

High-voltage switchgear and controlgear - Part 211:  
Direct connection between power transformers and  
gas-insulated metal-enclosed switchgear for rated  
voltages above 52 kV

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>See Eesti standard EVS-EN IEC 62271-211:2024 sisaldab Euroopa standardi EN IEC 62271-211:2024 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 01.11.2024.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN IEC 62271-211:2024 consists of the English text of the European standard EN IEC 62271-211:2024.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 01.11.2024.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
--	---

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 29.130.10

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele. Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

English Version

## High-voltage switchgear and controlgear - Part 211: Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages above 52 kV (IEC 62271-211:2024)

Appareillage à haute tension - Partie 211: Raccordements directs entre transformateurs de puissance et appareillage sous enveloppe métallique à isolation gazeuse de tensions assignées supérieures à 52 kV (IEC 62271-211:2024)

Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 211: Direkte Verbindungen zwischen Leistungstransformatoren und gasisolierten metallgekapselten Schaltanlagen für Bemessungsspannungen über 52 kV (IEC 62271-211:2024)

This European Standard was approved by CENELEC on 2024-10-09. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

## European foreword

The text of document 17C/935/FDIS, future edition 2 of IEC 62271-211, 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 62271-211:2024.

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) 2025-11-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2027-11-30

This document supersedes EN 62271-211:2014 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 62271-211:2024 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 62271-209:2019 NOTE Approved as EN IEC 62271-209:2019 (not modified)

IEC 62271-209:2019/AMD1:2022 NOTE Approved as EN IEC 62271-209:2019/A1:2022 (not modified)

ISO 17892-2:2014 NOTE Approved as EN ISO 17892-2:2014 (not modified)

IEC 60071-1:2019 NOTE Approved as EN IEC 60071-1:2019 (not modified)

# INTERNATIONAL STANDARD

**High-voltage switchgear and controlgear –  
Part 211: Direct connection between power transformers and gas-insulated  
metal-enclosed switchgear for rated voltages above 52 kV**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2024 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

**About the IEC**

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

**IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

**IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

**IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)**

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

**Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

preview generated by EVS



IEC 62271-211

Edition 2.0 2024-09

# INTERNATIONAL STANDARD

---

**High-voltage switchgear and controlgear –  
Part 211: Direct connection between power transformers and gas-insulated  
metal-enclosed switchgear for rated voltages above 52 kV**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.130.10

ISBN 978-2-8322-9578-6

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 Normal and special service conditions .....	10
4.1 Normal service conditions .....	10
4.2 Special service conditions.....	10
5 Ratings.....	10
5.1 General.....	10
5.2 Rated voltage ( $U_r$ ) .....	10
5.3 Rated insulation level ( $U_d$ , $U_p$ , $U_s$ ) .....	10
5.4 Rated frequency ( $f_r$ ).....	10
5.5 Rated continuous current ( $I_r$ ) .....	11
5.6 Rated short-time withstand current ( $I_k$ ) and rated thermal short-time current ( $I_{th}$ ) .....	11
5.7 Rated peak withstand current ( $I_p$ ) and rated dynamic current ( $I_d$ ) .....	11
5.8 Rated duration of short-circuit ( $t_k$ ) and of thermal short-time current ( $t_{th}$ ).....	11
6 Design and construction .....	11
6.1 Gas and vacuum tightness.....	11
6.2 Gas pressure for insulation of the bushing inside the gas-insulated switchgear (GIS) enclosure .....	12
6.3 Pressure withstands requirements .....	12
6.4 Standard dimensions and tolerances.....	12
6.4.1 General .....	12
6.4.2 Single-phase direct connection between oil-filled transformer and switchgear .....	13
6.4.3 Three-phase direct connection between oil-filled transformer and switchgear .....	13
6.4.4 Connection between gas-insulated transformer and switchgear .....	13
6.4.5 Transformer tolerances.....	13
6.4.6 Mounting of the transformer on its foundation .....	13
6.5 Limits of supply.....	13
6.6 Mechanical forces applied on the connection interface.....	15
6.7 Mechanical forces applied on the bushing flange .....	15
6.8 Horizontal and vertical displacement.....	17
6.9 Vibrations .....	17
7 Type tests .....	17
7.1 General.....	17
7.2 Dielectric tests .....	17
7.2.1 Dielectric tests of bushing.....	17
7.2.2 Dielectric tests of transformer connection in a single-phase enclosure.....	18
7.2.3 Dielectric tests of transformer connection in a three-phase enclosure .....	18
7.3 Cantilever loads withstand tests.....	18
7.4 Gas tightness tests .....	18
8 Routine tests .....	18

