BS EN IEC 62271-102:2018+A1:2022

BSI Standards Publication

High-voltage switchgear and controlgear

Alternating current disconnectors and earthing switches

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National foreword

This British Standard is the UK implementation of EN IEC 62271-102:2018+A1:2022. It is identical to IEC 62271-102:2018, incorporating amendment 1:2022. It supersedes BS EN IEC 62271-102:2018, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee PEL/17, High voltage switchgear, controlgear and assemblies.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches (IEC 62271-102:2018)

Appareillage à haute tension - Partie 102: Sectionneurs et sectionneurs de terre à courant alternatif (IEC 62271-102:2018)

Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 102: Wechselstrom-Trennschalter und -Erdungsschalter (IEC 62271-102:2018)

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European foreword

The text of document 17A/1173/FDIS, future edition 2 of IEC 62271-102, prepared by SC 17A "Switching devices" of IEC/TC 17 "High-voltage switchgear and controlgear" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62271-102:2018.

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)	2019-03-19
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2021-06-19

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

IEC 60507:2013	NOTE	Harmonized as EN 60507:2014 (not modified).
IEC 60447:2004	NOTE	Harmonized as EN 60447:2004 (not modified).
IEC 60060-1:2010	NOTE	Harmonized as EN 60060-1:2010 (not modified).

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European foreword to Amendment 1

The text of document 17A/1322/CDV, future IEC 62271-102/AMD1, prepared by SC 17A "Switching devices" of IEC/TC 17 "High-voltage switchgear and controlgear" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62271-102:2018/A1:2022.

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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 60050-151	-	International Electrotechnical Vocabulary - Part 151: Electrical and magnetic devices	-	-
IEC 60050-441	-	International Electrotechnical Vocabulary (IEV) - Chapter 441: Switchgear, controlgear and fuses	-	-
IEC 60050-471	-	International Electrotechnical Vocabulary - Part 471: Insulators	-	-
IEC 60050-614	-	International electrotechnical vocabulary - Part 614: Generation, transmission and distribution of electricity - Operation	-	-
IEC 60071-1	-	Insulation co-ordination - Part 1: Definitions, principles and rules	EN IEC 60071-1	-
IEC 60137	-	Insulated bushings for alternating voltages above 1000 V	EN 60137	-
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
			corr. May	1993
+A1	1999		+A1	2000
+A2	2013		+A2	2013
IEC 60865-1	-	Short-circuit currents - Calculation of effects - Part 1: Definitions and calculation methods	EN 60865-1	-
IEC 62262	2002	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)	EN 62262	2002
IEC 62271-1	2017	High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear	EN 62271-1	2017

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Publication	Year	Title	EN/HD	Year
IEC 62271-100 +A1 +A2	2008 2012 2017	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers	EN 62271-100 +A1 +A2	2009 2012 2017
IEC 62271-101 +A1	2012 2017	High-voltage switchgear and controlgear - Part 101: Synthetic testing	EN 62271-101 -	2013 -
IEC 62271-200	2011	High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	EN 62271-200	2012
IEC 62271-201	2014	High-voltage switchgear and controlgear - Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	EN 62271-201	2014
IEC 62271-203	2011	High-voltage switchgear and controlgear - Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	EN 62271-203	2012
IEC/TR 62271-305	-	High-voltage switchgear and controlgear - Part 305: Capacitive current switching capability of air-insulated disconnectors for rated voltages above 52 kV	-	-
ISO 2768-1	-	General tolerances - Part 1: Tolerances for linear and angular dimensions without individual tolerance indications	EN 22768-1	-

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 102: Alternating current disconnectors and earthing switches

FOREWORD

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International Standard IEC 62271-102 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 2001, Amendment 1:2011 and Amendment 2:2013. This edition constitutes a technical revision.

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

a) new numbering according to IEC 17/1025/RQ to harmonize with ISO/IEC Directives, Part 2, and IEEE Std. C37.100.1;
b) clause numbering has been aligned with IEC 62271-1:2017;
c) the Scope has been extended to cover all indoor and outdoor installations. Consideration of switching devices having disconnecting and/or earthing switch functionalities, apart from other functions, are also covered by this document;

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d) ratings have been moved from Annexes B, C and E to Clause 5; the order of the subclauses now corresponds to the order of subclauses in Clause 7;

e) new rating values for bus-transfer current and bus-transfer voltage have been assigned;

f) new class of mechanical endurance for earthing switches has been added (M1);

g) subclause "Rated values of electrical endurance for earthing switches" is now called "Classification of earthing switches for short-circuit making capability";

h) new subclause with ratings for ice-coating has been added;

i) new subclause with classification of bus-charging switching capability has been added;

j) new withstand requirements for interlocking devices have been added;

k) the way to comply with the requirements of the isolating distance of disconnectors has been modified;

l) design and construction requirements for position-indicating devices have been modified, aligning the requirements for position indication and signalling;

m) the value of the operating force has been changed;

n) the test procedures and validation criteria have been revised and modified where necessary;

o) requirements for applied voltage during single-phase test on non-simultaneous closing earthing switches have been changed;

p) non-verifiable requirements have been deleted;

q) a new subclause has been added for testing mechanical interlocking devices;

r) the high- and low-temperature test is mandatory if the temperature limits for the service conditions of the apparatus (defined by the manufacturer) are above +40 °C or below −5 °C, and a more detailed testing procedure is given;

s) the testing procedure to verify the proper functioning of the position-indicating device allows a more practicable testing for every technology used;

t) a new Annex B has been added with title: "Current-switching capability required of disconnectors and earthing switches";

u) a new Annex C has been added with title: "Tolerances on test quantities for type tests";

v) a new Annex E has been added with title: "Extension of validity of type tests".

This standard is to be read in conjunction with IEC 62271-1:2017, 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, except annexes, is used as in IEC 62271-1:2017. Additional subclauses are numbered from 101.

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

FDIS	Report on voting
17A/1173/FDIS	17A/1180/RVD

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

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

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.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 102: Alternating current disconnectors and earthing switches

1 Scope

This part of IEC 62271 applies to alternating current disconnectors and earthing switches, designed for indoor and outdoor installations for nominal voltages above 1 000 V and for service frequencies up to and including 60 Hz.

It also applies to the operating devices of these disconnectors and earthing switches and their auxiliary equipment.

Additional requirements for disconnectors and earthing switches in enclosed switchgear and controlgear are given in IEC 62271-200, IEC 62271-201 and IEC 62271-203.

NOTE Disconnectors in which the fuse forms an integral part are not covered by this standard.

This document is also applicable to switching devices having disconnecting and/or earthing functionalities apart from other functions, such as high-speed earthing switch, circuit-breaker and switch-disconnector.

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 60050-151, *International Electrotechnical Vocabulary – Part 151: Electrical and magnetic devices*

IEC 60050-441, *International Electrotechnical Vocabulary – Chapter 441: Switchgear controlgear and fuses*

IEC 60050-471, *International Electrotechnical Vocabulary – Part 471: Insulators*

IEC 60050-614, *International Electrotechnical Vocabulary – Part 614: Generation, transmission and distribution of electricity – Operation*

〈A1〉 IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules* 〈A1〉

IEC 60137, *Insulating bushings for alternating voltages above 1 000 V*

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

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

IEC 60865-1, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

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IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

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

IEC 62271-100:2008, *High-voltage switchgear and controlgear – Part 100: Alternating current circuit-breakers*
IEC 62271-100:2008/AMD1:2012
IEC 62271-100:2008/AMD2:2017

IEC 62271-101:2012, *High-voltage switchgear and controlgear – Part 101: Synthetic testing*
IEC 62271-101:2012/AMD1:2017

IEC 62271-200:2011, *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 62271-201:2014, *High-voltage switchgear and controlgear – Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 62271-203:2011, *High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

IEC/TR 62271-305, *High-voltage switchgear and controlgear – Part 305: Capacitive current switching capability of air-insulated disconnectors for rated voltages above 52 kV*

ISO 2768-1, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-151, IEC 60050-441, IEC 60050-471, IEC 60050-614, and IEC 62271-1 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

3.1 General terms and definitions

3.1.101
indoor switchgear and controlgear
switchgear and controlgear designed solely for installation within a building or other housing, where the switchgear and controlgear is protected against wind, rain, snow, abnormal dirt deposits, abnormal condensation, ice and hoar frost

[SOURCE: IEC 60050-441:2000, 441-11-04]

3.1.102
outdoor switchgear and controlgear
switchgear and controlgear suitable for installation in the open air, i.e. capable of withstanding wind, rain, snow, dirt deposits, condensation, ice and hoar frost

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[SOURCE: IEC 60050-441:2000, 441-11-05]

3.1.103
user
person or legal entity using the disconnectors or earthing switches

Note 1 to entry: This can include the purchaser (for example an electricity supplier), but it can also include the contracting company, the staff responsible for erection of installation, the maintenance or operating staff or anybody else temporarily or permanently responsible for the disconnector, earthing switch or electrical installation, or even the operation of the switchgear.

