

Tailored education Brugg Cables Academy



BRUGG CABLES ACADEMY
Stay connected.

Theoretical courses: Everybody talks about «Smart grids», we about «Smart customers»

Know-how is at the heart of all functioning industrial applications. That's why Brugg Cables offers its customers continued quality education. Profit from the Brugg Cables Academy.

Background

Reliable and functioning cable systems are influenced by a number of factors. These may range from choosing the right design of cables and accessories, considering the influences of thermal load conditions, selecting the appropriate earthing design or posing the right questions concerning installation tests, monitoring and diagnostic tools. Brugg Cables has extensive knowledge in all these fields and wants to share this with you, our customers, helping you to stay constantly «Well connected».

Target

The target of our education program is to provide you with relevant knowledge within your specific field. Brugg Cables Academy supports your need for specialization by offering courses in:

- High Voltage oil cable systems,
- High voltage polymeric cable systems,
- Monitoring and diagnostic tools.

Typical course participants include engineers and utility technicians as well as project managers or persons involved within the relevant fields.

Structure of courses

| Course | Duration |
|---|----------|
| High voltage oil-filled cable systems (cables & accessories). | 2 days |
| High voltage polymer cables. | 2 days |
| High voltage accessories for polymer cables. | 2 days |
| Partial discharge measurements for cable systems. | 1 day |
| Diagnostics for cable systems. | 1 day |

Place and time of courses

Standard courses

Standard courses are held each year in Brugg, Switzerland.

Individual courses

Courses can also be taken individually. Customers decide whether the courses are held in Switzerland or in their home country. For more information, contact our personnel or apply at info.hvaccessories@brugg.com.

Costs

For information on course costs, just contact our key account managers or apply at info.hvaccessories@brugg.com.



New-built facilities of Brugg Cables in Switzerland, including the rooms of the Brugg Cables Academy

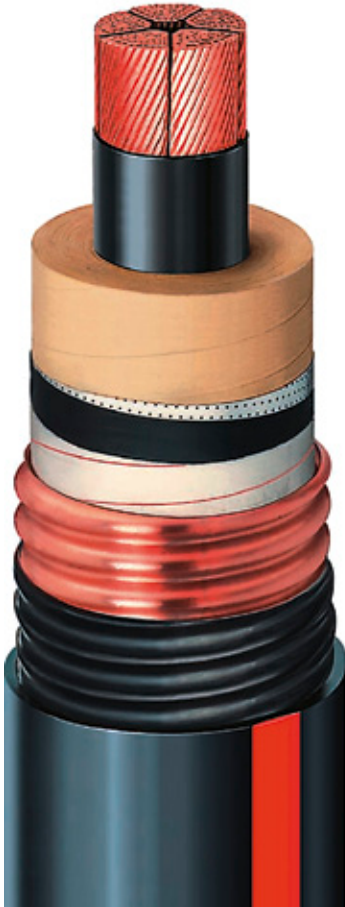


Individual training course held by one of our experts at a customer meeting

Theoretical courses

Theoretical course: High Voltage oil-filled cable systems (cables & accessories)

Learn all about high voltage oil-filled cable systems, their designs and specialities in applications and operation.



Objectives

Our course provides key information on and around oil-filled cable systems. Participants are sensitized to specific issues in the selection and operation of parts of oil-cable systems, such as accessories, and in the selection of complete oil-filled cable systems. By the end of our course, participants will be equipped with essential knowledge concerning specific design criteria, particulars of installation and application, as well as specific issues concerning the operation of oil-filled cable systems.

Specific focus of course contents

- Oil-filled cable designs
- Conductor types
- Different types of oil and oil-papers for cables
- Accessories (joints and terminations) for oil-filled cables
- Cable and accessory manufacturing
- Specifics of installation
- Heat dissipation during operation
- Best-practice experiences of oil-filled cable systems in operation
- Basics of diagnostics for oil-filled cable systems (brief coverage, see separate course «Diagnostics of cable systems» for in-depth coverage)
- Inspection of oil-filled cable manufacturing units

Target group

Personnel from electric utilities or companies employing oil-filled cable systems.

