

TECHNICAL REPORT



Control and protection systems for high-voltage direct current (HVDC) power transmission systems – Off-site real-time simulation testing

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONTROL AND PROTECTION SYSTEMS FOR HIGH-VOLTAGE DIRECT
CURRENT (HVDC) POWER TRANSMISSION SYSTEMS –
OFF-SITE REAL-TIME SIMULATION TESTING**

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IEC TR 63368 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment. It is a Technical Report.

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Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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- withdrawn, or
- revised.

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INTRODUCTION

It has been the mainstream practice of HVDC transmission system engineering to build a real-time simulation test system with actual control and protection (C&P) devices to test the functionality of various functions of the HVDC C&P system.

In order to provide practical guidance for the functional tests of HVDC transmission systems, this document covers the real-time test environment, functional performance tests, and the test report.

In order to construct the test system in the test preparation phase, Clause 4 introduces the off-site real-time simulation test environment of the functional performance tests (FPT), including the real-time simulator, the C&P system for test purposes, the interface devices and their connection relationships, and the simulation models.

Clause 5 introduces the test practices and test methods of HVDC steady state control functions.

Clause 6 introduces the test practices and test methods of HVDC dynamic control functions, whose main concerns are dynamic responses of DC voltage, DC current and DC power.

Clause 7 introduces the test practices and test methods of DC protection, whose main concerns are DC protection logic and threshold values.

Clause 8 introduces the reliability tests of C&P systems, including redundancy tests and related system switching tests, with the test practices and test methods described in detail.

Clause 9 introduces the special test practices and test methods for VSC-HVDC. In order to thoroughly test the unique functions of VSC-HVDC, it can be necessary to add some specific tests to be decided case by case.

Clause 10 introduces test reports. It includes mainly the contents of a test report.

The above clauses introduce various possible functionalities which do not apply to every HVDC project mandatorily as a whole. It is the purchaser's task to select the appropriate project-specific combination of functionalities. This document describes various possibilities; however, it is important that project-specific needs be clearly defined by the purchaser. The relationship between clauses and test phases is shown in Figure 1.

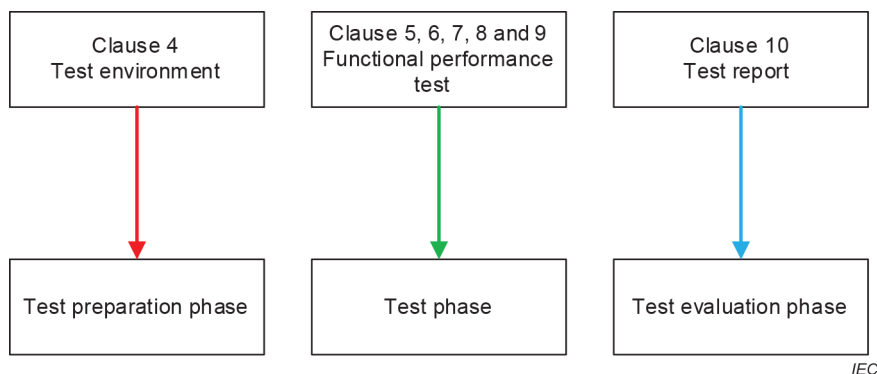


Figure 1 – Relationship between clauses and test phases

CONTROL AND PROTECTION SYSTEMS FOR HIGH-VOLTAGE DIRECT CURRENT (HVDC) POWER TRANSMISSION SYSTEMS – OFF-SITE REAL-TIME SIMULATION TESTING

1 Scope

This document provides guidance on off-site real-time simulation tests of control and protection (C&P) systems for HVDC power transmission systems. The off-site real-time simulation tests are carried out after the testing of C&P devices and prior to on-site system tests.

This document covers point-to-point, back-to-back, and multi-terminal HVDC systems of line commutated converters (LCC), voltage-sourced converters (VSC) and hybrid HVDC technologies.

In order to provide practical guidance for the functional performance tests of HVDC power transmission systems, this document covers the test environment, the contents and methods of functional performance tests, and the test report.

2 Normative references

There are no normative references in this document.