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IEEE Guide for the Application of Shunt Reactor Switching

IEEE Power and Energy Society

Sponsored by the
Switchgear Committee

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IEEE Std C37.015™-2017
(Revision of
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Abstract: Guidance for the application of ac high-voltage circuit breakers for shunt reactor switching is provided. Overvoltage generation for the three cases of shunt reactors being directly grounded, ungrounded, or grounded through a neutral reactor is addressed in terms of derivation and limitation methods. Circuit breaker specification for the purpose and the use of laboratory test results to predict field performance is also covered by this guide.

Keywords: ac high voltage circuit breakers, application, IEEE C37.015™, inductive load switching, overvoltages, reignition, shunt reactor switching, small inductive currents

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Introduction

This introduction is not part of IEEE Std C37.015-2017, IEEE Guide for the Application of Shunt Reactor Switching.

The following major changes were made to this guide compared to the 2009 version:

- Clause 4 (limitation of overvoltages) has been compiled into a table (Table 1).
- A general derivation of the equations associated with shunt reactor switching is given in Annex A (formerly Annex C). Other annexes have been renumbered accordingly.
- Figures have been added to Annex D (oscillation modes) to illustrate the components that take part in the different oscillations.
- The calculation example given in Annex E to estimate the overvoltage levels based on laboratory test results has been updated.
- Annex H (Overvoltage limitation by means of gapped surge arresters) was removed.
- The list with “other informative documents” in Annex I (now Annex H) was removed.

Contents

IEEE Guide for the Application of Shunt Reactor Switching

1. Overview

1.1 Scope

This application guide applies to ac high-voltage (> 1000 V) circuit breakers rated for shunt reactor switching. This application guide provides the theoretical background of shunt reactor switching and how information obtained from test results should be used to predict overvoltages in the field, and gives suggestions how to mitigate these overvoltages.

1.2 Purpose

This guide is intended for general use in the application of ac high-voltage circuit breakers for shunt reactor current switching.

The current to be interrupted is generally less than 300 A rms; however, shunt reactor switching imposes a unique and severe duty on the connected system and the circuit breaker. Successful interruption is the result of a complex interaction between the circuit breaker and the circuit; this interaction can result in significant overvoltages. The purpose of the guide is to describe, principally for the benefit of the user, the shunt reactor switching duty, the overvoltages generated, and the control of those overvoltages. The guide further details the specification of circuit breakers and procedures to predict field performance based on test data.

NOTE—Shunt reactors connected to the tertiary windings of transformers have typical currents in the order of some thousand Amperes.[1]

2. General application conditions

2.1 Maximum voltage for application

The continuous operating voltage should not exceed the rated maximum voltage for the circuit breaker.

[1] Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard