2017

TRAINING

Application and Product Training

Megger Sweden – Danderyd

Megger

WWW.MEGGER.COM

Welcome to our training centre

To achieve a reliable electrical grid it is necessary with an efficient maintenance strategy. This strategy in turn must be adapted to the development of new switchgear, primary and secondary equipment, as well as being able to handle the existing spectrum of installed equipment. This implies great expectations and responsibility on the shoulders of the maintenance and test technicians.

Also at the very start of the life of any high voltage equipment there is a commissioning phase. Often this is done under time pressure – so the commissioning engineers must be able to test efficiently but at the same time provide reliable test results that guarantee the correct function of primary equipment and protection devices.

Megger's test equipment is your toolbox in this work – but equally important is the knowledge and understanding of the objects that shall be tested. In the courses presented here we try to share our experience in testing in order to give a broader understanding of how and why testing is important as well as hands-on experience in how to use our testing products in an efficient way.

We believe that with the right equipment and knowledge you will work more safely, efficiently and produce more reliable test conclusions. So going for training should be a well worth investment. We look forward to welcoming you to our facility in Danderyd, Sweden.

Lukas Magnusson
Manager, Technical Support Group
Megger Sweden AB

Overview schedule – 2017

Art. No.	Date	Title	Course code	Duration
UU-00500	May 8-9	Testing and diagnosis of power transformers	TRAF1	2 days
UU-00400	May 10	Relay protection testing I	RELA1	1 day
UU-00500	May 11-12	Relay protection testing II	RELA2	2 days
UU-00400	May 15	Testing and diagnosis of circuit breakers I	BRAK1	1 day
UU-00500	May 16-17	Testing and diagnosis of circuit breakers II	BRAK2	2 days
UU-00400	May 18	Primary injection testing	PRIM1	1 day
UU-00400	May 19	Testing of battery systems	BATT1	1 day
UU-00400	Sep 18	Testing and diagnosis of circuit breakers I	BRAK1	1 day
UU-00500	Sep 19-20	Testing and diagnosis of circuit breakers II	BRAK2	2 days
UU-00400	Sep 21	Primary injection testing	PRIM1	1 day
UU-00400	Sep 22	Testing of battery systems	BATT1	1 day
UU-00500	Sep 25-26	Testing and diagnosis of power transformers	TRAF1	2 days
UU-00400	Sep 27	Relay protection testing I	RELA1	1 day
UU-00500	Sep 28-29	Relay protection testing II	RELA2	2 days

For details see the complete course information in the following pages.

Registration

To register contact your local Megger office or distributor.
You may also send your registration via email to:
seinfo@megger.com
In your email, please state:

- The name of the attendees
- The Art. No.
- Course code
- Date
- Company name and contact details

Customer Specific Training

We often hold training sessions specific to the customers' needs. You could pick a few of our training packages presented in this catalogue or ask us to custom make a schedule for you. Send us an email with your request, stating your background knowledge and preferred topics – and we will return with a proposal.

On-Site Training

If you prefer we can travel to your site (office or in the field) and perform training there. This is often very effective and could add the value that you train on equipment that meets in your daily work. Please send us en email with your request – and we will return with a proposal.

Relay protection testing I

General description

This training gives an overview of simple relay protection philosophies and basic knowledge of relay protection testing with hands-on exercises.

In the hands-on exercises we work with Megger test equipment and protection relays from some major manufacturer (e.g. ABB, Siemens, Schneider).

Content

- Relay protection basics
  - Relay operating principles
  - Components in a protection relay system
  - Electrical explanation of faults in power systems
  - Selectivity, sensitivity, speed, reliability
- Megger relay testing equipment: SVERKER 700/900 series
- Hands-on testing and theory for major protection functions
  - Over current protection
  - Earth-fault protection
  - Under/over voltage and frequency protection
  - Auto reclose functionality
- Testing of current transformers

Requirements

Basic general knowledge of electric power systems.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00400	RELA1	1 day	May 10	Danderyd, Sweden
UU-00400	RELA1	1 day	Sep 27	Danderyd, Sweden

Relay protection testing II

General description

This training gives an overview of complex relay protection philosophies and advanced knowledge of relay protection testing with hands-on exercises.

