mar. / BOG</td>
<td>NET-INSUL</td>
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<td>Power Transmission &amp; Distribution Systems – Load and Short Circuit Calculation</td>
<td>04.–05. Jul. / BOG</td>
<td>NET-CALCU</td>
</tr>
<tr>
<td><strong>Power System Simulation Software</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Power System Operation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market Operations</strong></td>
<td></td>
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<thead>
<tr>
<th>France / FR</th>
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<tr>
<td><strong>Primary Technology</strong></td>
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<td><strong>High Voltage</strong></td>
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<tr>
<td>AIS Current 3AP – 3AQ Product Range – Operation &amp; Maintenance</td>
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<tr>
<td>Hydraulic Knowledge &amp; Maintenance – Fundamentals</td>
</tr>
<tr>
<td>Hydraulic Knowledge &amp; Maintenance – Intermediate</td>
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<tr>
<td>Metal-Clad GIS – Current 8D Product Range – Operation and Maintenance – Advanced</td>
</tr>
<tr>
<td>Course</td>
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</tr>
<tr>
<td>Metal-Clad GIS – Current 8D Product Range – Operation &amp; Maintenance – Intermediate</td>
</tr>
<tr>
<td>Metal-Clad GIS Current Product Range – Presentation</td>
</tr>
<tr>
<td>Metal-Clad GIS – SF₆ Gas Handling &amp; Associated Treatment Operations – Advanced</td>
</tr>
<tr>
<td>Metal-Clad GIS – Vintage Product Range – Operation &amp; Maintenance – Advanced</td>
</tr>
<tr>
<td>Upgrading Oil Circuit Breakers – OP &amp; MO Product Range – Advanced</td>
</tr>
<tr>
<td>Vintage AIS Circuit Breakers – FA Range with Hydraulic Operating Mechanism – Operation &amp; Maintenance – Advanced</td>
</tr>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>SF₆ European Certification – Preparatory Course</td>
</tr>
</tbody>
</table>

---

**Germany / DE**

<table>
<thead>
<tr>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium Voltage</strong></td>
<td></td>
<td></td>
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<tr>
<td>MV – Assembly and Installation Training</td>
<td>See Webshop</td>
<td>16</td>
</tr>
<tr>
<td>MV Assembly and Installation Training – Refresher</td>
<td>See Webshop</td>
<td>17</td>
</tr>
<tr>
<td>MV Circuit Breakers – Maintenance</td>
<td>See Webshop</td>
<td>17</td>
</tr>
<tr>
<td>MVDC/SIPLINK – Benefits and Features</td>
<td>On request</td>
<td>17</td>
</tr>
<tr>
<td>MV Switchgear – Maintenance</td>
<td>See Webshop</td>
<td>17</td>
</tr>
<tr>
<td>MV Switchgear – Technical Information (Switchgear-Specific)</td>
<td>See Webshop</td>
<td>15</td>
</tr>
<tr>
<td>MV Switching Devices &amp; Switchgear – Basics &amp; Application</td>
<td>On request / NBG</td>
<td>15</td>
</tr>
<tr>
<td><strong>High Voltage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVDC and FACTS – Benefits of Power Electronics</td>
<td>On request</td>
<td>18</td>
</tr>
<tr>
<td>HVDC and FACTS – Workshop</td>
<td>On request</td>
<td>20</td>
</tr>
<tr>
<td>HV Switching Technology – 3A</td>
<td>On request / BLN</td>
<td>21</td>
</tr>
<tr>
<td>HV Switching Technology – General Information</td>
<td>22.–23. Apr. / BLN</td>
<td>18</td>
</tr>
<tr>
<td>HV Switching Technology GIS – Technical Information</td>
<td>27.–30. May / BLN</td>
<td>19</td>
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<tr>
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<td>26.–29. Aug. / BLN</td>
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BLN = Berlin; ERL = Erlangen; FFM = Frankfurt; GNB = Grenoble; ILM = Ilmenau; NBG = Nuremberg
## Transformers

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
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## Secondary Technology

