ABB SACE

Low Voltage Circuit Breakers
Training Programme 2007

1SDC001012B0201

ABB SACE Low Voltage Circuit Breakers Training Programme

Low Voltage Circuit Breakers by ABB SACE are known all over the world for their high quality and top-class performance. When electrical installation protection is needed there is no better choice.
However, circuit breaker and protection technology is developing at a fast pace, and so are application needs. It's not so easy to keep up-to-date and to know what is the best option for protecting a specific application by the latest technology.
In order to help our customers get the best for their application, we are now presenting the ABB SACE Training Programme on Low Voltage Circuit Breakers: a set of courses covering different needs, from basic electrical technology to the most advanced protection techniques.
We are sure you will find the one that fits your needs.



Course organization - How to attend

Courses will be given in English, unless otherwise stated.
Please book attendance at least 3 weeks in advance.
Course may be canceled if a minimum number of participants is not reached. In this case, you will receive a notification 2 weeks in advance.

Please request registration for courses to the ABB SACE Export Sales organization.
You may also send an e-mail to **LVB.training@it.abb.com**, and we will channel your request to the sales organization.

1. Introduction to circuit breakers

Basic concepts about CBs: how a CB works, what is its purpose as part of an installation, what are the main technical features of automatic CB and how they determine the choice of the proper circuit breaker.
Session includes an overview of ABB SACE products (ACBs and MCCBs).
The course is suitable even for participants with little or no experience with circuit breakers, or with limited technical background.
Course contents are based on IEC standards.
Duration: 2 days.

Goals

After this course, you will know what are the technical data required to properly specify and select a circuit breaker, either ACB or MCCB.
You will know how to read the Technical Catalogues and find the information you need to properly choose the circuit breaker and protection unit for your application.
You will understand how to select the right ordering codes for a circuit breaker and its accessories.

Contents

2. Technical Collection Tools – Basic

Advantages of using the TCT (DOCWin, CAT, DMBWin) in the design of an electrical installation.
No previous knowledge of TCT or other ABB SACE software is required.
Duration: half day.

Goals

After this course, you will know what software tools are available. You will know how DOCWin, CAT and DMBWin can be used for installation design. You will be able to design a very simple installation with DocWin and bring it to completion by selecting the part numbers with CAT.
This training session can be viewed as a first introduction to TCT. A more advanced course (e.g., “Design of electrical installations using DOCWin”) is provided as the next step.

Contents

Introduction to TCT and ABB design tools

- The Software Desktop and software tools
- Purpose of the main tools: DOCWin, CAT, DMBWin
- What DOCWin can do

Installation and usage tips

- Hardware and software requirements
- Registration
- Self-update

Additional tools

- Curves
- Viewer

Sample installation design

- Design and dimensioning of components using DOCWin
- Part number and accessories selection using CAT
- Switchboard arrangement using DMBWin

3. Dialogue & Communication - Basic

Basic information about communicating breakers understanding of communication systems, what such systems can do, what hardware/software is involved and what you need in order to put a breaker in communication with other equipment
Duration: half day.

Goals

After this course, you will know what features an Air Circuit Breaker or a Moulded Case Circuit Breaker with communication can add to your installation.
You will also be able to evaluate the basic requirements related to connection of a circuit breaker to a communication system, and to give indications about which accessories/components are required.
This training session can be viewed as a first introduction to communication systems. A more advanced course (“Dialogue and Communication – Advanced ”) is provided as the next step.

Contents

Introduction to communication systems

- Communication protocols,
- fieldbus systems and serial protocol
- Modbus communication systems

