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BSI Standards Publication

High-voltage direct current (HVDC) systems — Guidance to the specification and design evaluation of AC filters

Part 4: Equipment

bsi.

National foreword

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The UK participation in its preparation was entrusted to Technical Committee PEL/22, Power electronics.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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TECHNICAL REPORT

High-voltage direct current (HVDC) systems – Guidance to the specification and design evaluation of AC filters – Part 4: Equipment

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HIGH-VOLTAGE DIRECT CURRENT (HVDC) SYSTEMS – GUIDANCE TO THE SPECIFICATION AND DESIGN EVALUATION OF AC FILTERS –

Part 4: Equipment

FOREWORD

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IEC TR 62001-4 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.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision. This edition includes the following significant technical change with respect to the previous edition:

a) general updating of the document to reflect changes in practice;
b) Annex A deleted as its content is covered by IEC 61803.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
22F/615/DTR	22F/622B/RVDTR

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/standardsdev/publications.

A list of all parts in the IEC TR 62001 series, published under the general title *High-voltage direct current (HVDC) systems – Guidance to the specification and design evaluation of AC filters*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The IEC TR 62001 series is structured in five parts:

IEC TR 62001-1 – Overview

This part concerns specifications of AC filters for high-voltage direct current (HVDC) systems with line-commutated converters, permissible distortion limits, harmonic generation, filter arrangements, filter performance calculation, filter switching and reactive power management and customer specified parameters and requirements.

IEC TR 62001-2 – Performance

This part deals with current-based interference criteria, field measurements and verification.

IEC TR 62001-3 – Modelling

This part addresses the harmonic interaction across converters, pre-existing harmonics, AC network impedance modelling, simulation of AC filter performance.

IEC TR 62001-4 – Equipment

This part concerns steady-state and transient ratings of AC filters and their components, power losses, audible noise, design issues and special applications, filter protection, seismic requirements, equipment design and test parameters.

IEC TR 62001-5 – AC side harmonics and appropriate harmonic limits for HVDC systems with voltage sourced converters (VSC)

This part concerns specific issues of AC filter design related to high-voltage direct current (VSC) systems with voltage sourced converters (HVDC).

HIGH-VOLTAGE DIRECT CURRENT (HVDC) SYSTEMS – GUIDANCE TO THE SPECIFICATION AND DESIGN EVALUATION OF AC FILTERS –

Part 4: Equipment

1 Scope

This part of IEC TR 62001, which is a Technical Report, provides guidance on the basic data of AC side filters for high-voltage direct current (HVDC) systems and their components such as ratings, power losses, design issues and special applications, protection, seismic requirements, equipment design and test parameters.

This document covers AC side filtering for the frequency range of interest in terms of harmonic distortion and audible frequency disturbances. It excludes filters designed to be effective in the power line carrier (PLC) and radio interference spectra.

It concerns the conventional AC filter technology and LCC (line-commutated converter) HVDC but much of this applies to any filter equipment for VSC (voltage sourced converter) HVDC.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at https://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

4 Steady state rating

4.1 General

The calculation of the steady state ratings of the harmonic filter equipment is the responsibility of the contractor. Clause 4 gives guidance on the calculation of equipment rating parameters and the different factors to be considered in the studies. It is the responsibility of the customer to provide the appropriate system and environmental data and also to clarify the operational conditions, such as filter outages and network contingencies, which need to be taken into account.

4.2 Calculation method

4.2.1 General

Steady state rating of filter equipment for an LCC HVDC system is based on a solution of the following circuit which represents the HVDC converter, the filter banks and the AC supply system. See Figure 1.