3.2 Assemblies of switchgear and controlgear

3.2.1
test object
equipment needed to represent the specimen for a particular type test

[SOURCE: IEC 62271-1:2017, 3.2.1, modified – "switchgear and controlgear" replaced by "specimen"]

3.3 Parts of assemblies

Subclause 3.3 of IEC 62271-1:2017 is applicable.

3.4 Switching devices

3.4.101
disconnector
mechanical switching device which provides, in the open position, an isolating distance in accordance with specified requirements

Note 1 to entry: A disconnector is capable of opening and closing a circuit when either negligible current is broken or made, or when no significant change in the voltage across the terminals of each of the poles of the disconnector occurs. It is also capable of carrying currents under normal circuit conditions and carrying for a specified time currents under abnormal conditions such as those of short-circuit.

Note 2 to entry: "Negligible current" implies currents such as the capacitive currents of bushings, busbars, connections, very short lengths of cable, currents of permanently connected grading impedances of circuit-breakers and currents of voltage transformers and dividers (see also IEC/TR 62271-305). For U_r ≤ 420 kV, a current not exceeding 0,5 A is a negligible current for the purpose of this definition; for U_r > 420 kV and currents exceeding 0,5 A, the manufacturer should be consulted. "No significant change in voltage" refers to such applications as the by-passing of induction voltage regulators or circuit-breakers and bus transfer.

[SOURCE: IEC 60050-441:2000, 441-14-05, modified – Note 2 to entry has been added]

3.4.102
divided support disconnector
divided support earthing switch
disconnector (or earthing switch) in which the fixed and moving contacts of each pole are not supported by a common base or frame

Note 1 to entry: A typical example is the pantograph or semi-pantograph disconnector (or earthing switch).

[SOURCE: IEC 60050-441:2000, 441-14-06 and -07, modified – The term "earthing switch" is completed with "divided support" and the term "disconnector" substituted by "earthing switch" in Note 1 to entry when appropriate; Note 2 to entry deleted.]

3.4.103
centre-break disconnector
disconnector in which both contacts of each pole are movable and engage at a point substantially midway between their supports

Note 1 to entry: This term applies to high-voltage disconnectors only.

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[SOURCE: IEC 60050-441:2000, 441-14-08]

3.4.104
double-break disconnector
disconnector that opens a circuit at two points

[SOURCE: IEC 60050-441:2000, 441-14-09]

3.4.105
resistor-fitted disconnector
disconnector fitted with resistor in series or in parallel to the switching contacts in order to mitigate the very fast transient overvoltage (VFTO) during both the opening and closing operation in metal-enclosed gas-insulated switchgear

3.4.106
earthing switch
mechanical switching device for earthing parts of a circuit, capable of withstanding for a specified time currents under abnormal conditions such as those of short-circuit, but not required to carry current under normal conditions of the circuit

Note 1 to entry: An earthing switch may have a short-circuit making capacity.

Note 2 to entry: An earthing switch of U_r > 52 kV may have a rating for switching and carrying induced currents.

Note 3 to entry: These devices may sometimes be operated against short-circuit. The different classes of earthing switches are related to the number of short-circuit making operations.

Note 4 to entry: In some cases, earthing switches are used as fault-initiating devices.

[SOURCE: IEC 60050-441:2000, 441-14-11, modified – the Notes 2, 3 and 4 to entry have been added]

3.4.107
combined function earthing switch
earthing switch having a common contact system for earthing and at least one of the following functions:

– disconnecting;
– making and/or breaking of currents up to the short-circuit current.

3.4.108
switch-disconnector
switch which, in the open position, satisfies the isolating requirements specified for a disconnector

[SOURCE: IEC 60050-441:2000, 441-14-12]

3.5 Parts of switching devices

3.5.101
pole of a switching device
portion of a switching device associated exclusively with one electrically separated conducting path of its main circuit and excluding those portions which provide a means for mounting and operating all poles together

Note 1 to entry: A switching device is called single-pole if it has only one pole. If it has more than one pole, it may be called multipole (two-pole, three-pole, etc.) provided the poles are or can be coupled in such a manner as to operate together.