Application of communication to Low Voltage protection devices

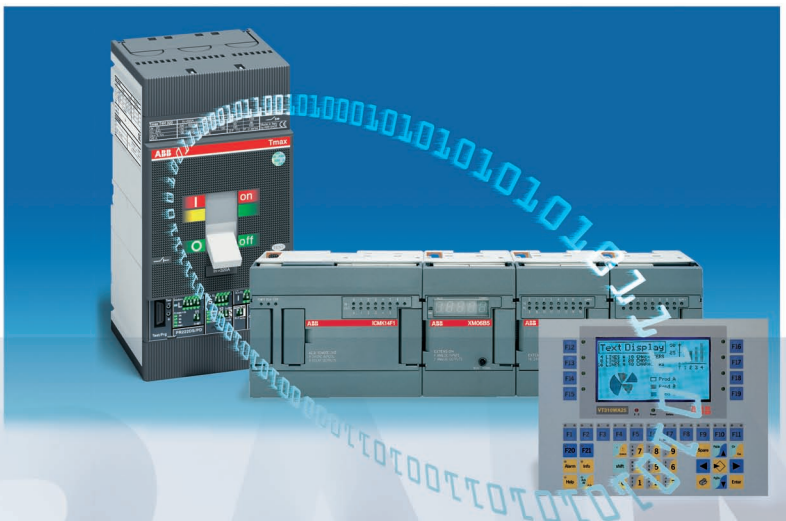
- What a circuit breaker with communication can do
- Supervision and automation application in Low Voltage power distribution

The range of ABB SACE electronic devices with communication

- Circuit Breakers with communication
- Required accessories
- Other communicating products
- Communication software

Hands-on session

- Practical demonstration of ABCs and MCCBs with communication



4. Dialogue & Communication – Advanced

How to dimension a communication system, how to set up and configure relevant devices and put the system in operation.
Main focus is on Modbus systems, which are described in detail. In addition, some special applications are included:

- Integration of communicating breakers into a system together with other devices such as SD-GEM and PLCs
- fieldbus communication, usage of the Fieldbus Plug for Profibus-DP communication with low voltage circuit breakers

Duration: 1 day.

Goals

After this course, you will have an in depth knowledge of how the communication units for low voltage circuit breakers work. You will be able to specify and size a communication system including low voltage circuit breakers.
You will also know how to set up, put into operation and test ABB SACE Modbus communicating circuit breakers.

Contents

Basic concepts about communication in LV systems
- Basics about industrial communication systems
- Fieldbus systems
- Modbus communication

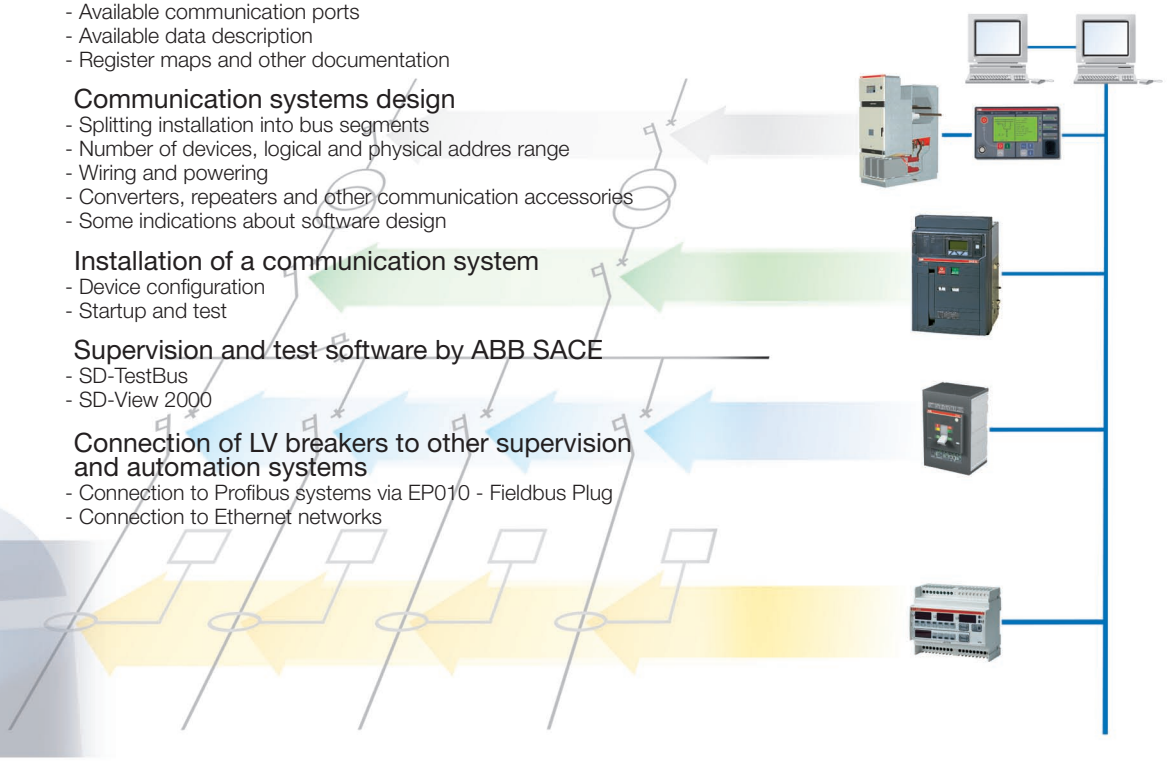
Communicating Circuit Breakers by ABB SACE
- Communication product range
- Technical features and functional description
- Available communication ports
- Available data description
- Register maps and other documentation