In the hands-on exercises we work with Megger test equipment and protection relays from some major manufacturer (e.g. ABB, Siemens, Schneider).

Content

- Advanced relay protection theory
  - Directional protection
  - Impedance based protection (e.g. distance, motor/generator)
  - Symmetrical components
- Megger relay testing equipment: SVERKER 900
- Hands-on testing of protection relays
  - Directional overcurrent and earth fault
  - Unbalanced overcurrent
  - Distance protection for transmission line

Requirements

General knowledge of electric power systems. Experience with testing of basic relay protection functions/devices.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00500	RELA2	2 days	May 11-12	Danderyd, Sweden
UU-00500	RELA2	2 days	Sep 28-29	Danderyd, Sweden

Testing and diagnosis of circuit breakers I

General description

In this course we survey the main testing methods used in testing of circuit breakers. As part of the training we also do hands-on exercises to put the theory in use. We work with Megger test equipment and focus on devices suitable for basic testing.

Content

- Test methods
  - Contact operation time measurement
  - Contact resistance
  - Contact motion measurement and analysis
- Megger test equipment: EGIL, MOM2
- Basic functionality of the software CABA win
- Examples of measurement data and how to interpret
- Hands-on
  - Best practice and safety when connecting the test instrument
  - Measurement on breaker simulator and circuit breaker in training room
  - Basic analysis of measurement data

Requirements

Basic general knowledge of electric power systems.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00400	BRAK1	1 day	May 15	Danderyd, Sweden
UU-00400	BRAK1	1 day	Sep 18	Danderyd, Sweden

Testing and diagnosis of circuit breakers II

General description

This course is suited for those who have done breaker testing but want to deepen the understanding and also learn how to work with Megger's advanced level breaker test instruments including the CABA Win software. All main testing methods are covered, but time is focused to more advance test methods.

Content

- Test methods
  - Contact operation time measurement
  - Contact resistance
  - Contact motion measurement and analysis
- DRM (Dynamic Resistance Measurement)
- Megger test equipment: TM1700, TM1800, MOM2
- Basic functionality of the software CABA win
- Examples of measurement data and how to interpret
- Hands-on
  - Best practice and safety when connecting the test instrument
  - Measurement on breaker simulator and circuit breaker in training room
  - Advanced analysis of measurement data

Requirements

Knowledge on how to perform basic breaker testing. The course planned the day before (BRAK1) can serve as preparation for those with no field experience.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00500	BRAK2	2 days	May 16-17	Danderyd, Sweden
UU-00500	BRAK2	2 days	Sep 19-20	Danderyd, Sweden

Testing and diagnosis of power transformers

General description

The training gives an overview of the measurement techniques and methods for determination of the state of a transformer. It is suited for beginners up to intermediate level. The test instruments covered are indicated in brackets below.

Content

- Test methods and standards
  - Turn ratio test (TTR)
  - Winding resistance measurement (MTO)
  - Isolation testing (MIT/S1)
  - Dielectric loss (DELTA)
  - Breakthrough voltage of oil (OTS)
  - Diagnostic tests
  - Dielectric spectroscopy (DFR/FDS), state of isolation paper (IDAX, VAX)
  - Sweep Frequency Response Analysis (FRAX)
  - Multifunctional test equipment (TRAX)
- Setup and handling of instruments
- Measurement setup

Requirements

General knowledge of electrical grids and the role of the transformer.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00500	TRAF1	2 days	May 8-9	Danderyd, Sweden
UU-00500	TRAF1	2 days	Sep 25-26	Danderyd, Sweden

Primary injection testing

General description

Testing by injecting current on the primary side can be a strong complement to secondary testing. In this course we discuss various valuable test scenario and the tools necessary to perform the tests.