### Protection

<table>
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<tr>
<th>Course Title</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Credits</th>
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<tr>
<td><strong>DIGSI 4 – CFC</strong></td>
<td>07.–08. Mar. / NBG</td>
<td></td>
<td>DIGSI4-C</td>
<td>34</td>
</tr>
<tr>
<td><strong>DIGSI 4 – IEC61850 and GOOSE Configuration</strong></td>
<td>04.–06. Mar. / NBG 02.–04. Dec. / NBG</td>
<td></td>
<td>DIGSI4-I</td>
<td>31</td>
</tr>
<tr>
<td><strong>DIGSI 5 – CFC</strong></td>
<td>26.–27. Sep. / NBG</td>
<td></td>
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<td>34</td>
</tr>
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<td><strong>DIGSI 5 – IEC61850 and GOOSE Configuration</strong></td>
<td>05.–06. Sep. / NBG 21.–22. Nov. / NBG</td>
<td></td>
<td>DIGSI5-I</td>
<td>32</td>
</tr>
<tr>
<td><strong>DIGSI 5 – Systems</strong></td>
<td>02.–04. Sep. / NBG 18.–20. Nov. / NBG</td>
<td></td>
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<td>31</td>
</tr>
<tr>
<td><strong>Generator/Motor Protection – Design and Settings</strong></td>
<td>On request / NBG</td>
<td></td>
<td>PR-DSMP</td>
<td>35</td>
</tr>
<tr>
<td><strong>Protection of Oil and Gas Power Networks – Part 1</strong></td>
<td>On request / NBG</td>
<td></td>
<td>PR-OG1</td>
<td>32</td>
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<tr>
<td><strong>Protection of Oil and Gas Power Networks – Part 2</strong></td>
<td>On request / NBG</td>
<td></td>
<td>PR-OG2</td>
<td>32</td>
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<tr>
<td><strong>Protection Schemes for Power Generation and Industry – Design and Settings</strong></td>
<td>On request / NBG</td>
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<td>PR-DSIN</td>
<td>35</td>
</tr>
<tr>
<td><strong>Protection Systems – Accessory Equipment</strong></td>
<td>22. Mar. / NBG</td>
<td></td>
<td>SIP4-ACCES</td>
<td>34</td>
</tr>
<tr>
<td><strong>Protection Technology – Additional Functions</strong></td>
<td>10.–11. Apr. / NBG</td>
<td></td>
<td>SIP4-ADDIT</td>
<td>34</td>
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<td><strong>SIGRA 4 – Efficient Interpretation of Fault Records</strong></td>
<td>04.–05. May. / NBG 16.–17. Sep. / NBG</td>
<td></td>
<td>SIP4-SIGRA</td>
<td>34</td>
</tr>
<tr>
<td>Course Index per region 2013</td>
<td>Date</td>
<td>Location</td>
<td>Code</td>
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<td><strong>SIPROTEC 4 – Application and Exercises</strong></td>
<td>22.–26. Apr. / NBG</td>
<td>04.–08. Nov. / NBG</td>
<td>SIP4-SYS</td>
<td>25</td>
</tr>
<tr>
<td><strong>SIPROTEC 4 – Busbar Protection 7SS</strong></td>
<td>25.–27. Feb. / NBG</td>
<td>22.–24. May / NBG</td>
<td>SIP4-7SS</td>
<td>26</td>
</tr>
<tr>
<td><strong>SIPROTEC 4 – Differential Protection 7SD</strong></td>
<td>06.–08. May / NBG</td>
<td>23.–25. Sep. / NBG</td>
<td>SIP4-7SD</td>
<td>27</td>
</tr>
<tr>
<td><strong>SIPROTEC 4 – Distance Protection 7SA</strong></td>
<td>13.–15. May / NBG</td>
<td>29.–31. Jul. / NBG</td>
<td>SIP4-7SA</td>
<td>26</td>
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<td><strong>SIPROTEC 4 – Overcurrent Protection 7SJ</strong></td>
<td>03.–05. Apr. / NBG</td>
<td>11.–13. Nov. / NBG</td>
<td>SIP4-7SJ</td>
<td>28</td>
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<tr>
<td><strong>SIPROTEC – Compact (7SJ80, 7SK80, 7RW89, 7SD80)</strong></td>
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<td>30. Sep.–01. Oct. / NBG</td>
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**Substation Automation**

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### Power System Simulation Software

**PSS®SINCAL**

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**PSS®**

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### Power System Operation

#### Market Operations

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<td>PSO-AHTM</td>
<td>63</td>
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<td>SCADA System – Spectrum Power CC – Basic Level</td>
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### India / IN

