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IEEE Guide for the Functional Specification of Medium Voltage (1kV to 35kV) Electronic Shunt Devices for Dynamic Voltage Compensation

IEEE Power and Energy Society

Developed by the
Substations Committee

IEEE Std 1623™-2020
(Revision of IEEE Std 1623-2004)

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Abstract: General guidelines on the preparation of a functional specification for a solid-state electronic shunt device used to compensate voltage fluctuation are provided in this guide. Devices rated medium voltage (1 kV to 35 kV) are covered in this guide. In general, these devices contain: an inverter, a rectifier or dc converter, an energy storage device, and a coupling transformer. The device is typically connected in parallel with the network using a coupling transformer.

Keywords: coupling transformer, energy storage, IEEE 1623™, inverter, parallel compensation, power electronics, power quality, sensitive loads, voltage control

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Introduction

This introduction is not part of IEEE Std 1623, IEEE Guide for the Functional Specification of Medium Voltage (1 kV to 35 kV) Electronic Shunt Devices for Dynamic Voltage Compensation.

Electric utilities are installing electronic devices to reduce voltage fluctuations. Industrial customers with sensitive loads are installing different electronic devices to mitigate voltage fluctuations. A significant number of these devices are installed every year. Most of these devices are bought using specifications provided by various manufacturers. Technical literature describes the operation of specific devices and provides results of computer simulations to prove the effectiveness of the devices. However, no document defines the technical data that may be collected and used for the specification of a new device.

This guide is not a tutorial. The application of its content to prepare a specification requires technical knowledge and understanding. Each user may modify the material to meet with user specific conditions. This guide does not include all topics necessary for every application and does not address the commercial aspect of the specifications.

This guide was prepared by Working Group I1, Power Electronic Equipment, of the FACTS and HVDC Stations Subcommittee for the IEEE PES Substations Committee.

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IEEE Guide for the Functional Specification of Medium Voltage (1kV to 35kV) Electronic Shunt Devices for Dynamic Voltage Compensation

1. Overview

1.1 Scope

This document provides general guidelines on the preparation of a functional specification for a solid-state electronic shunt device used mainly to compensate for voltage fluctuation. The guide covers devices rated to medium voltage (1 kV to 35 kV). In general, these devices contain: a bidirectional converter, an energy storage device, and a coupling transformer connected in parallel. The guide also covers the following equipment to assure proper interface with the electric network including, but not limited to, voltage and current transformers, disconnect switches, circuit breakers, and three-phase low voltage service for auxiliary power.

Normally these devices are not designed for flicker compensation. If flicker compensation is needed, the specification may be modified and the manufacturer can design the device for flicker compensation.

1.2 Purpose

The purpose of the guide is to provide information to utilities and other users to prepare a specification when they intend to purchase a shunt device.

The guide includes technical clauses describing the user's requirements, including operation methods and environmental conditions. It specifies basic requirements of solid-state electronic shunt devices used for compensation of voltage fluctuations by injection of reactive power.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals is *required to*).[1,2]

[1]The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations.
[2]The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.