[SOURCE: IEC 60050-441:2000, 441-15-01]

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3.5.102
main circuit
<of a switching device> all the conductive parts of a switching device included in the circuit which it is designed to close or open

[SOURCE: IEC 60050-441:2000, 441-15-02]

3.5.103
contact
<of a mechanical switching device> conductive parts designed to establish circuit continuity when they touch and which, due to their relative motion during an operation, open or close a circuit or, in the case of hinged or sliding contacts, maintain circuit continuity

[SOURCE: IEC 60050-441:2000, 441-15-05]

3.5.104
main contact
contact included in the main circuit of a mechanical switching device, intended to carry, in the closed position, the current of the main circuit

[SOURCE: IEC 60050-441:2000, 441-15-07]

3.5.105
control contact
contact included in a control circuit of a mechanical switching device and mechanically operated by this device

[SOURCE: IEC 60050-441:2000, 441-15-09]

3.5.106
"a" contact
make contact
control or auxiliary contact that is closed when the main contacts of the mechanical switching device are closed and open when they are open

[SOURCE: IEC 60050-441:2000, 441-15-12]

3.5.107
"b" contact
break contact
control or auxiliary contact that is open when the main contacts of a mechanical switching device are closed and closed when they are open

[SOURCE: IEC 60050-441:2000, 441-15-13]

3.5.108
position-indicating device
part of a mechanical switching device that indicates whether it is in the open, closed, or where appropriate, earthed position

[SOURCE: IEC 60050-441:2000, 441-15-25]

3.5.109
position-signalling device
part of a disconnector or earthing switch which uses auxiliary energy to indicate whether the contacts of the main circuit are in the open or closed position

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3.5.110
terminal
conductive part of a device, electric circuit or electric network, provided for connecting that device, electric circuit or electric network to one or more external conductors

[SOURCE: IEC 60050-151:2014, 151-12-12, modified – the note has been deleted.]

3.5.111
contact zone
<for divided support disconnectors and earthing switches> spatial region of positions the fixed contact may take up for correct engagement with the moving contact

3.5.112
power kinematic chain
mechanical connecting system between the operating mechanism and the moving contacts, both included

Note 1 to entry: Refer to Figure 1.

3.5.113
position-indicating kinematic chain
mechanical connecting system between the moving contacts and the position-indicating device(s), both included

3.5.114
position-signalling kinematic chain
mechanical connecting system between the moving contacts and the position of the signalling device(s)

3.5.115
connecting point
most upstream point (i.e. the closest to the source of energy) of the common part of the power and position-indicating/signalling kinematic chains

3.5.116
strain limiting device
device that limits to a defined value the torque or force transmitted to the downstream side of the device irrespective of the torque or force applied to the upstream side

3.5.117
torque (force) controlling system
system that monitors and controls the torque (force) transmitted to the downstream side of the device in comparison with defined value

3.5.118
bushing
device that enables one or several conductors to pass through a partition such as a wall or a tank, and insulate the conductors from it

[SOURCE: IEC 60050-471:2007, 471-02-01, modified – Notes 1 and 2 to entry deleted]

3.5.119
source of energy
origin of the energy released or of the force/torque applied to the power kinematic chain of a switching device during an operation or at any stable position of it

Note 1 to entry: The origin of the energy or force/torque can be human, electrical, hydraulics, pneumatics and mechanics i.e. springs, weights, etc. alone or in combination.

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3.6 Operation

3.6.101
operation
<of a mechanical switching device> transfer of the moving contact(s) from one position to an adjacent position

Note 1 to entry: For a circuit-breaker, this may be a closing operation or an opening operation.

Note 2 to entry: If distinction is necessary, an operation in the electrical sense, e.g. make or break, is referred to as a switching operation, and an operation in the mechanical sense, e.g. close or open, is referred to as a mechanical operation.

[SOURCE: IEC 60050-441:2000, 441-16-01]

3.6.102
operating cycle
<of a mechanical switching device> succession of operations from one position to another and back to the first position through all other positions, if any

[SOURCE: IEC 60050-441:2000, 441-16-02]

3.6.103
closing operation
<of a mechanical switching device> operation by which the device is brought from the open position to the closed position

[SOURCE: IEC 60050-441:2000, 441-16-08]

3.6.104
opening operation
<of a mechanical switching device> operation by which the device is brought from the closed position to the open position

[SOURCE: IEC 60050-441:2000, 441-16-09]

3.6.105
dependent manual operation
<of a mechanical switching device> operation solely by means of directly applied manual energy, such that the speed and force of the operation are dependent upon the action of the operator

Note 1 to entry: Dependent manual operation may be performed by a crank or by a swing lever (horizontal or vertical).

