POWERFACTORY

Protection System Analysis

Course Content

DIgsilent Buyisa (Pty) Ltd

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

Protection System Analysis

2 Day Course

Objective:
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.

Pre-requisites:

- **MUST have attended the Powerfactory Basic Course**
- A good working knowledge of PowerFactory.

No of participants:
At Customer specified premises: Minimum: 6; Maximum: 12.
At Digsilent Buyisa Training Centre: Minimum: 10; Maximum 16.
Online: Minimum 6; Maximum 16.

ECSA CPD Accredited and Points:
- The course is fully accredited with the Engineering Council of South Africa (ECSA).
- 2 CPD points for completion.

Who Should Attend:
The course is intended for;
- Protection engineers
- Planning, operations and maintenance engineers and technicians
- Consultants

Digsilent Buyisa
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Price per participant:

- For course pricing, kindly visit our website at: https://digsilent.co.za/training-courses/
- For in house prices at customer premises: contact Digsilent for a quote via email info@digsilent.co.za or Telephonically (+27) 087 351 6159.

  - ❖ Prices are exclusive of VAT
  - ❖ Please note that cost excludes your Company's internal administrative costs.
  - ❖ All prices may change without prior notice - please contact Digsilent Buyisa for the latest prices before booking.
  - ❖ **DISCOUNT** is offered if a company sends more than one delegate per course.
  - ❖ Trainings held at Digsilent Buyisa Training Centre includes light breakfast snack, lunch and refreshments.

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Training schedule

DAY 1

08:30 **Basic concept of Protection**
Basic overview of the protection system objective, fault detection criteria, fault types, protection requirements and protection functions.

Modelling of Protection Elements
Introduction to the structure of relay models and the relay library. Modelling of measurement devices and modelling of relay devices in the network.

Exercise 1: Adding relays and measurement devices to the network
In this exercise we will be adding protection devices (relays and measurement devices) to the network graphically.

10:30 **Tea/Coffee break**

11:00 **Overcurrent Protection**
Introduction to equipment overcurrent relays (including fuses and LV circuit breakers), using standard protection elements from the library and plotting time overcurrent plots.

Exercise 2: Protection grading using time-overcurrent plots
In this exercise we will be grading the protection devices using the time-overcurrent plots.

Protection Relay Information
Displaying protection relay information on the graphic using additional result boxes.

Exercise 3: Earth Fault Protection
For this exercise we will install a CT on the transformer neutral and use this CT to set the earth fault elements of the relay.

12:30 **Lunch break**

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13:30	**Exercise 4: LVCB Protection** For this exercise we will install an overcurrent relay on the 400 V circuit breaker.
	Motor Protection Introduction to motor starting methods, motor start up characteristic and motor protection.
	Exercise 5: Motor Protection For this exercise we will install an overcurrent relay on the motor.
15:00	**Tea/Coffee break**
15:30	**Paths** Introduction to defining of coordination paths. Paths are used primarily by the protection module to analyse the operation of protection devices within a network. This is very useful for determining grading margins.
	Exercise 6: Using Paths For this exercise we will define a path to show all protection devices along the path.
	Settings report Extracting protection setting report from PowerFactory. Locating protection devices in the single line diagram using the colouring tool or network model manager.
	Exercise 7: Settings Report
16:30	**End of the first day**

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DAY 2

08:30 **Differential Protection**
Introduction to differential protection relays, instrument transformers and protection characteristic.

Exercise 8: Differential protection
This exercise shows you how to model differential protection with PowerFactory.

10:30 **Tea/Coffee break**

11:00 **Short Circuit Trace**
The short circuit trace is a tool based on the complete short circuit calculation method that allows the user to examine the performance of a protection scheme in response to a fault or combination of faults; where the response is examined in time steps and where at each time step, the switching outcomes of the previous time step and the subsequent effect on the flow of fault current, is taken into consideration.

11:30 **Distance Protection**
Introduction of distance protection modelling, R-X diagrams and time distance diagrams.

Zone Reach Settings for Distance Protection
Introduction to reach colouring, underreach and overreach.

12:30 **Lunch break**

13:30 **Exercise 9: Distance Protection**
This exercise shows you how to model distance protection with PowerFactory.

14:30 **Protection Coordination Assistant**
Introduction to PowerFactory's protection coordination assistant tool that automatically calculates protection settings based on location of protection devices and the network impedances. Distance protection time grading against overcurrent protection results.

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15:00	**Coffee break**
15:30	**Automatic Audit of Protection Settings** Assessment of network's protection performance based on existing settings e.g., verification of tripping times / fault clearing times and verification of device coordination. **Protection Devices Library** Location of the protection device library in PowerFactory.
16:30	**End of Training**

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