Required knowledge

Basic knowledge in electrical engineering.

Duration

2 days, including a factory tour demonstrating oil-cable system manufacturing.

Language

English or German.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course.

Theoretical course: High voltage polymer cables

Learn all about the various designs, production steps, installation specifications and operation modes of high voltage polymer cables.



Objectives

Our course provides key information on and around polymer cable systems. Participants are sensitized to specific issues in the selection and operation of the appropriate polymer cable – in particular, XLPE cables. By the end of our course, participants will be equipped with essential knowledge concerning specific design criteria, particulars of installation and application, as well as specific issues concerning the operation of polymer cable systems.

Specific focus of course contents

- Polymer cable designs with focus on XLPE cables
- Conductor types
- Different types of polymer compounds
- Basics of high voltage polymer cable accessories (brief coverage, see separate course «High voltage accessories for polymer cables» for in-depth coverage)
- Cable manufacturing
- Installation
- Heat dissipation during operation
- Best-practice experiences of polymer cable systems in operation
- Inspection of polymer cable production units

Target group

Personnel from electric utilities or companies employing polymer cable systems.

Required knowledge

Basic knowledge in electrical engineering.

The course «High voltage accessories for polymer cables» is recommended.

Duration

2 days, including a factory tour demonstrating polymer cable system manufacturing.

Language

English or German.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course.

Theoretical course: High voltage accessories for polymer cables

Learn all about the numerous technologies, design variants, production, testing, installation and further related specific issues for the operation of high voltage accessories for all polymer cable types.



Objectives

Our course provides key information on and around accessories for high voltage (hv) polymer cables. Participants are sensitized to specific issues in the selection & operation of hv accessories for all polymer cables. By the end of our course, they will be equipped with essential knowledge concerning different technologies, specific designs, particulars of installation & application as well as specific issues concerning the operation of hv accessories for polymer cables.

Specific focus of course contents

- Different technologies, designs and philosophies for high voltage polymer accessories
- Types and applications of terminations
- Types and applications of joints
- Types and applications of additional accessories, such as cable clamps or cross bonding boxes
- Basics of polymer cables (brief coverage, see separate course «HV polymer cables» for in-depth coverage)
- Testing details: routine tests, type tests, prequalification tests and after installation tests
- Manufacturing and installation of accessories
- Best-practice experiences of high voltage polymer accessories in operation
- Basics of diagnostics and monitoring (brief coverage, see separate courses for in-depth coverage)
- Inspection of high voltage accessory production units

Target group

Personnel from electric utilities or companies employing polymer cable systems.

Required knowledge

Basic knowledge in electrical engineering. The course «High voltage polymer cables» is recommended.

Duration

2 days, including a factory tour demonstrating high voltage accessory manufacturing.

Language

English or German.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course.

Theoretical course: Partial discharge measurements for cable systems

Learn all about the numerous technologies and methods of partial discharge measurements, diagnostics and monitoring for high voltage (oil-filled or polymer) cables and accessories.



Objectives

Our course provides key information on and around partial discharge (PD) measurements and monitoring for high voltage cable systems. Participants are sensitized to specific issues concerning the measurements and interpretation of PD data, enabling them to reach independent conclusions on state of the art cable systems.

Specific focus of course contents

- Introduction into phenomena of PD and their impact on insulation systems
- Typical PD defects
- PD measurement basics
- Conventional PD measurements: PD test circuit, apparent charge, calibration, narrow- and broadband detectors, PD localization
- Non-conventional PD measurements: HF/UHF, acoustic, optical or chemical measurements
- Advanced diagnostics: PD signal analysis, PRPD, pulse-sequence analysis, pattern recognition
- Test procedures for PD sensors
- On-site PD testing: PD in after-installation tests, off-line versus on-line, on-site noise and noise reduction
- Online monitoring (purpose & solutions)
- Relevant standards
- Best-practice experiences of PD measurements and monitoring in operation

Target group

Personnel from electric utilities or companies employing cable systems and personnel from companies involved in measurements and asset management of cable systems.

