

INTERNATIONAL STANDARD

NORME INTERNATIONALE

High-voltage switchgear and controlgear –
Part 108: High-voltage alternating current disconnecting circuit-breakers for
rated voltages above 52 kV

Appareillage à haute tension –
Partie 108: Disjoncteurs-sectionneurs à courant alternatif à haute tension
de tensions assignées supérieures à 52 kV



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
info@iec.ch
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

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 It also gives information on projects, replaced and withdrawn publications.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

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

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

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22,000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67,000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

High-voltage switchgear and controlgear –
Part 108: High-voltage alternating current disconnecting circuit-breakers for
rated voltages above 52 kV

Appareillage à haute tension –
Partie 108: Disjoncteurs-sectionneurs à courant alternatif à haute tension
de tensions assignées supérieures à 52 kV

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.130.10

ISBN 978-2-8322-8507-7

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
3.1 General terms and definitions	7
3.2 Assemblies of switchgear and controlgear	7
3.3 Parts of assemblies	7
3.4 Switching devices	7
3.5 Parts of switchgear and controlgear	7
3.6 Operational characteristics of switchgear and controlgear	7
3.7 Characteristic quantities	8
3.8 Index of definitions	8
4 Normal and special service conditions	9
5 Ratings	9
5.1 General	9
5.3 Rated insulation level (U_d , U_p , U_s)	9
6 Design and construction	9
6.1 General	9
6.1.1 Nameplates	9
6.1.2 Locking devices	10
6.1.3 Position indication	10
6.1.01 Requirements for simultaneity of poles during single closing and single opening operations	10
6.1.02 Operation of disconnecting circuit-breakers	10
6.1.03 Pressure limits of fluids for operation	10
6.1.04 Vent outlets	10
6.1.05 Time quantities	10
6.1.06 Static mechanical loads	11
6.1.07 Disconnecting circuit-breaker classification	11
6.1.08 Requirements in respect of the isolating distance of disconnecting circuit-breakers	11
7 Type tests	11
7.1 General	11
7.2 Dielectric tests	11
7.3 Radio interference voltage (RIV) test	11
7.4 Resistance measurement	11
7.5 Continuous current tests	11
7.6 Short-time withstand current and peak withstand current tests	12
7.7 Verification of the protection	12
7.8 Tightness tests	12
7.9 Electromagnetic compatibility tests (EMC)	12
7.10 Additional tests on auxiliary and control circuits	12
7.11 X-radiation for vacuum interrupters	12
7.1.01 Mechanical and environmental tests	12
7.1.02 Miscellaneous provisions for making and breaking tests	13
7.1.03 General considerations for making and breaking tests	13

7.104	Demonstration of arcing times.....	13
7.105	Short-circuit test quantities	13
7.106	Short-circuit test procedure	13
7.107	Terminal fault tests	13
7.108	Additional short-circuit tests	13
7.109	Short-line fault tests.....	13
7.110	Out-of-phase making and breaking tests	13
7.111	Capacitive current tests	14
7.112	Tests to verify the proper function of the position indicating device	14
7.113	Combined function test	14
8	Routine tests	18
8.1	General.....	18
9	Guide to the selection of disconnecting circuit-breakers (informative)	18
10	Information to be given with enquires, tenders and orders (informative).....	18
11	Transport, storage, installation, operation instructions and maintenance.....	19
12	Safety	19
13	Influence of the product on the environment	19
Annex A (informative)	Explanatory notes and examples of disconnecting circuit-breakers	20
Bibliography.....		21
Figure 1	– Test sequence for mechanical operations and short-circuit combined function tests when performed as separate tests.....	15
Figure 2	– Test sequence for mechanical operations and short-circuit combined function tests when performed in one sequence	16
Figure A.1	– A making or breaking unit (or several identical units connected in series) which satisfies the dielectric requirements of a disconnector.....	20
Figure A.2	– Device with a single gap which is divided into a making or breaking section and an isolating section	20
Figure A.3	– Circuit-breaker which, together with a series connected disconnector, commonly satisfies the dielectric requirements of a disconnector in open position	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 108: High-voltage alternating current disconnecting
circuit-breakers 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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62271-108 has been prepared by subcommittee 17A, Switching devices of IEC technical committee 17: High-voltage switchgear and controlgear.