Communication systems design
- Splitting installation into bus segments
- Number of devices, logical and physical addres range
- Wiring and powering
- Converters, repeaters and other communication accessories
- Some indications about software design

Installation of a communication system
- Device configuration
- Startup and test

Supervision and test software by ABB SACE
- SD-TestBus
- SD-View 2000

Connection of LV breakers to other supervision and automation systems
- Connection to Profibus systems via EP010 - Fieldbus Plug
- Connection to Ethernet networks



5. Electronic releases

This training session includes the electronic, microprocessor-based releases that can be fitted to ACBs and MCCBs by ABB SACE. It also explains how the protections implemented in each of them work. Course contents are designed for participants with some experience in electrical installation who need to understand how to select and employ ABB SACE protection releases.
Duration: 1 day.

Goals

After this course, you will have an in depth knowledge of electronic protection releases and the protections they implement. You will be able to select the proper protection release based on application. You will also be able to set the protections parameters in several common cases.

Contents

Basic concepts about electronic releases
- Overcurrent electronic releases: structure and functions
- Differences and advantages compared to electromechanical releases
- Self-supply vs. auxiliary power supply operation

ABB SACE range of electronic protection releases
- Releases for ACBs and MCCBs
- Accessories

Overcurrent protections
- Basic protections: overload and short-circuit
- Selective short circuit protection
- How to read I-t curves
- Protection settings
- Advanced topics: startup threshold, double S, thermal memory

Ground fault protection
- Distribution systems
- G and double G protections
- RC protection and RC releases

Advanced protections
- Voltage-based protections
- Reverse Power protection
- Early fault detection protection (EFDP)
- Zone selectivity
- Directional protection
- Directional zone selectivity
- Dual setting

Additional functionalities of protection releases
- Measurements
- Signaling
- Communication
- Event detection and logging
- Fault / Alarm Data logging

Sample applications
- Feeder protection
- Transformer protection
- Protection of meshed networks

6. Selectivity and coordination

Techniques for coordination of protections and how they can be implemented using ABB SACE circuit breakers. Focus is mostly technical and it includes application specific details.
Course contents are designed for participants with some experience in electrical installations design and/or with some knowledge of ABB SACE CBs.
Duration: 1 day.

Goals

After this course, you will understand the concepts behind coordinated protection systems: discrimination, backup, continuity of service. You will be able to evaluate the options available for selective coordination, and select the circuit breakers and protection releases to be employed in some common cases.