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### Power System Engineering

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# Course Index per region 2013

## PSS®SINCAL

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<th>Page</th>
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## Netherlands / NL

### Primary Technology

#### General

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<thead>
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<th>Course</th>
<th>Dates / Location</th>
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<tbody>
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<td>SF₆ Gas Awareness</td>
<td>On request / HAG</td>
<td>SF6-AW</td>
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<td>SF₆ Gas Competence</td>
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#### Secondary Technology

##### Protection

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<td>WS-GUIDE</td>
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### Power System Engineering

#### Power Engineering

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<td>Electrical Energy Installations – Basics</td>
<td>On request / HAG</td>
<td>PE-INSTAL</td>
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<td>Medium and Low Voltage Installations – Design Criteria</td>
<td>On request / HAG</td>
<td>PE-LMV</td>
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### Network Planning

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<td>NET-MV/LV</td>
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</tr>
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</table>

## Nigeria / NG

### Primary Technology

#### Medium Voltage

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV – Assembly and Installation Training</td>
<td>See Webshop</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

HAG = The Hague; LOS = Lagos; THA = Thane
## Secondary Technology

### Protection

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Duration</th>
</tr>
</thead>
</table>

### Secondary Technology

#### Protection

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of Oil and Gas Power Networks – Part 1</td>
<td>27.–31. May / LOS</td>
<td>PR-OG1</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Protection of Oil and Gas Power Networks – Part 2</td>
<td>03.–07. Jun. / LOS</td>
<td>PR-OG2</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>SIPROTEC 4 – Application and Exercises</td>
<td>04.–08. Feb. / LOS</td>
<td>SIP4-SYS</td>
<td>25</td>
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</tr>
</tbody>
</table>

#### Substation Automation

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Duration</th>
</tr>
</thead>
</table>

#### Substation Information

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Duration</th>
</tr>
</thead>
</table>

#### Power System Engineering

##### General

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Duration</th>
</tr>
</thead>
</table>
### Power Engineering

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
</table>

### Smart Grid

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
</table>

### Network Planning

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
</table>

### Power System Operation

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
</table>

### Norway / NO

<table>
<thead>
<tr>
<th>Region</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basics for Protection Engineers</td>
<td>On request / TRD</td>
<td>PR-BASIC</td>
<td>33</td>
</tr>
<tr>
<td>DIGSI 4 – Basics</td>
<td>On request / TRD</td>
<td>DIGSI4-B</td>
<td>30</td>
</tr>
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<td>SIPROTEC 4 – Application and Exercises</td>
<td>On request</td>
<td>SIP4-SYS</td>
<td>25</td>
</tr>
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<td>Power System Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Metering – Basis for Smart Grids</td>
<td>On request / TRD</td>
<td>SG-METER</td>
<td>48</td>
</tr>
<tr>
<td>Network Planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit Diagrams and Reference Systems – Basics</td>
<td>On request / TRD</td>
<td>NET-CIRCUI</td>
<td>49</td>
</tr>
<tr>
<td>Power System Simulation Software</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSS®E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSS®E – Power Flow and Steady State Analysis Using PSS®E</td>
<td>On request / OSL</td>
<td>PSSE-PFSS</td>
<td>56</td>
</tr>
</tbody>
</table>

LOS = Lagos; OSL = Oslo; TRD = Trondheim
<table>
<thead>
<tr>
<th>Secondary Technology</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIGSI 4 – Advanced</td>
<td>22.–24. Jul. / MOW</td>
<td>DIGSI4-A</td>
<td>30</td>
</tr>
<tr>
<td>Protection Systems – Accessory Equipment</td>
<td>20. Jun / MOW</td>
<td>SIP4-ACCES</td>
<td>34</td>
</tr>
<tr>
<td>Protection Technology – Additional Functions</td>
<td>14.–15. May / MOW</td>
<td>SIP4-ADDIT</td>
<td>34</td>
</tr>
<tr>
<td>Protection Technology – Principles</td>
<td>08.–10. Apr. / MOW</td>
<td>PR-PRIN</td>
<td>24</td>
</tr>
<tr>
<td>SIPROTEC 4 – Application and Exercises</td>
<td>16.–22. Apr. / MOW</td>
<td>SIP4-SYS</td>
<td>25</td>
</tr>
<tr>
<td>SIPROTEC 4 – Overcurrent Protection 7SJ</td>
<td>15.–17. Jul. / MOW</td>
<td>SIP4-7SJ</td>
<td>28</td>
</tr>
<tr>
<td>SIPROTEC – Guided Exercises</td>
<td>16.–18. May / MOW</td>
<td>WS-GUIDE</td>
<td>34</td>
</tr>
<tr>
<td>Substation Automation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIPROTEC 4 – Engineering of Bay Controllers 6MD66 with IEC61850 – GOOSE Communication</td>
<td>14.–15. Mar. / MOW</td>
<td>SIP4-6MD66</td>
<td>43</td>
</tr>
<tr>
<td>Substation Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Networks – Application in Power Transmission &amp; Distribution</td>
<td>20.–21. May / MOW</td>
<td>SIT-COMPT</td>
<td>44</td>
</tr>
<tr>
<td>Power System Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Grid</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Smart Grid – Introduction</td>
<td>18. Mar. / MOW</td>
<td>SG-INTRO</td>
<td>48</td>
</tr>
<tr>
<td>Smart Metering – Basis for Smart Grids</td>
<td>20. Mar. / MOW</td>
<td>SG-METER</td>
<td>48</td>
</tr>
<tr>
<td>Renewables Integration</td>
<td></td>
<td></td>
<td></td>
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<td>Power System Simulation Software</td>
<td></td>
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<td></td>
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<td>PSS®SINCAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSS®SINCAL – Basics</td>
<td>08.–10. Apr. / MOW</td>
<td>SINCAL-BAS</td>
<td>59</td>
</tr>
<tr>
<td>PSS®SINCAL – Protection Suite</td>
<td>10.–11. Apr. / MOW</td>
<td>SINCAL-PRO</td>
<td>61</td>
</tr>
</tbody>
</table>
## Spain / ES

### Secondary Technology

#### Protection

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIGSI 4 – Advanced</td>
<td>04.–07. May / MAD 10.–12. Sep. / MAD</td>
<td>DIGSI4-A</td>
<td>30</td>
</tr>
<tr>
<td>DIGSI 4 – Basics</td>
<td>26.–28. Mar. / MAD</td>
<td>DIGSI4-B</td>
<td>30</td>
</tr>
<tr>
<td>DIGSI 4 – IEC61850 and GOOSE Configuration</td>
<td>23.–25. Apr. / MAD</td>
<td>DIGSI4-I</td>
<td>31</td>
</tr>
<tr>
<td>SIPROTEC 4 – Busbar Protection 7SS</td>
<td>02.–04. Jul. / MAD</td>
<td>SIP4-7SS</td>
<td>26</td>
</tr>
<tr>
<td>SIPROTEC 4 – Differential Protection 7SD</td>
<td>On request / MAD</td>
<td>SIP4-7SD</td>
<td>27</td>
</tr>
<tr>
<td>SIPROTEC 4 – Distance Protection 7SA</td>
<td>On request / MAD</td>
<td>SIP4-7SA</td>
<td>26</td>
</tr>
<tr>
<td>SIPROTEC 4 – HV Protection &amp; Control</td>
<td>15.–17. Jan. / MAD</td>
<td>SIP4-HV</td>
<td>33</td>
</tr>
<tr>
<td>SIPROTEC 4 – MV Protection &amp; Control</td>
<td>12.–14. Feb. / MAD</td>
<td>SIP4-MV</td>
<td>33</td>
</tr>
<tr>
<td>SIPROTEC 4 – Power System Protection – Advanced</td>
<td>09.–11. Apr. / MAD</td>
<td>SIP4-ADVAN</td>
<td>33</td>
</tr>
<tr>
<td>SIPROTEC 4 – Power System Protection – Basics</td>
<td>25.–27. Jun. / MAD</td>
<td>SIP4-BASIC</td>
<td>33</td>
</tr>
<tr>
<td>SIPROTEC 4 – Transformer Differential Protection 7UT</td>
<td>24.–26. Sep. / MAD</td>
<td>SIP4-7UT</td>
<td>28</td>
</tr>
</tbody>
</table>

#### Substation Automation

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
</table>

### Power System Engineering

#### Renewables Integration

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Plants Monitoring – Module 1 (Communications)</td>
<td>On request / MAD</td>
<td>REN-SOL1</td>
<td>52</td>
</tr>
<tr>
<td>Solar Plants Monitoring – Module 2 (Thermal Solar Power Plants)</td>
<td>On request / MAD</td>
<td>REN-SOL2</td>
<td>53</td>
</tr>
<tr>
<td>Solar Plants Monitoring – Module 3 (Solar Plants for Water Heating)</td>
<td>On request / MAD</td>
<td>REN-SOL3</td>
<td>53</td>
</tr>
<tr>
<td>Solar Plants Monitoring – Module 4 (Solar Photovoltaic Plants)</td>
<td>On request / MAD</td>
<td>REN-SOL4</td>
<td>53</td>
</tr>
<tr>
<td>Region</td>
<td>Course Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
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</tr>
</tbody>
</table>
| Turkey / TR | |}

**Primary Technology**

### Medium Voltage

- **MV – Assembly and Installation Training**
  - Dates: See Webshop
  - Location: GEB
  - Booking code: 16

- **MV Switchgear – Technical Information (Switchgear-Specific)**
  - Dates: See Webshop
  - Location: GEB
  - Booking code: 15

**Secondary Technology**

### Protection

- **DIGSI 4 – Basics**
  - Dates: 18.–20. Mar. / GEB
  - Location: GEB
  - Booking code: DIGSI4-B

- **Protection Technology – Principles**
  - Dates: 18.–20. Feb. / GEB
  - Location: GEB
  - Booking code: PR-PRIN

- **SIPROTEC 4 – Application and Exercises**
  - Dates: 04.–08. Feb. / GEB
  - Location: GEB
  - Booking code: SIP4-SYS

**Power System Engineering**

### Power Engineering

- **Transmission and Distribution Networks – Basics Part I**
  - Dates: 08.–10. Jan. / GEB
  - Location: GEB
  - Booking code: PE-TDNET1

- **Transmission and Distribution Networks – Basics Part II**
  - Dates: 12.–14. Feb. / GEB
  - Location: GEB
  - Booking code: PE-TDNET2

### Smart Grid

- **Smart Grid – Introduction**
  - Dates: 19. Mar. / GEB
  - Location: GEB
  - Booking code: SG-INTRO

### Network Planning

- **Power Transmission & Distribution Systems – Load and Short Circuit Calculation**
  - Dates: 15.–16. Apr. / GEB
  - Location: GEB
  - Booking code: NET-CALCU

### Renewables Integration

- **Wind Power – Introduction to Grid Compliance for Onshore Wind Farms**
  - Dates: 08.–09. Apr. / GEB
  - Location: GEB
  - Booking code: REN-WPGCOM

### Power System Simulation Software

- **PSS®SINCAL**
  - **PSS®SINCAL – Advanced for Distribution Companies**
    - Dates: 04.–08. Mar. / GEB
    - Location: GEB
    - Booking code: SINCAL-ADD
  
  - **PSS®SINCAL – Basics**
    - Location: GEB
    - Booking code: SINCAL-BAS
  
  - **PSS®SINCAL – Basics for Distribution Companies**
    - Location: GEB
    - Booking code: SINCAL-BAD

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**GEB = Gebze**
# Course Index per region 2013