This second edition cancels and replaces the first edition published in 2005. This edition contains the following significant technical changes with respect to the previous edition:

- The document has been restructured according to IEC 62271-1:2017.
- The document has been adapted to some of the changes introduced in IEC 62271-100:–1.
- The document has been adapted to some of the changes introduced in IEC 62271-102:2018.
- References have been reviewed and updated.

¹ Under preparation. Stage at the time of publication: IEC CDV 62271-100:2020.

- Some definitions have been reviewed and adapted to the latest IEC editions.
- Rated static terminal load and static terminal load test have been removed and a design requirement for static mechanical loads has been included.
- Additional type tests for auxiliary and control circuits have been included.
- X-radiation test procedure for vacuum interrupters has been included.
- Type test for testing of interlocking device and type test for testing of temporary mechanical locking devices have been included.
- Special requirements for making and breaking tests on class E2 disconnecting circuit-breakers have been removed.

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

FDIS	Report on voting
17A/1269/FDIS	17A/1274/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

This document is to be read in conjunction with IEC 62271-100:– and IEC 62271-102:2018, 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. 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, under the general title *High-voltage switchgear and controlgear*, can be found on the IEC website.

In Canada, disconnecting circuit-breakers are accepted only when a visible gap is provided.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 108: High-voltage alternating current disconnecting circuit-breakers for rated voltages above 52 kV

1 Scope

This part of IEC 62271 applies to high-voltage alternating current disconnecting circuit-breakers for operation at frequencies of 50 Hz and 60 Hz on systems having voltages above 52 kV.

This document identifies which requirements of IEC 62271-1, IEC 62271-100:– and IEC 62271-102 are applicable. It also gives the additional requirements specific to these devices.

This document covers single switching devices which perform the functions of both a circuit-breaker and a disconnector by means of contacts housed in a single enclosure, and in which the circuit-breaker contacts in the open position satisfy, or contribute to, the isolating requirements of the disconnector function. As there is interaction between the requirements of the separate functions, it is important to consider the standardization of requirements. This document details the requirements for a disconnecting circuit-breaker, identifying where these differ from the separate requirements of a discrete circuit-breaker and a disconnector.

2 Normative references

[IEC 62271-108:2020](https://standards.iteh.ai/catalog/standards/sist/2a9a5e24-8930-402a-b4e7-2c0a02a4e840/iec-62271-108-2020)

<https://standards.iteh.ai/catalog/standards/sist/2a9a5e24-8930-402a-b4e7-2c0a02a4e840/iec-62271-108-2020>

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 60050-441:1984, *International electrotechnical vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses*

IEC 60050-441:1984/AMD1:2000 (available at: <http://www.electropedia.org>)

IEC 60050-614:2016, *International electrotechnical vocabulary (IEV) – Part 614: Generation, transmission and distribution of electricity – Operation* (available at: <http://www.electropedia.org>)

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

IEC 62271-100:–, *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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-441, IEC 60050-614 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>

NOTE 1 Certain definitions taken from IEC 60050-441, IEC 60050-614 and IEC 62271-1 are recalled here for ease of reference.

NOTE 2 Additional definitions given here are classified in a manner that aligns with the classification used in IEC 60050-441.

3.1 General terms and definitions

No particular definitions.

3.2 Assemblies of switchgear and controlgear

No particular definitions.

3.3 Parts of assemblies

No particular definitions.

3.4 Switching devices

3.4.101 circuit-breaker

mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short circuit

[SOURCE: IEC 60050-441:2000, 441-14-20]

3.4.102 disconnecting circuit-breaker

circuit-breaker satisfying the requirements of a disconnecter, when the contacts are in open position

Note 1 to entry: For design examples of disconnecting circuit-breakers, refer to Annex A.

