SLOVENSKI STANDARD
SIST EN IEC 62501:2024

01-september-2024

Elektronke za pretvornike napetostnih virov (VSC) za enosmerni visokonapetostni prenos električne energije (HVDC) - Električno preskušanje (IEC 62501:2024)

Voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) power transmission - Electrical testing (IEC 62501:2024)

Ventile von Spannungszwischenkreis-Stromrichtern (VSC) für die Hochspannungsgleichstromübertragung (HGÜ) – Elektrische Prüfung (IEC 62501:2024)

Valves à convertisseur de source de tension (VSC) pour le transport d'énergie en courant continu à haute tension (CCHT) - Essais électriques (IEC 62501:2024)

Ta slovenski standard je istoveten z: **EN IEC 62501:2024**

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 IEC 62501:2024 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62501

May 2024

ICS 29.200; 29.240.99

Supersedes EN 62501:2009;
EN 62501:2009/A1:2014;
EN 62501:2009/A2:2017

English Version

Voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) power transmission - Electrical testing (IEC 62501:2024)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 62501:2024 E

European foreword

The text of document 22F/731/CDV, future edition 2 of IEC 62501, prepared by SC 22F "Power electronics for electrical transmission and distribution systems" of IEC/TC 22 "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62501:2024.

The following dates are fixed:

•	latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop) 2025-02-15
•	latest date by which the national standards conflicting with the document have to be withdrawn	(dow) 2027-05-15

This document supersedes EN 62501:2009 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of the International Standard IEC 62501:2024 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60146-2 NOTE Approved as EN 60146-2

IEC 62751-1 NOTE Approved as EN 62751-1

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60060	series	High-voltage test techniques	EN 60060	series
IEC 60071	series	Insulation co-ordination	EN IEC 60071	series
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60700-1	2015	Thyristor valves for high voltage direct current (HVDC) power transmission - Part 1: Electrical testing	EN 60700-1	2015
+ AMD1	2021		+ A1	2021
IEC 62747	-	Terminology for voltage-sourced converters (VSC) for high-voltage direct current (HVDC) systems	EN 62747	-
ISO/IEC 17025	-	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	-

IEC 62501

Edition 2.0 2024-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Voltage sourced converter (VSC) valves for high-voltage direct current (HVDC) power transmission – Electrical testing

Valves à convertisseur de source de tension (VSC) pour le transport d'énergie en courant continu à haute tension (CCHT) – Essais électriques

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.200, 29.240.99

ISBN 978-2-8322-8514-5

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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VOLTAGE SOURCED CONVERTER (VSC) VALVES FOR HIGH-VOLTAGE DIRECT CURRENT (HVDC) POWER TRANSMISSION – ELECTRICAL TESTING

FOREWORD

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IEC 62501 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 2009, Amendment 1:2014 and Amendment 2:2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Conditions for use of evidence in lieu are inserted as a new Table 1;
b) Test parameters for valve support DC voltage test, 7.3.2, and MVU DC voltage test, 8.4.1, updated;
c) AC-DC voltage test between valve terminals, Clause 9, is restructured and alternative tests, by individual AC and DC voltage tests, added in 9.4.2;

d) Partial discharge test in routine test program is removed;

e) More information on valve component fault tolerance, Annex B, is added;

f) Valve losses determination is added as Annex C.

The text of this International Standard is based on the following documents:

Draft	Report on voting
22F/731/CDV	22F/748A/RVC

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 International Standard 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.

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.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

VOLTAGE SOURCED CONVERTER (VSC) VALVES FOR HIGH-VOLTAGE DIRECT CURRENT (HVDC) POWER TRANSMISSION – ELECTRICAL TESTING

1 Scope

This International Standard applies to self-commutated converter valves, for use in a three-phase bridge voltage sourced converter (VSC) for high voltage DC power transmission or as part of a back-to-back link, and to dynamic braking valves. It is restricted to electrical type and production tests.

This document can be used as a guide for testing of high-voltage VSC valves used in energy storage systems (ESS).

The tests specified in this document are based on air insulated valves. The test requirements and acceptance criteria can be used for guidance to specify the electrical type and production tests of other types of valves.

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 (all parts), *High-voltage test techniques*

IEC 60071 (all parts), *Insulation co-ordination*

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

IEC 60700-1:2015, *Thyristor valves for high voltage direct current (HVDC) power transmission – Part 1: Electrical testing*
IEC 60700-1:2015/AMD1:2021

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

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62747 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 Insulation coordination terms

3.1.1
test withstand voltage
value of a test voltage of standard waveshape at which a new valve, with unimpaired integrity, does not show any disruptive discharge and meets all other acceptance criteria specified for the particular test, when subjected to a specified number of applications or a specified duration of the test voltage, under specified conditions

3.1.2
internal insulation
air external to the components and insulating materials of the valve, but contained within the profile of the valve or multiple valve unit

3.1.3
external insulation
air between the external surface of the valve or multiple valve unit and its surroundings

3.2 Power semiconductor terms

3.2.1
turn-off semiconductor device
controllable semiconductor device which may be turned on and off by a control signal, for example an IGBT

Note 1 to entry: There are several types of turn-off semiconductor devices which can be used in VSC converters for HVDC. For convenience, the term IGBT is used throughout this standard to refer to the main turn-off semiconductor device. However, the standard is equally applicable to other types of turn-off semiconductor devices.

3.2.2
insulated gate bipolar transistor IGBT
turn-off semiconductor device with three terminals: a gate terminal (G) and two load terminals emitter (E) and collector (C)

Note 1 to entry: By applying appropriate gate to emitter voltages, the load current can be controlled, i.e. turned on and turned off.

3.2.3
free-wheeling diode
FWD
power semiconductor device with diode characteristic

Note 1 to entry: A FWD has two terminals: an anode (A) and a cathode (K). The current through FWDs is in the opposite direction to the IGBT current.

Note 2 to entry: FWDs are characterized by the capability to cope with high rates of decrease of current caused by the switching behaviour of the IGBT.

3.2.4
IGBT-diode pair
arrangement of IGBT and FWD connected in inverse parallel

3.3 Operating states of converter

3.3.1
blocking state
condition of the converter, in which a turn-off signal is applied continuously to all IGBTs of the converter

Note 1 to entry: Typically, the converter is in the blocking state condition after energization.