

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



Determination of power losses in high-voltage direct current (HVDC) converter stations with line commutated converters

Détermination des pertes en puissance dans les postes de conversion en courant continu à haute tension (CCHT) munis de convertisseurs commutés par le réseau



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DETERMINATION OF POWER LOSSES IN HIGH-VOLTAGE
DIRECT CURRENT (HVDC) CONVERTER STATIONS WITH LINE-
COMMUTATED CONVERTERS**

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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 61803 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronics.

Annex A forms an integral part of this standard.

Annexes B and C are for information only.

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DETERMINATION OF POWER LOSSES IN HIGH-VOLTAGE DIRECT CURRENT (HVDC) CONVERTER STATIONS WITH LINE- COMMUTATED CONVERTERS

1 Scope

This International Standard applies to all line-commutated high-voltage direct current (HVDC) converter stations used for power exchange in utility systems. This standard presumes the use of 12-pulse thyristor converters but can, with due care, also be used for 6-pulse thyristor converters.

In some applications, synchronous compensators or static var compensators (SVC) may be connected to the a.c. bus of the HVDC converter station. The loss determination procedures for such equipment are not included in this standard.

This standard presents a set of standard procedures for determining the total losses of an HVDC converter station. Typical HVDC equipment is shown in figure 1. The procedures cover all parts, except as noted above, and address no-load operation and operating losses together with their methods of calculation which use, wherever possible, measured parameters.

Converter station designs employing novel components or circuit configurations compared to the typical design assumed in this standard, or designs equipped with unusual auxiliary circuits that could affect the losses, shall be assessed on their own merits.

2 Normative references

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

IEC 60076-1:~~1993~~, *Power transformers – Part 1: General*

IEC 60076-6, *Power transformers – Part 6: Reactors*

~~IEC 60289:1988, *Reactors*~~

IEC 60633:~~1998~~, *Terminology for high-voltage direct current (HVDC) transmission*

IEC 60700-1:~~1998~~, *Thyristor valves for high voltage direct current (HVDC) power transmission – Part 1: Electrical testing*

IEC 60747-6:~~1983~~, *Semiconductor devices—~~Discrete devices~~ – Part 6: Thyristors*

IEC 60871-1:~~1997~~, *Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V – Part 1: General ~~performance, testing and rating~~—~~Safety requirements~~—~~Guide for installation and operation~~*

3 Definitions and symbols

For the purpose of this International Standard, the following definitions apply: