

Tutorial I&CPS 2025

Title: AC Generator Protection in Industrial and Commercial Power Systems

This tutorial will focus on the protection of AC synchronous generators used in industrial and commercial cogeneration and standby power applications using microprocessor-based multi-function protective relays, drawing on material from IEEE C37.102 – Guide for AC Generator Protection. It will focus primarily on medium voltage applications but is also relevant to protection of large low-voltage machines. The principles of operation and performance characteristics of synchronous generators will be reviewed including the effect of machine reactances, time constants, and neutral grounding methods on available short circuit current. Typical instrument transformer configurations and control schematics for generator circuit breakers will be presented. Use and interpretation of manufacturer's alternator data sheets in relay settings will be discussed, and recommendations will be provided for selection and setting of relay elements to protect the generator against thermal damage, electrical fault, and abnormal system conditions. Coordination of generator protection with prime mover controls and downstream system protection will also be discussed.