SLOVENSKI STANDARD
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Visokonapetostne stikalne in krmilne narave - 204. del: Togi plinsko izolirani prenosni vodi za naznačene napetosti nad 52 kV (IEC 62271-204:2022)

High-voltage switchgear and controlgear - Part 204: Rigid gas-insulated transmission lines for rated voltage above 52 kV (IEC 62271-204:2022)

Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 204: Starre gasisolierte Übertragungsleitungen für Bemessungsspannungen über 52 kV (IEC 62271-204:2022)

Appareillage à haute tension - Partie 204: Lignes de transport rigides à isolation gazeuse de tension assignée supérieure à 52 kV (IEC 62271-204:2022)

Ta slovenski standard je istoveten z: **EN IEC 62271-204:2022**

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29.130.10	Visokonapetostne stikalne in krmilne naprave	High voltage switchgear and controlgear

SIST EN IEC 62271-204:2022 **en**

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English Version

High-voltage switchgear and controlgear - Part 204: Rigid gas-insulated transmission lines for rated voltage above 52 kV (IEC 62271-204:2022)

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Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 204: Starre gasisolierte Übertragungsleitungen für Bemessungsspannungen über 52 kV
(IEC 62271-204:2022)

This European Standard was approved by CENELEC on 2022-07-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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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

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European foreword

The text of document 17C/840/FDIS, future edition 2 of IEC 62271-204, prepared by SC 17C "Assemblies" of IEC/TC 17 "High-voltage switchgear and controlgear" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62271-204:2022.

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) 2023-04-05
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-07-05

This document supersedes EN 62271-204:2011 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.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62271-204:2022 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 standards indicated:

IEC 60071-1	NOTE Harmonized as EN IEC 60071-1
ISO 5817	NOTE Harmonized as EN ISO 5817
ISO 6520 (series)	NOTE Harmonized as EN ISO 6520 (series)
ISO 10042	NOTE Harmonized as EN ISO 10042
ISO 10675-1	NOTE Harmonized as EN ISO 10675-1
ISO 10675-2	NOTE Harmonized as EN ISO 10675-2
ISO 10893-8	NOTE Harmonized as EN ISO 10893-8
ISO 10893-9	NOTE Harmonized as EN ISO 10893-9
ISO 10893-10	NOTE Harmonized as EN ISO 10893-10
ISO 10893-11	NOTE Harmonized as EN ISO 10893-11
ISO 11666	NOTE Harmonized as EN ISO 11666
ISO 17640	NOTE Harmonized as EN ISO 17640
IEC 60270	NOTE Harmonized as EN 60270
ISO 22825	NOTE Harmonized as EN ISO 22825
ISO 23279	NOTE Harmonized as EN ISO 23279

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.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60060-1	2010	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	2010
IEC 60068-1	2013	Environmental testing - Part 1: General and guidance	EN 60068-1	2014
IEC 60229	2007	Electric cables - Tests on extruded oversheaths with a special protective function	EN 60229	2008
IEC 60287-3-1	2017	Electric cables - Calculation of the current rating - Part 3-1: Operating conditions - Site reference conditions	-	-
IEC 60376	-	Specification of technical grade sulfur hexafluoride (SF_6) and complementary gases to be used in its mixtures for use in electrical equipment	EN IEC 60376	-
IEC 60480	-	Specifications for the re-use of sulphur hexafluoride (SF_6) and its mixtures in electrical equipment	EN IEC 60480	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
-	-		+ corrigendum May	1993
+ A1	1999		+ A1	2000
+ A2	2013		+A2	2013
			+AC	2016-12
			+AC	2019-02
IEC 62271-1	2017	High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear	EN 62271-1	2017
IEC 62271-4	2013	High-voltage switchgear and controlgear - Part 4: Handling procedures for sulphur hexafluoride (SF_6) and its mixtures	EN 62271-4	2013

IEC 62271-203	2022	High-voltage switchgear and controlgear - Part 203: AC gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	-	-
ISO 9606	series	Qualification test of welders - Fusion welding	EN ISO 9606	series
ISO 9712	-	Non-destructive testing - Qualification and certification of NDT personnel	EN ISO 9712	-
ISO 14732	-	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials	EN ISO 14732	-
ISO 15609	series	Specification and qualification of welding procedures for metallic materials - Welding procedure specification	EN ISO 15609	series
ISO 15614	series	Specification and qualification of welding procedures for metallic materials - Welding procedure test	EN ISO 15614	series

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 204: Rigid gas-insulated transmission lines for rated voltage above 52 kV

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 62271-204 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear. It is an International Standard.

This second edition cancels and replaces the first edition published in 2011. This edition constitutes a technical revision.

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

a) update to be in line with IEC 62271-1:2017 and alignment of the voltage ratings and the test voltages.
b) addition of new information for welds on pressurized parts and gas tightness.

The text of this document is based on the following documents:

Draft	Report on voting
17C/840/FDIS	17C/846/RVD

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/standardsdev/publications.

This document is to be read in conjunction with IEC 62271-1:2017 and IEC 62271-203:2022, to which it refers and which are 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 62271-1:2017 and IEC 62271-203:2022. Amendments to these clauses and subclauses are given under the same numbering, whilst additional subclauses are numbered from 101.

A list of all parts of the IEC 62271 series can be found, under the general title *High-voltage switchgear and controlgear*, 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,
- replaced by a revised edition, or
- amended.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 204: Rigid gas-insulated transmission lines for rated voltage above 52 kV

1 Scope

This part of IEC 62271 applies to rigid HV gas-insulated transmission lines (GIL) in which the insulation is obtained, at least partly, by an insulating gas or gas mixture other than air at atmospheric pressure, for alternating current of rated voltages above 52 kV, and for service frequencies up to and including 60 Hz.

This document is applicable where the provisions of IEC 62271-203 do not cover the application of GIL (see Note 3).

At each end of the HV gas-insulated transmission line, a specific element is used for the connection between the HV gas-insulated transmission line and other equipment like bushings, power transformers or reactors, cable boxes, metal-enclosed surge arresters, voltage transformers or GIS, covered by their own specification.

Unless otherwise specified, the HV gas-insulated transmission line is designed to be used under normal service conditions.

NOTE 1 In this document, the term "HV gas-insulated transmission line" is abbreviated to "GIL".

NOTE 2 In this document, the word "gas" means gas or gas mixture, as defined by the manufacturer.

NOTE 3 Examples of GIL applications:

– where all or part of the HV gas-insulated transmission line is directly buried;
– where the HV gas-insulated transmission line is located, wholly or partly, in an area accessible to public;
– where the HV gas-insulated transmission line is long (typically longer than 500 m) and the typical gas compartment length exceeds the common practice of GIS technology.

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 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60229:2007, *Electric cables – Tests on extruded oversheaths with a special protective function*

IEC 60287-3-1:2017, *Electric cables – Calculation of the current rating – Part 3-1: Operating conditions – Site reference conditions*

IEC 60376, *Specification of technical grade sulfur hexafluoride (SF_6) and complementary gases to be used in its mixtures for use in electrical equipment*

IEC 60480, *Specifications for the re-use of sulfur hexafluoride (SF_6) and its mixtures in electrical equipment*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*

IEC 62271-203:2022, *High-voltage switchgear and controlgear – Part 203: AC gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

IEC 62271-4:2013, *High-voltage switchgear and controlgear – Part 4: Handling procedures for sulphur hexafluoride (SF_6) and its mixtures*

ISO 9606 (all parts), *Qualification test of welders – Fusion welding*

ISO 9712, *Non-destructive testing – Qualification and certification of NDT personnel*

ISO 14732, *Welding personnel – Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials*

ISO 15609 (all parts), *Specification and qualification of welding procedures for metallic materials – Welding procedure specification*

ISO 15614 (all parts), *Specification and qualification of welding procedures for metallic materials – Welding procedure test*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62271-1:2017 and the following apply.

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

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

3.101
area accessible to public
area accessible without restriction to any person

Note 1 to entry: A GIL installed above the ground and outside a substation is considered to be "installed in an area accessible to public".

3.102
gas-insulated transmission lines
GIL
metal-enclosed lines in which the insulation is obtained, at least partly, by an insulating gas other than air at atmospheric pressure, with the external enclosure intended to be earthed

3.103
GIL enclosure
part of GIL retaining the insulating gas under the required conditions protecting the equipment against external influences and providing a high degree of protection to personnel

3.104
compartment
part of GIL totally gastight enclosed except for openings necessary for interconnection and control

3.105
partition
gas tight support insulator of gas-insulated metal-enclosed switchgear separating two adjacent compartments

3.106
main circuit
all the conductive parts of GIL included in a circuit which is intended to transmit electrical energy

[SOURCE: IEC 60050-441:1984, 441-13-02, modified – Replacement of “an assembly" by “GIL".]

3.107
ambient air temperature
temperature, determined under required conditions, of the air surrounding the external GIL enclosure in case of installation in open air, open trenches or tunnels

[SOURCE: IEC 60050-441:1984, 441-11-13, modified – Replacement of “complete switching device or fuse" by “external GIL enclosure in case of installation in open air, open trenches or tunnels".]

3.108
design temperature of the enclosure
maximum temperature which can be reached on a GIL enclosure under service conditions

3.109
design pressure of the enclosure
relative pressure used to determine the design of the enclosure

Note 1 to entry: It is at least equal to the maximum relative pressure in the enclosure at the design temperature of the enclosure.