Content

- Principles and motivators for primary testing
- Correct connecting procedures and safety advice
- Applications
  - Protection relay systems
  - Circuit breaker testing
  - Ratio of current transformer
  - Other applications
- Hands-on testing using Megger test equipment
  - ODEN
  - INGVAR
  - VIDAR

Requirements

General understanding of the components in an electrical grid.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00400	PRIM1	1 day	May 18	Danderyd, Sweden
UU-00400	PRIM1	1 day	Sep 21	Danderyd, Sweden

Testing of battery systems

General description

Testing of stationary batteries is important in substations but also applicable for many other application areas. You can find stationary backup batteries in for example telecom, railroad and computer hall environments. This course covers basic battery theory and how to operate test equipment to be able to give a quality statement of the batteries being tested.

Content

- Definition and basics of batteries
- Test methods and relevant standards
- Hands-on testing
  - Practical advice on how to connect to get good results
  - Discharge test, using TORKEL
  - Other tests, using BVM and BITE
- Interpreting results

Requirements

General understanding of the components in an electrical grid.

Schedule – 2017

Art. No.	Course code	Duration	Date	Location
UU-00400	BATT1	1 day	May 19	Danderyd, Sweden
UU-00400	BATT1	1 day	Sep 22	Danderyd, Sweden

General information about the courses

Registration

To register contact your local Megger office or distributor. You may also Send your registration via email to:
seinfo@megger.com
In your email, please state the name of the attendees, the art. no., course code, date, company name and contact details.

The number of seminar places is limited. We also reserve the right to cancel a session if the number of attendees is too low. For our planning we wish to have your registration at least four weeks before the course date. You will get a final confirmation around three weeks before the course.

Course certificate and documentation

Every attendant will receive a printed copy with some written course information and the exercises used during the course. Also each attendant receives a certificate with the course name and content at the end of the course.

Software tools

We encourage you to bring your own computer with the appropriate software installed.

Eating, drinking and internet access

During the course days coffee, tea, water and some small snacks will be available. Of course we also invite you for lunch.

At our facility you will have wifi with access to internet. In general we plan for some spare time after lunch so that you can attend to any urgent email or phone call.

Accommodation and transportation

Accommodation is not included in the course fee. Please make reservation at your preferred location. If you wish we recommend a hotel for you which has a discounted Megger price that includes breakfast and internet.

Please plan for your own transportation between your hotel and our facility. We recommend taxi or rental car. It is possible to travel with public transportation but it might require some more time.

Course fee and cancellations

We invoice the course fee at the day of our final confirmation. If you cancel after this date full course fee must be paid. Cancellations up to four week before the course begins are free of charge.

You may at any time replace an attendee with another from the same company.

We reserve the right to cancel a course due to unexpected extreme events. In this unlikely case any paid course fee will returned. Further claims are not accepted.

Clothing and safety

Our training contains practical tests in which it is very important to follow appropriate safety procedures.

If the course contains parts in a substation environment you are required to bring your own personal safety equipment (PPE): Helmet, jacket, pants, glasses and shoes.

Your "One Stop" Source for all your electrical test equipment needs

- Battery Test Equipment
- Cable Fault Locating Equipment
- Circuit Breaker Test Equipment
- Data Communications Test Equipment
- Fiber Optic Test Equipment
- Ground Resistance Test Equipment
- Insulation Power Factor (C&DF) Test Equipment
- Insulation Resistance Test Equipment
- Line Testing Equipment
- Low Resistance Ohmmeters
- Motor & Phase Rotation Test Equipment
- Multimeters
- Oil Test Equipment
- Portable Appliance & Tool Testers
- Power Quality Instruments
- Recloser Test Equipment
- Relay Test Equipment
- T1 Network Test Equipment
- Tachometers & Speed Measuring Instruments
- TDR Test Equipment
- Transformer Test Equipment
- Transmission Impairment Test Equipment
- Watthour Meter Test Equipment
- STATES® Terminal Blocks & Test Switches
- Professional Hands-On Technical and Safety Training Programs

Megger is a leading global manufacturer and supplier of test and measurement instruments used within the electric power, building wiring and telecommunication industries.

With research, engineering and manufacturing facilities in the USA, UK, Germany and Sweden, combined with sales and technical support in most countries, Megger is uniquely placed to meet the needs of its customers worldwide.

Megger is certified according to ISO 9001 and 14001. Megger is a registered trademark.

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