Note 2 to entry: Switching devices with dependent manual operation have not any inherent switching capability.

[SOURCE: IEC 60050-441:2000, 441-16-13, modified – Notes 1 and 2 to entry have been added]

3.6.106
dependent power operation
<of a mechanical switching device> operation by means of energy other than manual, where the completion of the operation is dependent upon the continuity of the power supply (to solenoids, electric or pneumatic motors, etc.)

[SOURCE: IEC 60050-441:2000, 441-16-14]

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3.6.107
stored energy operation
<of a mechanical switching device> operation by means of energy stored in the mechanism itself prior to the completion of the operation and sufficient to complete it under predetermined conditions

Note 1 to entry: This kind of operation may be subdivided according to:

1) the manner of storing the energy (spring, weight, etc.);
2) the origin of the energy (manual, electric, etc.);
3) the manner of releasing the energy (manual, electric, etc.).

[SOURCE: IEC 60050-441:2000, 441-16-15]

3.6.108
independent manual operation
<of a mechanical switching device> stored energy operation where the energy originates from manual power, stored and released in one continuous operation, such that the speed and force of the operation are independent of the action of the operator

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

3.6.109
closed position
<of a mechanical switching device> position in which the predetermined continuity of the main circuit of the device is secured

Note 1 to entry: Predetermined continuity means that the contacts are fully closed to carry the rated continuous and the rated short-circuit currents, as applicable.

[SOURCE: IEC 60050-441:2000, 441-16-22, modified – Note to entry has been added]

3.6.110
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]

3.6.111
toggle point
point beyond which any further movement of the charging mechanism causes the stored energy to be released

3.6.112
mechanical endurance
<of a disconnector or earthing switch> capability of a disconnector or earthing switch to perform a defined number of operations without voltage on or current through the circuit under specified operation conditions

3.7 Characteristic quantities

3.7.101
peak making current
<of an earthing switch> peak value of the first major loop of the current in a pole of the earthing switch during the transient period following the initiation of current during a making operation

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Note 1 to entry: Where, for a three-phase circuit, a single value of (peak) making current is referred to, this is, unless otherwise stated, the highest value in any phase.

3.7.102
peak current
peak value of the first major loop of current during the transient period following initiation

3.7.103
short-time withstand current
current that a circuit or a switching device in the closed position can carry during a specified short time under prescribed conditions of use and behaviour

[SOURCE: IEC 60050-441:2000, 441-17-17]

3.7.104
peak withstand current
value of peak current that a circuit or a switching device in the closed position can withstand under prescribed conditions of use and behaviour

[SOURCE: IEC 60050-441:2000, 441-17-18]

3.7.105
insulation level
set of withstand voltages specified which characterize the dielectric strength of the insulation

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

3.7.106
power frequency withstand voltage
RMS value of sinusoidal power frequency voltage that the insulation of the given equipment can withstand during tests made under specified conditions and for a specified duration

[SOURCE: IEC 60050-614:2016, 614-03-22]

3.7.107
lightning impulse withstand voltage
peak value of the lightning impulse voltage which the insulation of the disconnector or earthing switch withstands under specified test conditions

3.7.108
switching impulse withstand voltage
peak value of the switching impulse voltage which the insulation of the disconnector or earthing switch withstands under specified test conditions

3.7.109
external insulation
distances in atmospheric air, and along the surfaces in contact with atmospheric air of solid insulation of the equipment which are subject to dielectric stresses and to the effects of atmospheric and other environmental conditions from the site

Note 1 to entry: Examples of environmental conditions are pollution, humidity, vermin, etc.

Note 2 to entry: External insulation is either weather-protected or non-weather-protected, designed to operate inside or outside closed shelters, respectively.

[SOURCE: IEC 60050-614:2016, 614-03-02, modified – Note 2 to entry has been added]

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3.7.110
internal insulation
internal distances of the solid, liquid or gaseous insulation of equipment which are protected from the effects of atmospheric and other external conditions

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

3.7.111
self-restoring insulation
insulation which completely recovers its insulating properties within a short time after a disruptive discharge

[SOURCE: IEC 60050-614:2016, 614-03-04]

3.7.112
non-self-restoring insulation
insulation which loses its insulating properties, or does not recover them completely, after a disruptive discharge

Note 1 to entry: Definitions 3.7.111 and 3.7.112 apply only when the discharge is caused by the application of a test voltage during a dielectric test. However, discharges occurring in service can cause a self-restoring insulation to lose partially or completely its original insulating properties.

[SOURCE: IEC 60050-614:2016, 614-03-05, modified – Note to entry has been added]

3.7.113
parallel insulation
insulator arrangement with two insulators in parallel where the distance between the two insulators might influence the dielectric strength

Note 1 to entry: With open terminal disconnectors and earthing switches, parallel insulation is used when a drive insulator is situated next to a support insulator.

3.7.114
disruptive discharge
failure of insulation under electric stress, in which the discharge completely bridges the insulation under test, reducing the voltage between electrodes to practically zero

Note 1 to entry: Non-sustained disruptive discharge in which the test object is momentarily bridged by a spark or arc may occur. During these events the voltage across the test object is momentarily reduced to zero or to a very small value. Depending on the characteristics of the test circuit and the test object, a recovery of dielectric strength may occur and may even allow the test voltage to reach a higher value. Such an event should be interpreted as a disruptive discharge unless otherwise specified by the relevant technical committee.

Note 2 to entry: A disruptive discharge in a solid dielectric produces permanent loss of dielectric strength; in a liquid or gaseous dielectric the loss may be only temporary.

[SOURCE: IEC 60060-1:2010, 3.1.1]

3.7.115
clearance
distance between two conductive parts along a string stretched the shortest way between these conductive parts

[SOURCE: IEC 60050-441:2000, 441-17-31]

3.7.116
clearance between poles
clearance between any conductive parts of adjacent poles

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[SOURCE: IEC 60050-441:2000, 441-17-32]

3.7.117
clearance to earth
clearance between any conductive parts and any parts which are earthed or intended to be earthed

[SOURCE: IEC 60050-441:2000, 441-17-33]

3.7.118
clearance between open contacts
total clearance between the contacts, or any conductive parts connected thereto, of a pole of a mechanical switching device in the open position

Note 1 to entry: The total clearance is the sum of the clearances existing between the contacts.

[SOURCE: IEC 60050-441:2000, 441-17-34, modified – Note to entry has been added]

3.7.119
mechanical terminal load
external load acting on each terminal

Note 1 to entry: The external load is the result of the combined mechanical forces which may be applied to the terminals of the switching device. Wind forces acting on the equipment itself are not included as they do not contribute to the external load acting on terminals.

Note 2 to entry: A disconnector or earthing switch can be subjected to several mechanical forces different in value, direction and point of action.

Note 3 to entry: The terminal loads as defined here do not usually apply to enclosed switchgear.

3.7.119.1
static mechanical terminal load
static mechanical terminal load at each terminal equivalent to the mechanical force to which this terminal of the disconnector or earthing switch is subjected by the flexible or rigid conductor connected to this terminal

Note 1 to entry: The static mechanical terminal load includes forces resulting from ice, wind and connected conductors.

3.7.119.2
dynamic mechanical terminal load
combination of the static mechanical load and the electromagnetic forces under short-circuit conditions

3.7.120
bus-transfer current switching
opening and closing of disconnectors under load when this load is not interrupted, but transferred from one bus to a parallel bus

3.7.121
bus-transfer current
current that flows when a load is transferred from one bus system to another

3.7.122
bus-transfer voltage
power frequency voltage across the open disconnector after breaking or before making the bus-transfer current

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3.7.123
induced current switching
making or breaking of inductive or capacitive currents by an earthing switch, whereupon the currents are induced in an earthed or unearthed system by adjacent energized lines or cables

Note 1 to entry: When two or more transmission lines are mounted together, energy will be induced electrostatically and/or electromagnetically from a live system into a de-energized system resulting in capacitive or inductive currents flowing in this system, depending whether it is earthed at one or at both ends.

3.7.124
electromagnetically induced current
<on an earthing switch> inductive current that flows through an earthing switch when it connects to and disconnects from earth one termination of a de-energized transmission line, with the other termination earthed, and with an energized line carrying current in parallel with, and in proximity to, the earthed line

Note 1 to entry: The inductive current in a de-energized line earthed at both terminations is dependent upon the current in the energized line and the coupling factor to the energized line, as determined by the circuit configuration.