3.5 Parts of switchgear and controlgear

3.5.101 power kinematic chain

mechanical connecting system between the operating mechanism and the moving contacts, both included

3.6 Operational characteristics of switchgear and controlgear

3.6.101 closed position

<of a mechanical switching device> position in which the predetermined continuity of the main circuit of the device is secured

[SOURCE: IEC 60050-441:2000, 441-16-22]

3.6.102

open position

<of a mechanical switching device> position in which the predetermined clearance between open contacts in the main circuit of the device is secured

[SOURCE: IEC 60050-441:2000, 441-16-23]

3.6.103

interlocking device

device which makes the operation of a switching device dependent upon the position or operation of one or more other pieces of equipment

[SOURCE: IEC 60050-441:2000, 441-16-49]

3.7 Characteristic quantities

3.7.101

insulation level

set of withstand voltages specified which characterize the dielectric strength of the insulation

[SOURCE: IEC 60050-614:2016, 614-03-23]

3.7.102

external insulation

distances in atmospheric air, and surfaces of solid insulation of disconnectors and earthing switches in contact with the air, which are subject to dielectric stresses and to the effect of atmospheric and other external conditions

Note 1 to entry: External insulation is either weather-protected or non-weather-protected, designed to operate outside or inside closed shelters, respectively.

Note 2 to entry: Other external conditions include pollution, humidity, vermin, etc.

[SOURCE: IEC 60050-614:2016, 614-03-02, modified – Note 1 to entry has been added.]

3.7.103

internal insulation

internal solid, liquid or gaseous parts of the insulation of equipment which are protected from the effects of atmospheric and other external conditions

[SOURCE: IEC 60050-614:2016, 614-03-03, modified – In the definition, "distances of the" has been deleted and "parts of the" has been added.]

3.7.104

isolating distance

<of a pole of a mechanical switching device> clearance between open poles meeting the safety requirements specified for disconnectors

[SOURCE: IEC 60050-441:2000, 441-17-35, modified – In the definition, "contacts" has been replaced by "poles".]

3.8 Index of definitions

C

Circuit-breaker	3.4.101
Closed position (of a mechanical switching device)	3.6.101

D – E

Disconnecting circuit-breaker	3.4.102
-------------------------------	---------

External insulation	3.7.102
I	
Insulation level	3.7.101
Interlocking device	3.6.103
Internal insulation	3.7.103
Isolating distance (of a pole of a mechanical switching device)	3.7.104
O – P	
Open position (of a mechanical switching device)	3.6.102
Power kinematic chain	3.5.101

4 Normal and special service conditions

Clause 4 of IEC 62271-100:– is applicable.

5 Ratings

5.1 General

Clause 5 of IEC 62271-100:– is applicable with the following additions and modification.

The rated characteristics of the disconnecting circuit-breaker are referred to the rated operating sequence.

Disconnecting circuit-breakers need not be assigned ratings with respect to bus-transfer current switching. The bus-transfer current switching capability is covered by the making and breaking tests in IEC 62271-100:–.

Rated contact zone is not applicable for disconnecting circuit-breakers.

5.3 Rated insulation level (U_d , U_p , U_s)

Subclause 5.3 of IEC 62271-100:– is applicable with the following addition:

The standard values of rated withstand voltages across the isolating distance of the disconnecting circuit-breaker are given in columns 3 and 5 of Table 1 and Table 2, columns 3, 6 and 8 of Table 3 and columns 3, 5 and 7 of Table 4 in IEC 62271-1:2017.

6 Design and construction

6.1 General

Clause 6 of IEC 62271-100:– and IEC 62271-102:2018 are applicable, unless stated otherwise.

The design of the disconnecting circuit-breaker shall take into account the mechanical, electrical and other requirements of a circuit-breaker and a disconnecter as a single device.

6.11 Nameplates

Subclause 6.11 of IEC 62271-100:– is applicable with the following addition:

The nameplate shall state that the device is a disconnecting circuit-breaker and the data shall be applicable to both a circuit-breaker and a disconnector of the declared ratings.

