

# Protection systems in low and medium voltage grids



## 1 – Introduction

- 1 Introduction to protection systems and grid integration of distributed renewables
- 2 Introduction to requirements of protection systems

## 2 – Electrical behavior of protection devices and photovoltaic generation systems

- 1 Introduction to the impact of photovoltaic generation systems on grid integration
- 2 Protection systems
- 3 Inverter contribution to voltage stability during normal grid operation
- 4 Influence on voltage stability in the event of grid faults
- 5 Focus on new protection devices?
- 5 Chapter endnotes

## 3 – Grid calculation methods

- 1 Necessary data for grid calculation methods
- 2 Symmetrical components and neutral point treatment
- 3 Short circuit calculation IEC 60909 I
- 4 Short circuit calculation IEC 60909 II
- 5 Superposition and equivalent voltage source (EVS) methods
- 6 Impact of increasing amount of photovoltaic capacity and limits of the calculation models
- 7 Calculation examples I
- 8 Identification of endangered grid areas
- 9 Chapter endnotes

## 4 – Protection system planning principles

- 1 Introduction to protection system planning
- 2 Principles for protection scheme planning I
- 3 Principles for protection scheme planning II
- 4 Protection functions for grid protection regarding photovoltaic
- 5 Parameterisation of protection systems I
- 6 Parameterisation of protection systems II

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**7** Parameterisation of protection systems III

**8** Chapter endnotes

## 5 – Protection testing

**1** Meaning of protection testing

**2** Requirements for protection testing

**3** Chapter endnotes

## 6 – Compliance monitoring

## 7 – Summary of the course

**1** Summary

**2** References