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High voltage direct current (HVDC) substation audible noise

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High voltage direct current (HVDC) substation audible noise



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

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IEC 61973, which is a technical specification, has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment, with the participation of IEC technical committee 115: High voltage direct current (HVDC) transmission for DC voltages above 100 kV.

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

The committee has decided that the contents of the base publication and its amendment 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

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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HIGH VOLTAGE DIRECT CURRENT (HVDC) SUBSTATION AUDIBLE NOISE

1 Scope

This technical specification applies to the specification and evaluation of outdoor audible noise from high voltage direct current (HVDC) substations. It is intended to be primarily for the use of the utilities and consultants who are responsible for issuing technical specifications for new HVDC projects with and evaluating designs proposed by prospective contractors. It is primarily intended for HVDC projects with line-commutated converters. Part of this technical specification can also be used for the same purpose for HVDC projects using voltage sourced converters, and for flexible a.c. transmission systems (FACTS) devices such as static Var compensators (SVCs) and static synchronous compensators (STATCOMs).

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 60076-10, *Power transformers – Part 10: Determination of sound levels*

IEC 60076-10-1*, Power transformers – Part-10-1: Determination of sound levels – Application guide*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 61672-2, *Electroacoustics – Sound level meters – Part 2: Pattern evaluation tests*

ISO 1996-2, *Acoustics – Description, assessment and measurement of environmental noise – Part 2: Determination of environmental noise levels*

ISO 266:1997*, Acoustics – Preferred frequencies*

ISO 3740*, Acoustics – Determination of sound power levels of noise sources – Guidelines for the use of basic standards*

ISO 3743-2, *Acoustics – Determination of sound power levels of noise sources; engineering methods for small, movable sources in reverberant fields – Part 2: Methods for special reverberation test rooms*

ISO 3744, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane*

ISO 3745, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for anechoic and hemi-anechoic rooms*

ISO 3746, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane*

ISO 8297, *Acoustics – Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment – Engineering method*

ISO 9613-1, *Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere*

ISO 9613-2, *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

ISO 9614-1, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*

ISO 9614-2, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning*

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HIGH VOLTAGE DIRECT CURRENT (HVDC) SUBSTATION AUDIBLE NOISE

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 61973, which is a technical specification, has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment, with the participation of IEC technical committee 115: High voltage direct current (HVDC) transmission for DC voltages above 100 kV.

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

The committee has decided that the contents of the base publication and its amendment 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

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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

HIGH VOLTAGE DIRECT CURRENT (HVDC) SUBSTATION AUDIBLE NOISE

1 Scope

This technical specification applies to the specification and evaluation of outdoor audible noise from high voltage direct current (HVDC) substations. It is intended to be primarily for the use of the utilities and consultants who are responsible for issuing technical specifications for new HVDC projects with and evaluating designs proposed by prospective contractors. It is primarily intended for HVDC projects with line-commutated converters. Part of this technical specification can also be used for the same purpose for HVDC projects using voltage sourced converters, and for flexible a.c. transmission systems (FACTS) devices such as static Var compensators (SVCs) and static synchronous compensators (STATCOMs).

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 60076-10, *Power transformers – Part 10: Determination of sound levels*

IEC 60076-10-1*, Power transformers – Part-10-1: Determination of sound levels – Application guide*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 61672-2, *Electroacoustics – Sound level meters – Part 2: Pattern evaluation tests*

ISO 1996-2, *Acoustics – Description, assessment and measurement of environmental noise – Part 2: Determination of environmental noise levels*

ISO 266:1997*, Acoustics – Preferred frequencies*

ISO 3740*, Acoustics – Determination of sound power levels of noise sources – Guidelines for the use of basic standards*

ISO 3743-2, *Acoustics – Determination of sound power levels of noise sources; engineering methods for small, movable sources in reverberant fields – Part 2: Methods for special reverberation test rooms*

ISO 3744, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane*

ISO 3745, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for anechoic and hemi-anechoic rooms*

ISO 3746, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane*

ISO 8297, *Acoustics – Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment – Engineering method*

ISO 9613-1, *Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere*

ISO 9613-2, *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

ISO 9614-1, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 1: Measurement at discrete points*

ISO 9614-2, *Acoustics – Determination of sound power levels of noise sources using sound intensity – Part 2: Measurement by scanning*