Required knowledge

Basic knowledge in electrical engineering.

Duration

1 day.

Language

English or German.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course.

Theoretical course: Diagnostics for cable systems

Learn all about the numerous technologies and methods of diagnostics for high- and medium voltage (oil-filled or polymer) cables and accessories.



Objectives

Our course provides key information on and around the possibilities and limitations of diagnostics for medium and high voltage polymer and oil-filled cable systems (cables and accessories). Participants are sensitized to specific issues concerning the measurements, diagnostics and interpretation of the measured data, enabling them to reach independent conclusions on state of the art cable systems.

Specific focus of course contents

- Ageing structure and failure performance of medium voltage cable systems in Germany
- Stress and ageing mechanisms of paper-insulated- and polymer cables
- Influences of age and deterioration on the performance of cables
- Assessment of cables with dielectric diagnostic tools
- Measurements of partial discharges of cables (brief coverage, see separate course «PD measurements for cable systems» for in-depth coverage)
- Typical tests after repair
- Possibilities and limitations of on-site diagnostics
- Assessment of PD failures in medium voltage accessories
- Assessment of paper-insulated high-voltage cables
- Best-practice experiences of diagnostics for cable systems in operation

Target group

Personnel from electric utilities or companies employing cable systems and personnel from companies involved in measurements and asset management of cable systems.

Required knowledge

Basic knowledge in electrical engineering.

Duration

1 day.

Language

English or German.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course.

Practical courses

Practical courses: Education – the basis of a reliably functioning cable system

Proper installation requires skilled jointers, whose expertise is essential for reliable high voltage cable systems. That's why Brugg Cables offers its customers continued quality education. Profit from the Brugg Cables Academy.

Background

Reliable and functioning cable systems greatly depend on proper installation processes and therefore on the expertise of skilled jointers. Brugg Cables profits from a team of highly qualified jointers and extensive knowledge in installation work. We want to share our experiences and knowledge to train your installer personnel, helping you to stay constantly «Well connected».

Target

Our practical installation courses aim to provide your installation team with all relevant knowledge for the installation of Brugg Cables high voltage accessories. Typical course participants are jointers of high voltage cable systems or any other installation personnel with basic skills in cable installation.

Place and time of courses

Standard courses

Standard courses are held in Brugg, Switzerland. All tools, accessories, cables and further additional items are provided.

Individual courses

Courses can also be taken individually. Customers decide whether the courses are held in Switzerland or in their home country. For more information, contact our personnel or apply at info.hvaccessories@brugg.com.

Costs

For information on course costs, just contact our key account managers or apply at info.hvaccessories@brugg.com.

Structure of basic practical installation courses at the Brugg Cables Academy.

| Course | Voltage level/kV | Type of cable | Training days |
|---|------------------|-----------------|---------------|
| Basic course terminations 1 | 72 -170 kV | Polymer | 4 |
| Basic course terminations 2 | 245 – 550 kV | Polymer | 4 |
| Basic course joints 1 | 72 -170 kV | Polymer | 5 |
| Basic course joints 2 | 245 – 550 kV | Polymer | 5 |
| Combined basic course joints and terminations 1 | 72 -170 kV | Polymer | 8 |
| Combined basic course joints and terminations 2 | 245 – 550 kV | Polymer | 8 |
| Combined basic course joints and terminations 3 | 72 – 420 kV | Oil | 8 |
| Basic course transition joints | 72 – 420 kV | Oil and Polymer | 8 |

Structure of refresher practical installation courses at the Brugg Cables Academy.

