

POWERFACTORY

Protection

S2021.04.20.Online_Pro.En

April 20th - April 22nd 2021

Online training course

The application of protection concepts and the definition and analysis of protection settings is an important aspect of the safe operation of electrical power supply networks.

Using practical examples, the participants will familiarise themselves with the fundamentals of overcurrent, distance and differential protection handling in *PowerFactory*.

PowerFactory's extensive protection toolset will be applied to a variety of applications including directional overcurrent protection coordination, impact analysis of parallel lines on distance protection and the automatic determination of distance protection zone reach settings.

The third day is dedicated to the automated auditing of protection settings and the modelling of relay intercommunication scheme.

WHO SHOULD ATTEND:

This training course is aimed at planning, operational and project engineers, whose tasks include the coordination, configuration and checking of devices in transmission, distribution or industrial networks.

The participants should be familiar with the operation of our software *PowerFactory*, e.g. by attending the introductory course "Load flow and short circuit calculation", or by having obtained commensurate experience through using the software independently for similar calculations.

PRICE PER PARTICIPANT:

- 1,674.00€* (with valid maintenance contract)
- 1,905.00€* (without valid maintenance contract)
- 570.00€* (with valid student identification)

*Prices are exclusive of VAT

Training schedule

Central European Time (UTC +01:00)

DAY 1 - Overcurrent Protection

9:00 Basics

Explanation of terms, tasks and requirements of protection technology with a focus on overcurrent protection. Modelling of protection devices and measurement transformers in *PowerFactory* as well as presentation of the available toolset for the evaluation of a protection scheme.

10:30 Coffee break

11:00 Exercise: Overcurrent Protection in an Industrial Network

Modelling of overcurrent protection devices and calculation of setting values with regard to selectivity, taking into account thermo-mechanical damage curves of transformers and motor starting characteristics.

12:30 Lunch break

13:30 Exercise: Current Based Earth Fault Protection

Modelling a current transformer at the star point of a transformer.

14:00 Presentation: Directional Overcurrent Protection

Presentation of the short-circuit trace feature and introduction of the directional overcurrent protection concept.

15:00 Coffee break

15:30 Exercise: Directional Overcurrent Protection

Direction determination of fault power flows and representation of relay current and voltage signals in a vector diagram.

17:00 End of the first day

DAY 2 - Distance Protection

9:00 Basics

Functional principles of distance protection relays and different starting methods. Modelling of devices and presentation of the available distance protection coordination tools in *PowerFactory*.

10:30 Coffee break

11:00 Exercise: Distance Protection in a Transmission Network

Modelling of protection devices and calculation of protection settings according to given criteria. Verification of different starting methods. Impact of the earth return impedance on the measured impedance.

12:30 Lunch break

13:30 Exercise: Selection Criteria for Distance Protection Zones and Advanced Visualisation of Zone Reaches

Review of various setting criteria for distance protection zones. Effect of generator infeed and parallel lines on distance protection. Representation of the behaviour of different protection variables along a coordination path.

15:00 Coffee break

15:30 Protection Coordination Assistant

PowerFactory protection coordination assistant and the application to an example network. Input of flexible setting rules, verification of two sets of settings and time coordination with overcurrent devices.

17:00 End of the second day

DAY 3 - Advanced Applications

9:00 Differential Protection

Modelling of a transformer differential protection relay, verification of the derived currents using vector diagrams and calculations.

10:30 Coffee break

11:00 Presentation: Protection Audit

Principle of the Protection Audit tool in *PowerFactory*: Topological search, determination of the protection category and analysis of table reports for tripping times and coordination.

12:30 Lunch break

13:30 Exercise: Automatic Audit of Protection Settings

Application of the protection audit to two training networks with different philosophies: Industrial and Transmission grid. Definition of fault cases and analysis of tripping and coordination times.

15:00 Coffee break

15:30 Communication between Relays

Introduction to modelling of protection devices in *PowerFactory*. Application of minor modifications to a relay model, implementation of a signalling scheme between multiple overcurrent devices.

17:00 End of the training course