

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

**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**



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CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
3.1 Converter types	7
3.2 Semiconductor devices	7
3.3 Converter operating states	8
3.4 Device characteristics	8
3.5 Other definitions	9
4 General conditions	10
4.1 General	10
4.2 Causes of power losses	11
4.3 Categories of valve losses	12
4.4 Operating conditions	12
4.4.1 General	12
4.4.2 Reference ambient conditions	12
4.4.3 Reference a.c. system conditions	12
4.4.4 Converter operating states	12
4.4.5 Treatment of redundancy	13
4.5 Use of real measured data	13
4.5.1 General	13
4.5.2 Routine testing	13
4.5.3 Characterisation testing	14
5 Conduction losses	14
5.1 General	14
5.2 IGBT conduction losses	17
5.3 Diode conduction losses	17
5.4 Other conduction losses	17
6 D.C. voltage-dependent losses	18
7 Losses in d.c. capacitors	18
8 Switching losses	19
8.1 General	19
8.2 IGBT switching losses	19
8.3 Diode switching losses	21
9 Other losses	22
9.1 Snubber circuit losses	22
9.2 Valve electronics power consumption	22
10 Total valve losses per converter substation	23
Annex A (informative) Determination of power losses in other HVDC substation equipment	26
A.1 General	26
A.2 Guidance for calculating losses in each equipment	26
A.2.1 Circuit breaker	26
A.2.2 Pre-insertion resistor	27
A.2.3 Line side harmonic filter	27

A.2.4	Line side high frequency filter	28
A.2.5	Interface transformer	28
A.2.6	Converter side harmonic filter	28
A.2.7	Converter side high frequency filter	28
A.2.8	Phase reactor	28
A.2.9	VSC unit	28
A.2.10	VSC d.c. capacitor	28
A.2.11	D.C. harmonic filter	29
A.2.12	Dynamic braking system	29
A.2.13	Neutral point grounding branch	29
A.2.14	D.C. reactor	29
A.2.15	Common mode blocking reactor	30
A.2.16	D.C. side high frequency filter	30
A.2.17	D.C. cable or overhead transmission line	30
A.3	Auxiliaries and station service losses	30
Bibliography		31
Figure 1 – On-state voltage of an IGBT or diode		15
Figure 2 – Piecewise-linear representation of IGBT or diode on-state voltage		16
Figure 3 – IGBT switching energy as a function of collector current		20
Figure 4 – Diode recovery energy as a function of current		21
Figure A.1 – Major components that may be found in a VSC substation		27
Table 1 – Matrix indicating the relationship of data needed for calculation of losses and the type of valve losses (1 of 2)		24

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POWER LOSSES IN VOLTAGE SOURCED CONVERTER (VSC)
VALVES FOR HIGH-VOLTAGE DIRECT CURRENT (HVDC) SYSTEMS –****Part 1: General requirements**

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IEC 62751-1 edition 1.2 contains the first edition (2014-08) [documents 22F/302/CDV and 22F/321A/RVC], its amendment 1 (2018-04) [documents 22F/439A/CDV and 22F/458A/RVC] and its amendment 2 (2022-03) [documents 22F/648/CDV and 22F/679/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62751 series, published under the general title *Power losses in voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) systems*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

Part 1: General requirements

1 Scope

This part of IEC 62751 sets out the general principles for calculating the power losses in the converter valves of a voltage sourced converter (VSC) for high-voltage direct current (HVDC) applications, independent of the converter topology. Clauses 6 and 8 and subclauses 9.1, 9.2 and A.2.12 of the standard can also be used for calculating the power losses in the dynamic braking valves (where used) and as guidance for calculating the power losses of the valves for a STATCOM installation or unified power flow controller (UPFC).

Power losses in other items of equipment in the HVDC substation, apart from the converter valves, are excluded from the scope of this standard. Power losses in most equipment in a VSC substation can be calculated using similar procedures to those prescribed for HVDC systems with line-commutated converters (LCC) in IEC 61803. Annex A presents the main differences between LCC and VSC HVDC substations in so far as they influence the method for determining power losses of other equipment.

This standard does not apply to converter valves for line-commutated converter HVDC systems.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60633, *Terminology for high-voltage direct current (HVDC) transmission*

IEC 60747-2, *Semiconductor devices – Discrete devices and integrated circuits – Part 2: Rectifier diodes*

IEC 60747-9:2007, *Semiconductor devices – Discrete devices – Part 9: Insulated-gate bipolar transistors (IGBTs)*

IEC 62747:2014, *Terminology for voltage-sourced converters (VSC) for high-voltage direct current (HVDC) systems*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60633, IEC 62747, IEC 60747-2, IEC 60747-9 as well as the following apply.

NOTE 1 Related terms and definitions can also be found in IEC TR 62543, IEC 62751-2 and in the other relevant parts of the IEC 60747 series.