6.12 Locking devices

Subclause 6.12 of IEC 62271-100:– is applicable with the following addition.

Disconnecting circuit-breakers to be mechanically interlocked and/or temporarily mechanically locked by blocking the shaft or power kinematic chain of the disconnecting circuit-breaker, and not integrated in switchgear and controlgear assemblies covered by IEC 62271-200, IEC 62271-201 or IEC 62271-203, shall be designed to withstand the tests specified in 7.101.6 and 7.101.7.

6.13 Position indication

Subclauses 6.13 and 6.104.3.2 of IEC 62271-102:2018 are applicable.

6.101 Requirements for simultaneity of poles during single closing and single opening operations

Subclause 6.101 of IEC 62271-100:– is applicable.

6.102 Operation of disconnecting circuit-breakers

Subclauses 6.102 of IEC 62271-100:– and 6.104 of IEC 62271-102:2018 are applicable with the following additions.

6.102.1 Securing of position

Disconnecting circuit-breakers shall be designed in such a way that they cannot come out of their open or closed position by gravity, wind pressure, vibrations, reasonable shocks or accidental touching of the operating system.

Disconnecting circuit-breakers shall have provisions for temporary mechanical locking in the open position. Provisions for temporary mechanical locking in the closed position are required only if specified by the user.

NOTE 1 Temporary mechanical securing of the disconnecting circuit-breaker in the closed position prevents the short circuit protection function and is used only when alternative protection is provided.

NOTE 2 Temporary mechanical locking in the closed position is typically required when the disconnecting circuit-breaker is intended to be used for earthing purposes.

6.102.2 Additional requirements for power operated mechanisms

Subclause 6.104.2 of IEC 62271-102:2018 is not applicable because manual operating facilities for such a device when in service are not required.

6.103 Pressure limits of fluids for operation

Subclause 6.103 of IEC 62271-100:– is applicable.

6.104 Vent outlets

Subclause 6.104 of IEC 62271-100:– is applicable.

6.105 Time quantities

Subclause 6.105 of IEC 62271-100:– is applicable.

6.106 Static mechanical loads

Subclause 6.106 of IEC 62271-100:– is applicable.

6.107 Disconnecting circuit-breaker classification

Subclause 6.107 of IEC 62271-100:– is applicable.

6.108 Requirements in respect of the isolating distance of disconnecting circuit-breakers

Subclause 6.102 of IEC 62271-102:2018 is applicable with the following replacement of second paragraph:

The design shall take into account the long-term effects of contamination caused by wear and arcing by-products. The effectiveness of the design to withstand these effects in service shall be verified by testing according to 7.113.

7 Type tests

7.1 General

Clause 7 of IEC 62271-100:– is applicable as appropriate to the rating of the device. Additional tests are required to demonstrate that the device complies with the relevant requirements of a disconnecting circuit-breaker.

In particular, the combined function tests are required to demonstrate that the dielectric withstand across the isolating distance remains without undue deterioration after the type-tests specified in IEC 62271-100:–. [IEC 62271-108:2020](https://standards.iteh.ai/catalog/standards/sist/2a9a5e24-8930-402a-b4e7-2c6a62a4e840/iec-62271-108-2020)

If a circuit-breaker already has been type-tested according to IEC 62271-100:–, only the additional tests indicated below need to be performed.

For convenience of testing, the additional combined function tests may be combined with those for the circuit-breaker.

7.2 Dielectric tests

Subclause 7.2 of IEC 62271-100:– is applicable with the following addition:

The test values across the isolating distance of the disconnecting circuit-breaker are given in columns 3 and 5 of Table 1 and Table 2, columns 3, 6 and 8 of Table 3 and columns 3, 5 and 7 of Table 4 in IEC 62271-1:2017.

7.3 Radio interference voltage (RIV) test

Subclause 7.3 of IEC 62271-100:– is applicable.

7.4 Resistance measurement

Subclause 7.4 of IEC 62271-100:– is applicable.

7.5 Continuous current tests

Subclause 7.5 of IEC 62271-100:– is applicable.