## United Kingdom / GB

<table>
<thead>
<tr>
<th>Technology</th>
<th>Course Title</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Technology</td>
<td>MV Switchgear – Technical Information (Switchgear-Specific)</td>
<td>See Webshop</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Medium Voltage</td>
<td>High Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HV AIS Circuit Breaker Reyrolle Type SPL2 420/550 kV</td>
<td>On request / HBN</td>
<td>HV-SPL2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>HV Circuit Breaker – Testing</td>
<td>On request / HBN</td>
<td>HV-BREAK</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>HV GIS Circuit Breaker Reyrolle Type SPD2 420/550 kV</td>
<td>On request / HBN</td>
<td>HV-SPD2</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>HV GIS Switchgear Reyrolle Type YG 420/550 kV</td>
<td>On request / HBN</td>
<td>HV-YG</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>HV Substation Design – Basics</td>
<td>On request / HBN</td>
<td>HV-SUBST</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>HV Switchgear Design – Basics</td>
<td>On request / HBN</td>
<td>HV-SWITCH</td>
<td>20</td>
</tr>
<tr>
<td>General</td>
<td>SF₆ Gas Awareness</td>
<td>On request / HBN</td>
<td>SF6-AW</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>SF₆ Gas Competence</td>
<td>On request / HBN</td>
<td>SF6-COMP</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Substation Condition Monitoring System Operation</td>
<td>On request / HBN</td>
<td>COND-NONIT</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>UHF Partial Discharge Monitoring for GIS Substations</td>
<td>On request / HBN</td>
<td>GIS-UHF</td>
<td>23</td>
</tr>
<tr>
<td>Secondary Technology</td>
<td>Protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>DIGSI 4 – Basics</td>
<td>On request / HBN</td>
<td>DIGSI4-B</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – ARGUS 1 – ARGUS 6</td>
<td>On request / HBN</td>
<td>REY-ARGUS</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – ARGUS-C 7SR11, 7SR12</td>
<td>On request / HBN</td>
<td>REY-ARGUSC</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – ARGUS-M 7SR21, 7SR22</td>
<td>On request / HBN</td>
<td>REY-ARGUSM</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – DAD-N (High Impedance Schemes)</td>
<td>On request / HBN</td>
<td>REY-HIGH</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – Itinerary DUOBAIS</td>
<td>On request / HBN</td>
<td>REY-DUOBAI</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – RECLOSER-M CONTROLLER 7SR224</td>
<td>On request / HBN</td>
<td>REY-RECL0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>REYROLLE – SOLKOR RF Schemes</td>
<td>On request / HBN</td>
<td>REY-SOLKOR</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>SIPROTEC 4 – Application and Exercises</td>
<td>On request / HBN</td>
<td>SIP4-SYS</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>SIPROTEC 4 – Differential Protection 7SD</td>
<td>On request / HBN</td>
<td>SIP4-7SD</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>SIPROTEC 4 – Distance Protection 7SA</td>
<td>On request / HBN</td>
<td>SIP4-7SA</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>SIPROTEC 4 – Overcurrent Protection 7SJ</td>
<td>On request / HBN</td>
<td>SIP4-7SJ</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>SIPROTEC 4 – Protection Devices for Service Engineers</td>
<td>On request / HBN</td>
<td>SIP4-SERV</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>SIPROTEC 4 – Secondary Testing with OMICRON Test System CMC</td>
<td>On request / HBN</td>
<td>SIP4-CMC</td>
<td>29</td>
</tr>
</tbody>
</table>
### Power System Engineering

#### Network Planning

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Flow Analysis with Applications – Fundamentals</td>
<td>On request / MAN</td>
<td>NET-POWER 50</td>
<td></td>
</tr>
<tr>
<td>Power System Dynamics – Basics</td>
<td>On request / MAN</td>
<td>NET-PSDK 55</td>
<td></td>
</tr>
</tbody>
</table>

#### Renewables Integration

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Power – Grid Connection Feasibility for Onshore Wind Farms</td>
<td>On request / MAN</td>
<td>REN-WPGC 52</td>
<td></td>
</tr>
<tr>
<td>Wind Power – Introduction to Grid Compliance for Onshore Wind Farms</td>
<td>On request / MAN</td>
<td>REN-WPGCOM 55</td>
<td></td>
</tr>
</tbody>
</table>

#### Power System Simulation Software

**PSS®E**

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS®E – Advanced Power Flow Using PSS®E</td>
<td>05.–07. Mar. / MAN</td>
<td>PSSE-ADVPF 56</td>
<td></td>
</tr>
<tr>
<td>PSS®E – Fault Analysis</td>
<td>On request / MAN</td>
<td>PSSE-ANALY 61</td>
<td></td>
</tr>
<tr>
<td>PSS®E – Model Writing for User Defined Models (UDMs) in PSS®E</td>
<td>06.–18. Apr. / MAN</td>
<td>PSSE-UDM 60</td>
<td></td>
</tr>
<tr>
<td>PSS®E – Using Python to Integrate PSS®E Workflow</td>
<td>05.–07. Feb. / MAN</td>
<td>PSSE-PSCRI 58</td>
<td></td>
</tr>
</tbody>
</table>

**PSS®SINCAL**

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS®SINCAL – Basics</td>
<td>On request / MAN</td>
<td>SINCAL-BAS 59</td>
<td></td>
</tr>
</tbody>
</table>