3.110
design pressure of the partitions
relative pressure across the partition

Note 1 to entry: It is at least equal to the maximum differential pressure across the partition during maintenance activities.

3.111
disconnecting unit
unit to electrically isolate one side from another of the main circuit, mainly for site testing or maintenance

3.112
disruptive discharge
phenomenon associated with the failure of insulation under electric stress, in which the discharge completely bridges the insulation, reducing the voltage between the electrodes to zero or almost zero

Note 1 to entry: The term applies to discharges in solid, liquid and gaseous dielectrics and to combinations of these.

Note 2 to entry: A disruptive discharge in a solid dielectric produces permanent loss of dielectric strength (non-self-restoring insulation); in a liquid or gaseous dielectric, the loss can be only temporary (self-restoring insulation).

Note 3 to entry: The term "sparkover" is used when a disruptive discharge occurs in a gaseous or liquid dielectric. The term "flashover" is used when a disruptive discharge occurs over the surface of a solid dielectric in a gaseous or liquid medium. The term "puncture" is used when a disruptive discharge occurs through a solid dielectric.

3.113
GIL section
part of GIL which is defined by operational or other requirements such as maximum length for dielectric testing or installation sequence

Note 1 to entry: A GIL can consist on the assembly of several GIL sections.

Note 2 to entry: It can consist of one or more compartments.

Note 3 to entry: Sections can be segregated by disconnecting units.

4 Normal and special service conditions

4.1 Normal service conditions

4.1.1 General

Subclause 4.1.1 of IEC 62271-1:2017 is applicable with the following addition.

The normal service conditions which apply to a GIL depending on the installation conditions are given in 4.101, 4.102 and 4.103. When more than one of these installation conditions apply, the relevant subclause shall apply to each section of the GIL.

4.1.2 Indoor switchgear and controlgear

Subclause 4.1.2 of IEC 62271-1:2017 is applicable.

4.1.3 Outdoor switchgear and controlgear

Subclause 4.1.3 of IEC 62271-1:2017 is applicable.

4.2 Special service conditions

Subclause 4.2 of IEC 62271-1:2017 is applicable.

4.101 Installation in open air

For determining the ratings of GIL for open air installation, the normal service conditions of IEC 62271-1:2017 shall apply. These are also valid for open trenches.

If the actual service conditions differ from the normal service conditions, the ratings shall be adapted accordingly.

4.102 Buried installation

General values for thermal resistivity and soil temperature are:

– 1,2 K · m/W, and 20 °C in summer;
– 0,85 K · m/W, and 10 °C in winter.

For guidance, values given in IEC 60287-3-1 can be considered.

For long distance transmission lines (several kilometres), site measurement of soil resistivity should also be considered.

NOTE 1 The use of controlled backfill with a given soil thermal resistivity can also be considered.

NOTE 2 A risk of thermal runaway exists if the soil surrounding the buried GIL becomes dry. In order not to dry out the soil, a maximum service temperature of the enclosure in the range of 50 °C to 60 °C is generally considered acceptable.

The depth of laying should be agreed between manufacturer and user. The determination of depth of laying shall take into account thermo mechanical stresses, safety requirements and local regulations.

4.103 Installation in tunnel, shaft or similar situation

Forced cooling is an adequate method to handle with the waste heat and can be used in case of tunnel, shaft or similar installations.

In the case of long vertical shafts and inclined tunnels or sections thereof, attention shall be paid to thermal and density gradients.

5 Ratings

5.1 General

Subclause 5.1 of IEC 62271-1:2017 is not applicable and is replaced as follows.

The rating of a GIL consists of the following:

a) rated voltage (U_r);

b) rated insulation level (U_d, U_p, U_s);

c) rated frequency (f_r);

d) rated continuous current (I_r);

e) rated short-time withstand current (I_k) (for main and earthing circuits);

f) rated peak withstand current (I_p) (for main and earthing circuits);

g) rated duration of short-circuit (t_k);

h) rated supply voltage of auxiliary and control circuits (U_a);

i) rated supply frequency of auxiliary and control circuits.

5.2 Rated voltage (U_r)

Subclause 5.2 of IEC 62271-1:2017 is applicable.

5.3 Rated insulation level (U_d, U_p, U_s)

Subclause 5.3 of IEC 62271-1:2017 is applicable with the following addition:

Rated insulation levels shall be chosen from IEC 62271-203 on the basis of insulation coordination study for the specific installation in order to consider parameters like overvoltages, voltage reflections, etc. Specific insulation coordination studies are recommended for each installation. For more information, see [1][1].

Although internal arcing faults can largely be avoided by the choice of a suitable insulation level, measures to limit external overvoltages at each end of the installation (e.g. surge arresters) should be considered.

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1 Numbers in square brackets refer to the Bibliography.