3.7.125
electrostatically induced current
<on an earthing switch> capacitive current that flows through an earthing switch when it connects to and disconnects from earth one termination of a de-energized transmission line, with the other termination open, and with an energized line in parallel with, and in proximity to, the earthed line

Note 1 to entry: The capacitive current in a de-energized line earthed at one termination is dependent upon the voltage of the energized line, the coupling factor to the energized line as determined by the circuit configuration, and the length of the earthed line between the earthed termination and the open termination.

3.7.126
bus-charging current switching
making or breaking of bus-charging currents by disconnectors

3.7.127
bus-charging current
capacitive current that flows when an isolated part of a busbar system is energised or de-energised

3.7.128
transient voltage to earth
U_{TVE}
voltage to earth which appears at the first prestrike during a closing operation of a disconnector

3.7.129
filling pressure for insulation and/or switching
filling density for insulation and/or switching
pressure in Pascal (Pa) for insulation and/or for switching, referred to the standard atmospheric air conditions of +20 °C and 101,3 kPa (or density), which may be expressed in relative or absolute terms, to which the assembly is filled before being put into service, or automatically replenished

[SOURCE: IEC 62271-1:2017, 3.6.5.1]

3.7.130
minimum functional pressure for insulation and/or switching
minimum functional density for insulation and/or switching
pressure (Pa) for insulation and/or for switching, referred to the standard atmospheric air conditions of +20 °C and 101,3 kPa (or density), which may be expressed in relative or

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absolute terms, at which and above which rated characteristics of switchgear and controlgear are maintained and at which a replenishment becomes necessary

[SOURCE: IEC 62271-1:2017, 3.6.5.5]

3.8 Index of definitions

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4 Normal and special service conditions

Clause 4 of IEC 62271-1:2017 is applicable.

5 Ratings

5.1 General

Clause 5 of IEC 62271-1:2017 is applicable for a disconnector or earthing switch, including their operating devices and auxiliary equipment. The list of ratings is complemented with the following items:

k) rated short-circuit making current (for earthing switches only);
l) rated contact zone;
m) rated static mechanical terminal load;
n) rated ice-coating;
o) rated values of the bus-transfer current switching capability (for disconnectors only);
p) rated values of the induced current switching capability (for earthing switches only);
q) rated values of the bus-charging current switching capability (for disconnectors only).

In addition to the rated values given above, the following classifications may be assigned:

r) short-circuit making class (for earthing switches only);
s) mechanical endurance class;
t) induced current switching class (for earthing switches only);
u) bus-charging current switching class (for disconnectors only).

Disconnectors or earthing switches being classified for more than one switching capability may indicate their classification by combined class designations. For example, an earthing

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switch having short-circuit making capability class E1 and an induced current switching capability class B may be classified as class B+E1.

Ratings for making and breaking capabilities cannot be assigned to disconnectors and earthing switches with only manual dependent operation.

In the case of disconnectors and earthing switches with both dependent power and dependent manual operation, any making and breaking capability is not valid for dependent manual operation.

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:

For disconnectors rated above 52 kV and disconnectors having an isolating distance in parallel to the base of the disconnector and having integrated earthing switches, the insulation level between moving parts of the earthing switch and the opposite live parts, during operation of the earthing switch, shall be at least the short-duration power frequency withstand voltage for the smallest gap between them specified in 7.2.6.

If national safety regulations specify higher withstand values for earthing switches that have manual operating mechanisms only, this has to be agreed upon between the user and the manufacturer.

5.4 Rated frequency (f_r)

Subclause 5.4 of IEC 62271-1:2017 is applicable.

5.5 Rated continuous current (I_r)

Subclause 5.5 of IEC 62271-1:2017 is applicable. This subclause applies only to disconnectors.

5.6 Rated short-time withstand current (I_k)

Subclause 5.6 of IEC 62271-1:2017 is applicable with the following addition.

An earthing switch may be assigned a rating different from the rating of the related main circuit (if applicable).

An earthing switch forming an integral part of a combined function earthing switch may be assigned a rating different from the rating of its main circuit.

5.7 Rated peak withstand current (I_p)

Subclause 5.7 of IEC 62271-1:2017 is applicable with the following addition.

An earthing switch may be assigned a rating different from the rating of the related main circuit (if applicable).

An earthing switch forming an integral part of a combined function earthing switch may be assigned a rating different from the rating of its main circuit.

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