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TECHNICAL SPECIFICATION

High-voltage switchgear and controlgear – Part 315: Direct current (DC) transfer switches

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 315: Direct current (DC) transfer switches

FOREWORD

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IEC TS 62271-315 has been prepared by subcommittee 17A: Switching devices, of IEC technical committee 17: High-voltage switchgear and controlgear. It is a Technical Specification.

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

Draft	Report on voting
17A/1412/DTS	17A/1417/RVDTS

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 Specification 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/publications.

This document is to be read in conjunction with IEC TS 62271-5:2024, to which it refers and which is applicable unless otherwise specified. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC TS 62271-5. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101.

A list of all parts of IEC 62271 series, under the general title *High-voltage switchgear and controlgear* 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- withdrawn, or
- revised.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 315: Direct current (DC) transfer switches

1 Scope

This part of IEC 62271 is applicable to direct current (DC) transfer switches designed for indoor or outdoor installation and for operation on HVDC transmission systems having direct voltages of 100 kV and above.

DC transfer switches normally include metallic return transfer switches (MRTS), earth return transfer switches (ERTS), neutral bus switches (NBS) and neutral bus earthing switches (NBES).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60071-11:2022, *Insulation co-ordination – Part 11: Definitions, principles and rules for HVDC system*

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

IEC 60099-9, *Surge arresters – Part 9: Metal-oxide surge arresters without gaps for HVDC converter stations*

IEC 60255-21-1:1988, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section One: Vibration tests (sinusoidal)*

IEC 60270:2000, *High-voltage test techniques – Partial discharge measurements*

IEC 60633, *High-voltage direct current (HVDC) transmission – Vocabulary*

IEC 60871-1, *Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V – Part 1: General*

IEC 61000-4-18:2019, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC TS 62271-5:2024, *High-voltage switchgear and controlgear – Part 5: Common specifications for direct current switchgear and controlgear*

IEC 62271-100:2021, *High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers*

IEC 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating-current disconnectors and earthing switches*

IEC 62271-207, *High-voltage switchgear and controlgear – Part 207: Seismic qualification for gas-insulated switchgear assemblies for rated voltages above 52 kV*

IEC TS 63014-1, *High-voltage direct current (HVDC) power transmission – System requirements for DC-side equipment Part 1: Using line-commutated converters*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in in IEC 60633, IEC TS 63014-1 and the following apply.

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

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

3.1 General terms and definitions

Subclause 3.1 of IEC TS 62271-5:2024 is applicable.

3.2 Assemblies of switchgear and controlgear

Subclause 3.2 of IEC TS 62271-5:2024 is applicable.

3.3 Parts of assemblies

Subclause 3.3 of IEC TS 62271-5:2024 is applicable.

3.4 Switching devices

Subclause 3.4 of IEC TS 62271-5:2024 is applicable with the following additions:

3.4.101
active DC transfer switch
DC transfer switch with charging device in oscillating branch, installed in parallel to the commutation switch

3.4.102
blank DC transfer switch
DC transfer switch with a sole commutation switch only, without any additional external branches or components

Note 1 to entry: Some commutation switches use internal components to increase voltage drop across the switching units during transfer operation.

3.4.103
passive DC transfer switch
DC transfer switch without charging device in oscillating branch, installed in parallel to the commutation switch

3.4.104
earth return transfer switch
ERTS
DC transfer switch used to transfer direct current from a metallic return path to an earth return path

Note 1 to entry: "DC transfer switch" is used instead of "DC commutation switch" to refer to whole switch, including oscillating branch and energy dissipation branch.

Note 2 to entry: Although the term "earth return transfer breaker" (ERTB) has been widely used in the industry for many years, it is misleading since such switches have no ability to interrupt fault current.

[SOURCE: IEC 60633:2019, 9.23, modified – The terms "earth return transfer breaker" and "ERTB" have been removed, "DC commutation switch" has been replaced by "DC transfer switch", DC current is replaced by direct current, Note 1 to entry and reference to Figure 7 have been deleted.]

3.4.105
metallic return transfer switch
MRTS
DC transfer switch used to transfer direct current from an earth return path to a metallic return path

Note 1 to entry: "DC transfer switch" is used instead of "DC commutation switch" to refer to whole switch, including oscillating branch and energy dissipation branch.

Note 2 to entry: Although the term "metal return transfer breaker" (MRTB) has been widely used in the industry for many years, it is misleading since such switches have no ability to interrupt fault current.

[SOURCE: IEC 60633:2019, 9.22, modified – The terms "metallic return transfer breaker" and "MRTB" have been removed, "DC commutation switch" has been replaced by "DC transfer switch", DC current is replaced by direct current, Note 1 to entry is moved to Note 2, and reference to Figure 7 has been deleted.]

3.4.106
neutral bus switch
NBS
DC transfer switch connected in series with the neutral bus on a bipolar HVDC scheme, designed to commutate current out of the pole conductor or neutral bus and into the electrode line or dedicated metallic return conductor or earth e.g. in response to a fault in a converter or neutral bus

Note 1 to entry: "DC transfer switch" is used instead of "DC commutation switch" to refer to whole switch, including oscillating branch and energy dissipation branch.

[SOURCE: IEC 60633:2019, 9.26, modified, "DC commutation switch" has been replaced by "DC transfer switch" and Note 1 has been replaced by a new Note 1.]

3.4.107
neutral bus earthing switch
NBES
DC transfer switch connected from the neutral bus to the station earth mat on a bipolar HVDC scheme, designed to provide a temporary earth connection, e.g. in the event of an open circuit fault on the electrode line until the imbalance of current between the two poles can be reduced to a safe minimum level or the electrode line connection can be restored

Note 1 to entry: Although the term “Neutral Bus Grounding Switch” (NBGS) has been widely used in the industry for many years.

Note 2 to entry: In some applications, NBES and high-speed earthing switch (HSES) are used in series.

[SOURCE: IEC 60633:2019, 9.27, modified – The terms “neutral bus grounding switch” and “NBGS” have been removed, “DC commutation switch” has been replaced by “DC transfer switch”, Note 1 and Note 2 have been replaced by new notes.]

3.5 Parts of switchgear and controlgear

Subclause 3.5 of IEC TS 62271-5:2024 is applicable with the following additions:

3.5.101
commutation switch
mechanical switching device used in the main current path of DC transfer switches

Note 1 to entry: A single pole of an AC circuit-breaker or its modification was often used as commutation switch in DC transfer switch.

Note 2 to entry: Some commutation switches use internal components to increase voltage drop across the switching units during transfer operation.

3.5.102
oscillating branch
circuit in parallel with the commutation switch in DC transfer switches, consisting of

– capacitors and reactors, in case of passive DC transfer switches;
– capacitors including a charging device and a making switch, in case of active DC transfer switches.

Note 1 to entry: The oscillating branch forces a current oscillation between itself and the commutation switch branch in order to produce current zeros in the last one.

Note 2 to entry: Depending on the stray inductance of the arrangement reactors are not necessarily needed to be installed.

Note 3 to entry: Passive DC transfer switches having a making device in series with the oscillating branch are also known.

3.5.103
current zero device
oscillating circuit in case of passive DC transfer switch or current impulse generator in case of active DC transfer switch

3.5.104
energy dissipation branch
impedance circuit in parallel with the commutation switch of DC transfer switches which dissipates the energy stored in the energy storage components (e.g. reactors, stray inductance, stray capacitance, etc.) in DC system after successful commutation of current from commutation switch branch to oscillating branch

Note 1 to entry: In real transfer switch, metal oxide surge arrester commonly is used as energy dissipation device.