Contents

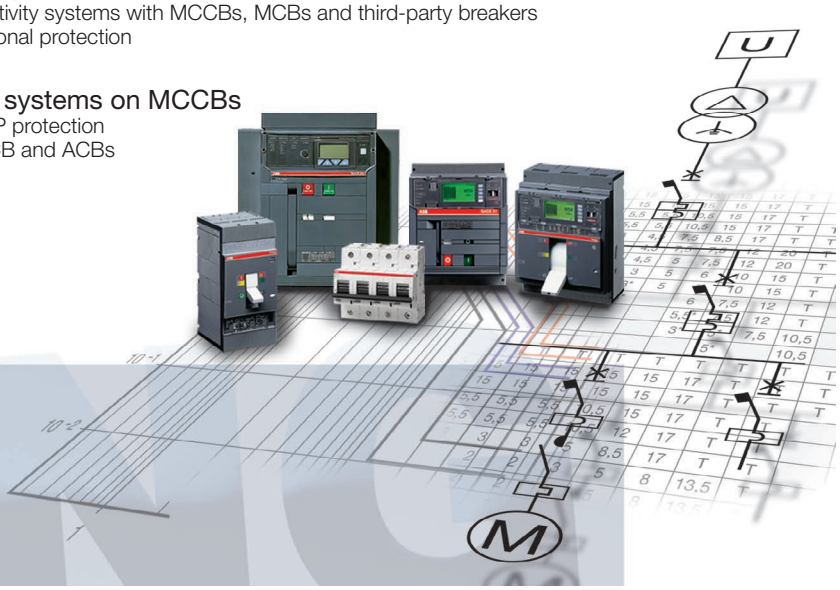
Coordination of protections
- Standard definitions for selective coordination and backup
- Current-based, time-based, energy-based selectivity
- Zone selectivity
- Backup protection
- Selectivity under overload vs. selectivity under short circuit conditions

Implementing backup protections
- Breaker selection
- Release selection and setting

Implementing selectivity
- Current-based selectivity
- Energy-based selectivity
- Time based selectivity

Advanced selectivity systems on ACBs
- zone selectivity on S and G protections
- coordination of zone selectivity systems with MCCBs, MCBs and third-party breakers
- time selectivity with directional protection
- directional zone selectivity

Advanced selectivity systems on MCCBs
- Fast interlocking and EFDP protection
- interlocking between MCCB and ACBs



7. Design of electrical installations using DOCWin

DocWin is the design tool provided by ABB SACE to electrical installation engineers and consultants. This training session introduces DocWin and explains its usage as a tool for installation dimensioning, component selection and project documentation.
Course contents are designed for participants with some experience in electrical installations design and/or with some knowledge of ABB SACE CBs
Duration: 2 days.

Goals

After this course, you will be able to use DocWin to design electrical installations of medium / high complexity, including low- and medium-voltage. You will also be able to use DocWin to produce project documentation and reporting.

Contents

The design flow using DocWin
- Network design: network general data
- Objects: the most common object types and their properties
- Calculation and available options
- Component sizing with automatic selection and manual modification
- Curve drawing
- Reporting
- Data export

Distribution systems
- Choosing distribution systems and phases distribution across the plant
- Single phase loads and phase balancing
- Ground fault protection

Circuit Breakers and other protection devices in DocWin
- Manual selection of circuit breakers
- Automatic selection of circuit breakers with manually added requirements

Protection coordination
- Coordination by curve comparison
- Implementing selectivity chains and/or backup systems

Advanced Cable dimensioning
- Effects of different calculation standards
- Effects of different installation methods

Network configurations
- Using different power sources
- Generator powered networks
- Mesh networks

Medium voltage systems
- Medium voltage cables and their properties
- MV Protection curves: user defined curves
- Protection of MV/LV transformers

Reporting and documentation
- Using diagram configurations
- Component reporting
- Curve printouts

Switchboards design hints
- Busbar dimensioning
- temperature rise evaluation

8. Application of Low Voltage Circuit Breakers

This training session is focused on the application of circuit breakers to electrical installations. A number of typical cases are described and the proper choice of circuit breaker and setting of protection unit are discussed.
Duration: 2 days.

Goals

After this course, you will know how to specify and select a circuit breaker in the most frequent instances of power distribution systems. You will also be able to evaluate the different options for the protection of a given electrical installation.
Contents

Contents

Basics
What is a circuit breaker
The automatic circuit breaker as a protection device
Overcurrent protection: overload and short circuit

Circuit Breaker specification
IEC standard
Technical data
Air Circuit Breakers and Moulded Case Circuit Breakers

Protection releases
Thermomagnetic and electronic protection releases
How to read time-current curves

Short circuit currents
How to calculate short-circuit currents

Current-Limiting circuit breakers
Concepts about current limitation
Specification of current limiting circuit breakers
How to read and apply limitation curves

Distribution systems and ground fault protection
Classification of distribution systems
Ground fault and its effects
Choice of ground fault protection devices

Feeder protection
Technical data for feeder specification
Choice of circuit breaker
Selection and setting of protection release
Comparison with fuses as means for protection

Transformer protection
Technical data for transformer specification
Specific transformer issues: inrush current, thermal point, service values
Choice of circuit breaker
Selection and setting of protection release

Generator protection
Technical data for generator specification
Choice of circuit breaker
Selection and setting of protection release

Capacitor banks protection
Calculation of significant currents
Choice of circuit breaker
Selection and setting of protection release

Basic concepts about motor protection
Relevant technical data about motors
Tripping class
Choice of circuit breaker
Selection and setting of protection release

Effects of harmonics
Concepts on harmonics and distorted waveforms
Typical installations with harmonics
Effects on the neutral
Effects on protection releases
DC installations
Most common types of DC networks
Faults and fault protection in DC networks
Selection and usage of circuit breakers in DC applications

9. Standards and Certification of Circuit Breakers

This training session is a technical explanation of some aspects of industrial and marine standards that affect the design of electrical installation. Focus is on the prescriptions for application of circuit breakers, and how they are tested in order to ensure compliance.
Course contents are designed for participants with some technical background in electrical engineering and/or with some knowledge of ABB SACE CBs
Duration: 1 day

Goals

After this course, you will understand the concepts behind IEC and UL testing procedures. You will also know the additional requirements for circuit breakers used in marine application and subject to approval by shipping registers.

Contents

General principles of IEC 60947
Definitions
Time-current curves and limitation curves: computation and representation
Conditioned and limited current

Test sequences according to IEC 60947-2
Type tests and routine tests
Number of samples
Overtemperature on terminals and choice of cables/busbars in direct connection

IEC 60947-2 Annexes
Additional tests due to electronic release
Aingle-pole tests for IT systems
Tests on thermomagnetic and residual current releases

UL/ANSI standards
UL 1066 standard on ACBs and UL 489 standard on MCCBs
Comparison with IEC, main differences
Follow-up and e UL file

CB scheme / GOST

ENEL compliance: breaker specification and testing

Shipping register approval
Procedure for entirely new breaker (interrupting part and electronic release)
Procedure for new release: renewal of certification

Specifications for marine applications
EMC, environmental, vibration, shock tests
Main differences with respect to IEC standard

RINA approval

SIL certification by RINA and TUV

Product databases

Courses and locations

Course	Month	Day	Location
Advanced Dialogue&Comm.	February	22	Bergamo
	May	24	Frosinone
	July	26	Bergamo
	October	25	Frosinone
	December	13	Bergamo
Application of LV Circuit Breakers	April	17-18	Bergamo
	June	26-27	Frosinone
	November	6-7	Frosinone
Basic Dialogue&Comm.	February	15	Bergamo
	March	15	Frosinone
	May	17	Frosinone
	June	14	Bergamo
	July	19	Frosinone
	September	20	Bergamo
	October	18	Frosinone
	November	15	Bergamo
	December	6	Frosinone
Basic TCT	February	15	Bergamo
	March	15	Frosinone
	May	17	Frosinone
	June	14	Bergamo
	July	19	Frosinone
	September	20	Bergamo
	October	18	Frosinone
	November	15	Bergamo
	December	6	Frosinone
Design with DocWin	April	19-20	Bergamo
	June	28-29	Frosinone
	November	8-9	Frosinone
Electronic Releases	February	20	Bergamo
	May	22	Frosinone
	July	24	Bergamo
	October	23	Frosinone
	December	11	Bergamo
Introduction to circuit breakers	February	13-14	Bergamo
	March	13-14	Frosinone
	May	15-16	Frosinone
	June	12-13	Bergamo
	July	17-18	Frosinone
	September	18-19	Bergamo
	October	16-17	Frosinone
	November	13-14	Bergamo
	December	4-5	Frosinone
Selectivity & Coordination	February	21	Bergamo
	May	23	Frosinone
	July	25	Bergamo
	October	24	Frosinone
	December	12	Bergamo
Standards & Certifications of CB	February	23	Bergamo
	May	25	Frosinone
	July	27	Bergamo
	October	26	Frosinone
	December	14	Bergamo