### Primary Technology

#### Medium Voltage

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV Switchgear – Technical Information (AIS &amp; GIS)</td>
<td>On request / MC</td>
<td>MV-INFO 15</td>
<td></td>
</tr>
<tr>
<td>MV Switching Devices &amp; Switchgear – Basics &amp; Application</td>
<td>On request / MC</td>
<td>MV-SWITCH 15</td>
<td></td>
</tr>
</tbody>
</table>

#### High Voltage

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV Switchgear Design – Basics</td>
<td>On request / MC</td>
<td>HV-SWITCH 20</td>
<td></td>
</tr>
<tr>
<td>HV Switching Technology – Introduction</td>
<td>On request / MC</td>
<td>HV-INTRO 20</td>
<td></td>
</tr>
</tbody>
</table>

#### Transformers

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates / Location</th>
<th>Booking code</th>
<th>Page</th>
</tr>
</thead>
</table>
## Course Index per region 2013

### Secondary Technology

#### Protection

- **Protective Relaying – Fundamentals**
  - 21.–23. May / NY
  - 24.–26. Sep. / NC
  - **PR-FUNDA 24**

### Power System Engineering

#### Power Engineering

- **Power Distribution Engineering – Introduction**
  - 13.–15. Mar. / FL
  - 16.–18. Sep. / NC
  - **PE-DISTENG 47**

- **Siemens Energy Professional Series**
  - 12.–15. Feb. / FL
  - 23.–26. Apr. / NY
  - 13.–16. Aug. / CA
  - 22.–25. Oct. / FL
  - 10.–13. Dec. / TX
  - **PE-PROF 48**

- **Substation – Engineering and Operations**
  - 17.–19. Sep. / NC
  - 06.–08. Nov. / FL
  - **PE-SUBENG 47**

#### Smart Grid

- **The Smart Grid Professionals Series**
  - 11.–13. Feb. / FL
  - 15.–17. Apr. / NY
  - 28.–30. Oct. / FL
  - 16.–18. Dec. / CA
  - **SG-PROF 49**

#### Network Planning

- **Low Voltage Networks – Theory and Practical Applications**
  - 30. Apr.–03. May / NY
  - 01.–04. Oct. / NC
  - **NET-LV 54**

- **Power Flow Analysis with Applications – Introduction**
  - 21.–25. Jan. / CA
  - 11.–15. Mar. / AB
  - 29. Apr.–06. May / FL
  - 08.–12. Jul. / CO
  - 09.–13. Sep. / NY
  - **NET-PFLOW 50**

- **Power System Dynamics – Introduction**
  - 16.–20. Sep. / NY
  - 09.–13. Dec. / AB
  - 16.–20. Dec. / FL
  - **NET-PSDUS 51**

- **Power System – Reliability**
  - 08.–09. Jul. / NY
  - 02.–03. Dec. / FL
  - **NET-PSREL 55**

- **Power System – Stability and Stabilizer Tuning**
  - 05.–09. Dec. / NY
  - **NET-STABIL 55**

### Renewables Integration

- **Distributed Generation – Energy Storage Applications on Power Systems**
  - On request
  - **REN-STORAG 55**

- **Wind Power – Power System Studies for Integration**
  - **REN-WPPSS 52**

### Power System Simulation Software

#### PSS®E

- **Power Electronics in Transmission Systems (PETS)**
  - 11.–15. Nov. / MC
  - **PSSE-PETS 57**

- **PSS®E – Advanced Dynamic Simulation for PSS®E**
  - 22.–26. Apr. / NY
  - 07.–11. Oct. / NY
  - **PSSE-ADVDY 60**
<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Location</th>
<th>Code</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS®E – Advanced Transmission Planning</td>
<td>02.–06. Dec. / FL</td>
<td>PSSE-ADVTR</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>PSS®E – Integrating Renewables Using PSS®E</td>
<td>16.–18. Apr. / NY</td>
<td>PSSE-RPSIN</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>PSS®E – Optimal Power Flow</td>
<td>On request / NY</td>
<td>PSSE-OPF</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>PSS®E – Transmission Reliability Studies Using PSS®E</td>
<td>05.–09. Dec. / FL</td>
<td>PSSE-TRANS</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>PSS®SINCAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSS®SINCAL – Basics</td>
<td>On request / MC</td>
<td>SINCAL-BAS</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>PSS®</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Power System Operation

#### Market Operations

| Market Operations and Power System Scheduling | On request / MC | MO-PDECO | 63 |