| Course | Voltage level/kV | Type of cable | Training days |
|--|------------------|-----------------|---------------|
| Refresher course terminations 1 | 72 -170 kV | Polymer | 3 |
| Refresher course terminations 2 | 245 – 550 kV | Polymer | 3 |
| Refresher course joints 1 | 72 -170 kV | Polymer | 4 |
| Refresher course joints 2 | 245 – 550 kV | Polymer | 4 |
| Refresher course joints and terminations 1 | 72 -170 kV | Polymer | 5 |
| Refresher course joints and terminations 2 | 245 – 550 kV | Polymer | 5 |
| Refresher course joints and terminations 3 | 72 – 420 kV | Oil | 5 |
| Refresher course transition joints | 72 – 420 kV | Oil and Polymer | 5 |

Practical course: Terminations for high voltage polymer cables

Learn all about the installation of outdoor terminations as well as terminations for transformers and gas insulated switch-gears (GIS) of high voltage polymer cable systems.



Objectives

Our course provides key information and practical experience on and around the installation of terminations for high voltage polymer cables. Participants are sensitized to specific issues for the installation of Brugg Cables polymer terminations. At the end of the course, attendees will be equipped with first-hand practical experience and all information needed for the successful independent installation of Brugg Cable terminations.

Specific focus of course contents

- Short theoretical introduction in design and operation mode of high voltage terminations for polymer cables
- Conductor types
- Preparation and requirements for termination installation
- Dismantling of cables and cable-end preparation
- Careful preparation of electric critical areas
- Basics to mounting of different insulators (Composite- and porcelain insulators as well as insulators for GIS and transformer terminations)
- Insulation filling
- Finishing and fixing the complete termination

Target group

Jointers of high voltage cable systems or all those aspiring to enter the jointer profession.

Required knowledge

Basic mechanical skills. Experience in accessory installation is an advantage.

Duration

4 days for each type of termination.
4 additional days for each further type.

Language

English or German.
Other languages available on special request.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course. Within this certificate the jointer will be able and allowed to install the trained accessories of Brugg Cables.

Practical course: Joints for high voltage polymer cables

Learn all about the installation of joints for high voltage polymer cable systems.



Objectives

Our course provides key information and practical experience on and around the installation of joints for high voltage polymer cables. Participants are sensitized to specific issues for the installation of Brugg Cables polymer joints. At the end of the course, attendees will be equipped with first-hand practical experience and all the information needed for the successful independent installation of Brugg Cable joints.

Specific focus of course contents

- Short theoretical introduction in design and operation mode of high voltage joints for polymer cables
- Preparation and requirements for joint installation
- Dismantling of cables and cable-end preparation including push-back
- Careful preparation of electric critical areas
- Realising of conductor connection(s)
- Handling the easy and fast insulation body slip-on process
- Installation of earthing or cross-bonding connections
- Mounting of different mechanical and moisture protection levels
- Finishing and fixing the complete joint

Target group

Jointers of high voltage cable systems or all those aspiring to enter the joiner profession.

Required knowledge

Basic mechanical skills. Experience in accessory installation is an advantage.

Duration

5 days for each type of joint.

4 additional days for each further type.

Language

English or German.

Other languages available on special request.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course. Within this certificate the joiner will be able and allowed to install the trained accessories of Brugg Cables.

Practical course: Joints and terminations for high voltage polymer cables

Learn all about the installation of high voltage accessories for polymer cables and profit from a combined course for the installation of terminations and joints.



Objectives

Our course provides key information and practical experience on and around the installation of terminations and joints for hv polymer cables. Participants are sensitized to specific issues for the installation of Brugg Cables polymer terminations and joints. At the end of the course, attendees will be equipped with first-hand practical experience and all the information needed for the successful independent installation of Brugg Cable terminations and joints.