Course planning 2007

January

Week 1	1	M	
	2	T	
	3	W	
	4	T	
	5	F	
	6	S	
	7	S	
Week 2	8	M	
	9	T	
	10	W	
	11	T	
	12	F	
	13	S	
	14	S	
Week 3	15	M	
	16	T	
	17	W	
	18	T	
	19	F	
	20	S	
	21	S	
Week 4	22	M	
	23	T	
	24	W	
	25	T	
	26	F	
	27	S	
	28	S	
Week 5	29	M	
	30	T	
	31	W	

February

Week 5	1	T	
	2	F	
	3	S	
	4	S	
Week 6	5	M	
	6	T	
	7	W	
	8	T	
	9	F	
	10	S	
	11	S	
Week 7	12	M	
	13	T	Introduction to circuit breakers
	14	W	Introduction to circuit breakers
	15	T	Basic TCT + Basic Dialogue&Comm.
	16	F	
	17	S	
	18	S	
Week 8	19	M	
	20	T	Electronic Releases
	21	W	Selectivity & Coordination
	22	T	Advanced Dialogue&Comm.
	23	F	Standards & Certification of CBs
	24	S	
	25	S	
Week 9	26	M	
	27	T	
	28	W	

March

Week 9	1	T	
	2	F	
	3	S	
	4	S	
Week 10	5	M	
	6	T	
	7	W	
	8	T	
	9	F	
	10	S	
	11	S	
Week 11	12	M	
	13	T	Introduction to circuit breakers
	14	W	Introduction to circuit breakers
	15	T	Basic TCT + Basic Dialogue&Comm.
	16	F	
	17	S	
	18	S	
Week 12	19	M	
	20	T	
	21	W	
	22	T	
	23	F	
	24	S	
	25	S	
Week 13	26	M	
	27	T	
	28	W	
	29	T	
	30	F	
	31	S	

April

13	1	S	
Week14	2	M	
	3	T	
	4	W	
	5	T	
	6	F	
	7	S	
	8	S	
Week 15	9	M	
	10	T	
	11	W	
	12	T	
	13	F	
	14	S	
	15	S	
Week 16	16	M	
	17	T	Application of LV Circuit Breakers
	18	W	Application of LV Circuit Breakers
	19	T	Design with DOCWin
	20	F	Design with DOCWin
	21	S	
	22	S	
Week 17	23	M	
	24	T	
	25	W	
	26	T	
	27	F	
	28	S	
	29	S	
18	30	M	

May

Week18	1	T	
	2	W	
	3	T	
	4	F	
	5	S	
	6	S	
Week 19	7	M	
	8	T	
	9	W	
	10	T	
	11	F	
	12	S	
	13	S	
Week 20	14	M	
	15	T	Introduction to circuit breakers
	16	W	Introduction to circuit breakers
	17	T	Basic TCT + Basic Dialogue&Comm.
	18	F	
	19	S	
	20	S	
Week 21	21	M	
	22	T	Electronic Releases
	23	W	Selectivity & Coordination
	24	T	Advanced Dialogue&Comm.
	25	F	Standards & Certification of CBs
	26	S	
	27	S	
Week 22	28	M	
	29	T	
	30	W	
	31	T	

June

22	1	F	
	2	S	
	3	S	
Week 23	4	M	
	5	T	
	6	W	
	7	T	
	8	F	
	9	S	
	10	S	
Week 24	11	M	
	12	T	Introduction to circuit breakers
	13	W	Introduction to circuit breakers
	14	T	Basic TCT + Basic Dialogue&Comm.
	15	F	
	16	S	
	17	S	
Week 25	18	M	
	19	T	
	20	W	
	21	T	
	22	F	
	23	S	
	24	S	
Week 26	25	M	
	26	T	Application of LV Circuit Breakers
	27	W	Application of LV Circuit Breakers
	28	T	Design with DocWin
	29	F	Design with DocWin
	30	S	

