SLOVENSKI STANDARD
SIST EN 62751-1:2014/oprA2:2021

01-december-2021

Dopolnilo 2 - Izgube moči v napetostnih pretvorniških ventilih za visokonapetostne enosmerne sisteme - 1. del: Splošne zahteve

Amendment 2 - Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems - Part 1: General requirements

Bestimmung der Leistungsverluste in Spannungszwischenkreis-Stromrichtern (VSC) für Hochspannungsgleichstrom(HGÜ)-Systeme - Teil 1: Allgemeine Anforderungen

Amendement 2 - Pertes de puissance dans les valves à convertisseur de source de tension (VSC) des systèmes en courant continu à haute tension (CCHT) - Partie 1: Exigences générales

Ta slovenski standard je istoveten z: **EN 62751-1:2014/prA2:2021**

ICS:

29.200	Usmerniki. Pretvorniki. Stabilizirano električno napajanje	Rectifiers. Convertors. Stabilized power supply
29.240.01	Omrežja za prenos in distribucijo električne energije na splošno	Power transmission and distribution networks in general

SIST EN 62751-1:2014/oprA2:2021 **en,fr,de**

22F/648/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62751-1/AMD2 ED1**	
DATE OF CIRCULATION: **2021-10-01**	CLOSING DATE FOR VOTING: **2021-12-24**
SUPERSEDES DOCUMENTS: **22F/631/CD, 22F/641/CC**	

IEC SC 22F : POWER ELECTRONICS FOR ELECTRICAL TRANSMISSION AND DISTRIBUTION SYSTEMS

SECRETARIAT: Russian Federation	SECRETARY: Mr Lev Travin
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 115	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☒ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Amendment 2 - Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems - Part 1: General requirements

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

The decision to begin the review of IEC 62751-1 AMD2 ED1 by SC 22F / MT 31 (convenor Mr. Colin DAVIDSON, Great Britain) in 2021 was proposed by SC 22F secretariat and was supported by 100% voting of SC P-members (see 22F/599/DC, 22F/609/INF).

The decision to prepare a CDV based on documents 22F/631/CD and 22F/641/CC was taken by the Chair of SC 22F and supported by the secretary of SC 22F.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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POWER LOSSES IN VOLTAGE SOURCED CONVERTER (VSC) VALVES FOR HIGH-VOLTAGE DIRECT CURRENT (HVDC) SYSTEMS –

Part 1: General requirements

AMENDMENT 2

FOREWORD

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Amendment 2 to IEC 62751-1:2014 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment.

The text of this Amendment is based on the following documents:

Draft	Report on voting
XX/XX/XXXX	XX/XX/XXX

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 Amendment 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/.

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.

1 Scope

In the first paragraph, replace:

"as guidance for calculating the power losses of the valves for a STATCOM installation"

by

"as guidance for calculating the power losses of the valves for a STATCOM installation or Unified Power Flow Controller (UPFC)".

3.4.2 IGBT turn-on energy

Replace the definition by:

energy dissipated inside the IGBT during the turn-on process for a single collector current pulse.

3.4.3 IGBT turn-off energy

Replace the definition by:

energy dissipated inside the IGBT during the turn-off process for a single collector current pulse

3.4.5 diode reverse recovery energy

Replace the definition by:

energy dissipated inside the diode during the turn-off process

4.1 General

Replace the 4th paragraph by:

This standard standardizes a method of calculating the HVDC converter station losses by summing the losses calculated for each item of equipment. The standardized calculation method will help the purchaser to meaningfully compare the competing bids. It will also allow an easy generation of performance curves for the wide range of operating conditions in which the performance has to be known. In the absence of an inexpensive and accurate experimental method which could be employed for an objective verification of losses during type tests, the calculation method is the next best alternative as it uses, wherever possible, experimental data obtained from measurements on individual equipment and components under conditions equivalent to those encountered in real operation.

4.4.1 General

Replace paragraph by:

When power losses are being calculated for the purposes of determining the worst-case ratings of individual components or equipment (for example, the cooling plant), the worst possible combination of AC network conditions, ambient conditions and real/reactive power (including overload) shall be considered.

When power losses are being calculated for the purpose of contractual loss guarantees, it is important that a standard set of assumptions with regard to AC network conditions, ambient conditions and real/reactive power are made so that bids from different manufacturers can be compared on an equal basis. Purchasers of HVDC systems may specify their own standard reference conditions for atmospheric pressure, ambient temperature, humidity, coolant temperature, power transmission level etc, at which the power losses are to be determined. Where the purchaser does not specify such reference conditions, losses shall be determined under the following default conditions.

4.4.5 Treatment of redundancy

Replace the note by:

This approach yields the highest total losses in the valve, although it does not give the highest losses per VSC valve level, which generally occur when redundant levels are shorted.

4.5.3.2 Characterisation testing of other components

Replace the existing text by:

Characterization tests for components are as follows:

- R_{ESR} test on DC capacitor;
- snubber turn-on and turn-off tests;
- power consumption of valve electronics.

7 Losses in d.c. capacitors

Replace note 1 by:

Dielectric losses are normally most significant in a.c. applications where the capacitor voltage polarity reverses twice per cycle. For d.c. capacitors the voltage is usually non-reversing and dielectric losses are therefore small, but depending on the capacitor technology used, may not be negligible.

8.2 IGBT switching losses

In the paragraph above equation 11, delete the words "which is recommended to be one second".

Add the following text to the end of subclause 8.2:

The sampling period t_s should be chosen to represent a period of time in which the converter is operating in normal, steady-state conditions with no transient phenomena such as power order changes, network faults etc.

A typical value of sampling period is one second; however, the choice of sampling period shall take into account the specific type of modulation strategy employed and how predictable the resulting switching pattern is. For example if a Pulse Width Modulation (PWM) control strategy is used, the switching pattern may be relatively predictable and a sampling time shorter than 1 second may be acceptable, but certain control strategies may require a sampling period longer than 1 second.

Table 1 – Matrix indicating the relationship of data needed for calculation of losses and the type of valve losses

Move "snubber turn-on energy E_{sn_on}" *and* "snubber turn-off energy E_{sn_off}" *from the* "specified by VSC manufacturer" *column to the* "characterisation testing" *column*.

A.1 General

Put the following text in the beginning of subclause A.1:

CIGRE B4-75 has published a Technical Brochure "Feasibility study for assessment of lab losses measurement of VSC valves" which discusses several possible experimental methods for determining valve losses. In some special circumstances it may be possible, for example, to arrange a temporary test connection in which two converters are operated from the same a.c. source and also connected together via their d.c. terminals. In this connection, the power drawn from the a.c. source equals the losses in the circuit. However, this method requires additional instrument transformers and switchgear and is only possible where there are two identical