8.1	General.....	18
8.2	External pressure test of the bushing.....	18
8.3	Tightness tests.....	19
9	Guide to the selection of switchgear and controlgear (informative).....	19
10	Information to be given with enquiries, tenders and orders (informative).....	19
11	Transport, storage, installation, operating instructions and maintenance.....	19
12	Safety.....	19
13	Environmental aspects.....	20
	Bibliography.....	25
	Figure 1 – Typical direct connection between power transformer and gas-insulated metal-enclosed switchgear.....	21
	Figure 2 – Standard dimensions for typical direct connection between power transformer and gas-insulated metal-enclosed switchgear.....	22
	Figure 3 – Transformer tolerances for a typical direct connection shown on the example of a three-phase power transformer connected to a single-phase gas-insulated metal-enclosed switchgear.....	23
	Figure 4 – Transformer tolerances for a typical direct connection shown on the example of a three-phase power transformer connected to a three-phase gas-insulated metal-enclosed switchgear up to 170 kV.....	24
	Table 1 – Moments and forces applied on the bushing flange and transformer.....	16

preview generated by EVS

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

**HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –****Part 211: Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62271-211 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 of IEC 62271-211:2014. This edition constitutes a technical revision.

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

- a) re-numbering of clauses according to IEC 62271-1:2017,
- b) Clause 3: updating definition about bushing (3.1), updating some pressure definitions (3.6, 3.7, 3.8, 3.9), rewording definition about proctor density (3.11), new term very-fast-front overvoltage (3.12),

- c) Clause 5 (former clause 4): add a subclause 5.1 General, according to IEC 62271-1:2017 and IEC 62271-203:2022,
  - 1) subclause 5.5: new first paragraph, rewording second paragraph,
  - 2) subclause 5.8: modify the term "Rated duration of thermal short-time current" of the bushing,
- d) Clause 6 (former Clause 5): restructure and rewording of subclauses:
  - 1) 6.1 (former 5.3): requirements about gas and vacuum tightness of the transformer bushing
  - 2) 6.3 (former 5.2): harmonization with IEC 62271-203:2022 about typical maximum pressure in service for SF<sub>6</sub>, other gases and gas mixtures,
  - 3) 6.4 (former 5.8), rewording
  - 4) 6.5 (former 5.1), some rewording and modification
  - 5) 6.6 (former 5.4), some rewording, updated references
  - 6) 6.7 (former 5.5), some rewording
  - 7) 6.8 (former 5.6), some rewording
  - 8) 6.9 (former 5.7), slight rewording,
- e) Clause 7 (former clause 6) type tests: some rewording and clarifications about references,
- f) Clause 8 (former clause 7) routine tests:
  - 1) 8.2 (former 7.2): add a paragraph about SF<sub>6</sub>-mixtures and other gases than SF<sub>6</sub>,
  - 2) 8.3 (former 7.3): update reference to relevant on-site test according to IEC 62271-203:2022,
- g) Clause 9 Guide to the selection of switchgear and controlgear (new): informative, to have a reference to IEC 62271-203:2022,
- h) Clause 11 (former 10): updated headline and updated reference according to IEC 62271-1:2017,
- i) new Clauses 12 Safety and 13 Environmental aspects: Adding of references to safety and environmental aspects,
- j) correction of errors in Corrigendum 2 of IEC 62271-211:2017,
- k) modified orientation of Figure 1 to Figure 4 for easier reading of the tables,

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

Draft	Report on voting
17C/935/FDIS	17C/945/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

A list of all parts in the IEC 62271 series, published 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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

This document is a preview generated by EVS

## HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

### Part 211: Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages above 52 kV

#### 1 Scope

This part of IEC 62271 is applicable to single- and three-phase direct connections between gas-insulated metal-enclosed switchgear (GIS) for rated voltages above 52 kV and transformer arrangements to establish electrical and mechanical interchange ability and to determine the limits of supply for the transformer connection.

Direct connections are immersed on one end in the transformer oil or insulating gas and on the other end in the insulating gas of the switchgear.

Transformer arrangements are single-phase transformers with single-phase enclosed arrangement, three-phase transformers with three single-phase enclosed arrangements or three-phase transformers with a three-phase enclosed arrangement with three transformer bushings.

The connection satisfies the requirements of IEC 62271-203 for gas-insulated metal-enclosed switchgear, IEC 60076 for power transformer and IEC 60137 for completely immersed bushings.

For the purpose of this document the term “switchgear” is used for “gas-insulated metal-enclosed switchgear and the term “transformer” is used for “power transformer”.

#### 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 60076 (all parts), *Power transformers*

IEC 60076-1:2011, *Power transformers – Part 1: General*

IEC 60137:2017, *Insulated bushings for alternating voltages above 1 000 V*

IEC 61936-1:2021, *Power installations exceeding 1 kV AC and 1,5 kV DC – Part 1: AC*

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*  
IEC 62271-1:2017/AMD1:2021

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

IEC 62271-207:2023, *High-voltage switchgear and controlgear – Part 207: Seismic qualification for gas-insulated switchgear assemblies, metal enclosed and solid-insulation enclosed switchgear for rated voltages above 1 kV*