July

26	1	S	
Week27	2	M	
	3	T	
	4	W	
	5	T	
	6	F	
	7	S	
	8	S	
Week 28	9	M	
	10	T	
	11	W	
	12	T	
	13	F	
	14	S	
	15	S	
Week 29	16	M	
	17	T	Introduction to circuit breakers
	18	W	Introduction to circuit breakers
	19	T	Basic TCT + Basic Dialogue&Comm.
	20	F	
	21	S	
	22	S	
Week 30	23	M	
	24	T	Electronic Releases
	25	W	Selectivity & Coordination
	26	T	Advanced Dialogue&Comm.
	25	F	Standards & Certification of CBs
	28	S	
	29	S	
31	30	M	
	31	T	

August

Week 31	1	W	
	2	T	
	3	F	
	4	S	
	5	S	
Week 32	6	M	
	7	T	
	8	W	
	9	T	
	10	F	
	11	S	
	12	S	
Week 33	13	M	
	14	T	
	15	W	
	16	T	
	17	F	
	18	S	
	19	S	
Week 34	20	M	
	21	T	
	22	W	
	23	T	
	24	F	
	25	S	
	26	S	
Week 35	27	M	
	28	T	
	29	W	
	30	T	
	31	F	

September

35	1	S	
	2	S	
Week 36	3	M	
	4	T	
	5	W	
	6	T	
	7	F	
	8	S	
	9	S	
Week 37	10	M	
	11	T	
	12	W	
	13	T	
	14	F	
	15	S	
	16	S	
Week 38	17	M	
	18	T	Introduction to circuit breakers
	19	W	Introduction to circuit breakers
	20	T	Basic TCT + Basic Dialogue&Comm.
	20	F	
	21	S	
	22	S	
Week 39	24	M	
	25	T	
	26	W	
	27	T	
	28	F	
	29	S	
	30	S	

October

Week 40	1	M	
	2	T	
	3	W	
	4	T	
	5	F	
	6	S	
	7	S	
Week 41	8	M	
	9	T	
	10	W	
	11	T	
	12	F	
	13	S	
	14	S	
Week 42	15	M	
	16	T	Introduction to circuit breakers
	17	W	Introduction to circuit breakers
	18	T	Basic TCT + Basic Dialogue&Comm.
	19	F	
	20	S	
	21	S	
Week 43	22	M	
	23	T	Electronic Releases
	24	W	Selectivity & Coordination
	25	T	Advanced Dialogue&Comm.
	26	F	Standards & Certification of CBs
	27	S	
	28	S	
Week 44	29	M	
	30	T	
	31	W	

November

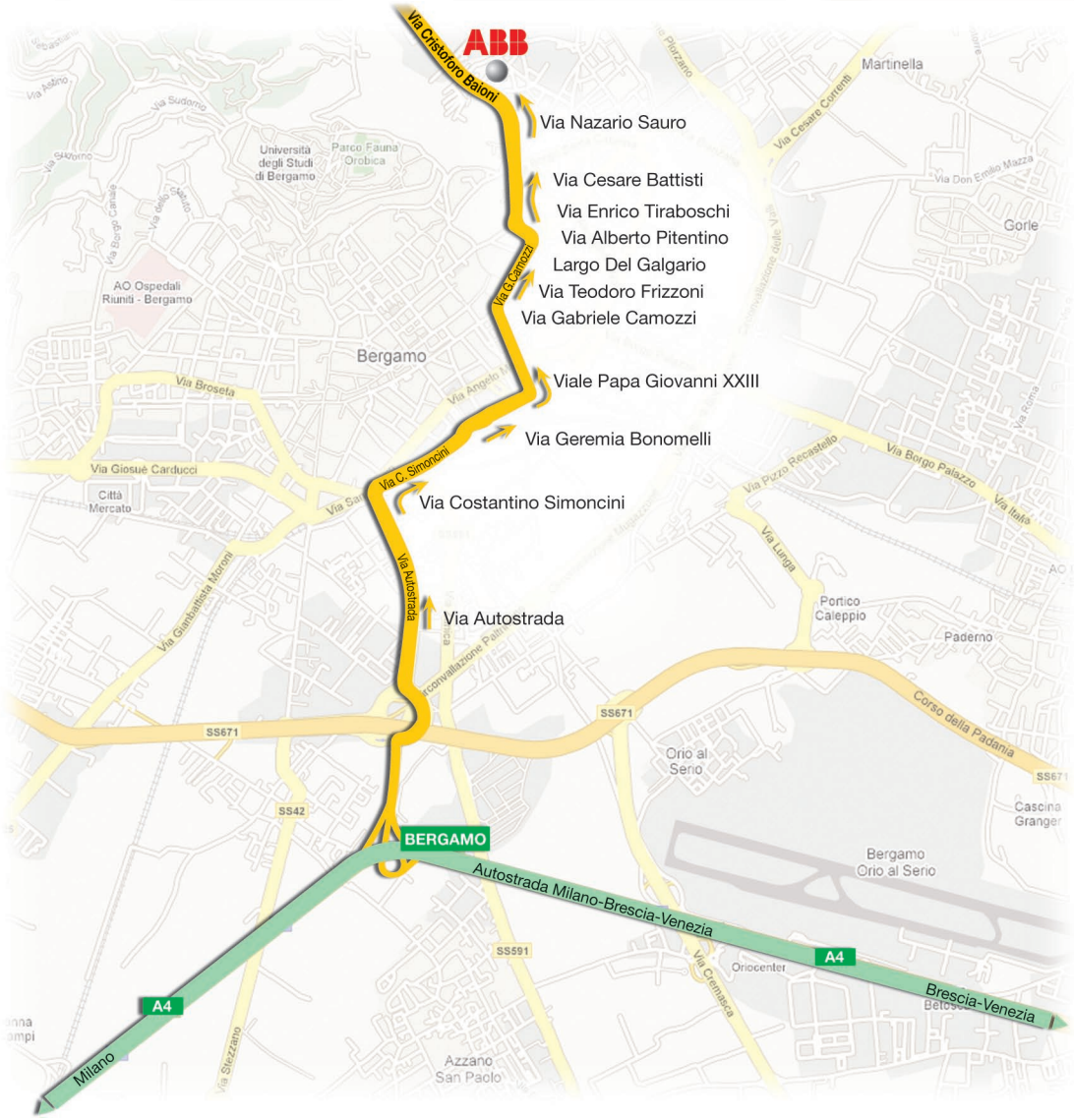
44	1	T	
	2	F	
	3	S	
	4	S	
Week 45	5	M	
	6	T	Application of LV Circuit Breakers
	7	W	Application of LV Circuit Breakers
	8	T	Design with DocWin
	9	F	Design with DocWin
	10	S	
	11	S	
Week 46	12	M	
	13	T	Introduction to circuit breakers
	14	W	Introduction to circuit breakers
	15	T	Basic TCT + Basic Dialogue&Comm.
	16	F	
	17	S	
	18	S	
Week 47	19	M	
	20	T	
	21	W	
	22	T	
	23	F	
	24	S	
	25	S	
Week 48	26	M	
	27	T	
	28	W	
	29	T	
	30	F	

December

49	1	S	
	2	S	
Week 50	3	M	
	4	T	Introduction to circuit breakers
	5	W	Introduction to circuit breakers
	6	T	Basic TCT + Basic Dialogue&Comm.
	7	F	
	8	S	
	9	S	
Week 51	10	M	
	11	T	Electronic Releases
	12	W	Selectivity & Coordination
	13	T	Advanced Dialogue&Comm.
	14	F	Standards & Certification of CBs
	15	S	
	16	S	
Week 52	17	M	
	18	T	
	19	W	
	20	T	
	21	F	
	22	S	
	23	S	
Week 53	24	M	
	25	T	
	26	W	
	27	T	
	28	F	
	29	S	
	30	S	
1	31	M	

Location maps

Frosinone
Via Enrico Fermi, 14 (ex via Vado La Lena)
Tel. 0775 2971



Bergamo
Via Baioni, 35
Tel.035 395.1

Due to possible developments of standards as well as of materials, the characteristics and dimensions specified in the present catalogue may only be considered binding after confirmation by ABB SACE.

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