Specific focus of course contents

- Short theoretical introduction in design and operation of hv terminations & joints for polymer cables
- Preparation & requirements for termination & joint installation
- Dismantling of cables and cable-end preparation including push-back
- Careful preparation of electric critical areas
- Basics to mounting of different insulators (Composite- & porcelain as well for GIS & transformer terminations)
- Insulation filling
- Realising joint conductor connection(s)
- Handling the easy & fast insulation body slip-on process
- Installation of earthing or cross-bonding connections
- Mounting of different mechanical & moisture protection levels
- Finishing and fixing the complete termination and joint

Target group

Joiners of high voltage cable systems or all those aspiring to enter the joiner profession.

Required knowledge

Basic mechanical skills. Experience in accessory installation is an advantage.

Duration

8 days for each type of joint and termination.
4 additional days for each further type.

Language

English or German.

Other languages available on special request.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course. Within this certificate the joiner will be able and allowed to install the trained accessories of Brugg Cables.

Practical course: Joints and terminations for high voltage oil-filled cables

Learn all about the installation of high voltage accessories for oil-filled cable systems. Profit from a combined course for the installation of terminations (outdoor terminations and terminations for transformers and GIS and joints).



Objectives

Our course provides key information and practical experience on and around the installation of terminations and joints for hv oil-filled cables. Participants are sensitized to specific issues for the installation of Brugg Cables terminations and joints. At the end of the course, attendees will be equipped with first-hand practical experience and all the information needed for the successful independent installation of Brugg Cable terminations and joints.

Specific focus of course contents

- Short theoretical introduction in design and operation mode of hv terminations and joints for oil-filled cables.
- Preparation & requirements for termin. & joint install.
- Dismantling of oil-filled cables
- Proper wrapping of oil impregnated insulation papers
- Realising the field grading and careful preparation of electric critical areas
- Basics to mounting of different insulators (Composite- & porcelain as well for GIS & transformer terminations)
- Insulation filling
- Realising joint conductor connection(s)
- Installation of earthing or cross-bonding connections
- Mounting of diff. mechanical & moisture protection levels
- Cable-oil treatment and filling
- Finishing and fixing the complete termination and joint

Target group

Jointers of high voltage cable systems or all those aspiring to enter the joiner profession.

Required knowledge

Basic mechanical skills. Experience in accessory installation is an advantage.

Duration

8 days for each type of joint and termination.
4 additional days for each further type.

Language

English or German.

Other languages available on special request.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course. Within this certificate the joiner will be able and allowed to install the trained accessories of Brugg Cables.

Practical course: Transition joints for the connection of oil-filled & polymer cables

Learn all about the installation of transition joints for the connection of high voltage oil-filled cables to high voltage polymer cable systems.



Objectives

Our course provides key information and practical experience on and around the installation of transition joints for the connection of high voltage polymer cables to high voltage oil-filled cables. Participants are sensitized to specific issues for the installation of Brugg Cables transition joints. At the end of the course, attendees will be equipped with first-hand practical experience and all the information needed for the successful independent installation of Brugg Cable joints.

Specific focus of course contents

- Short theoretical introduction in design & operation mode of high voltage terminations & joints for oil-filled cables
- Preparation and requirements for termination and joint installation
- Dismantling of polymer and oil-filled cables
- Proper wrapping of the oil impregnated insulation papers
- Realising the field grading and careful preparation of electric critical areas
- Basics to mounting of polymer insulator
- Insulation filling
- Realising joint conductor connection
- Mounting of different mechanical and moisture protection levels
- Cable-oil treatment and filling
- Finishing and fixing the complete joint

Target group

Joiners of high voltage cable systems or all those aspiring to enter the joiner profession.

Required knowledge

Basic mechanical skills. Experience in accessory installation is an advantage.

Duration

8 days.

Language

English or German.

Other languages available on special request.

Certificates

Brugg Cables Academy Certificates are awarded on the successful completion of the above course. Within this certificate the joiner will be able and allowed to install the trained accessories of Brugg Cables.

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