IEC 62271-103

Edition 2.0 2021-05

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High-voltage switchgear and controlgear – Part 103: Alternating current switches for rated voltages above 1 kV up to and including 52 kV

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Appareillage à haute tension – Partie 103: Interrupteurs à courant alternatif pour tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV

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3, rue de Varembé
CH-1211 Geneva 20
Switzerland

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.130.10

ISBN 978-2-8322-9770-4

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 103: Alternating current switches for rated voltages above 1 kV up to and including 52 kV

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IEC 62271-103 has been prepared by subcommittee 17A: Switching devices, of IEC technical committee 17: High-voltage switchgear and controlgear. It is an International Standard.

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

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

a) this document has been aligned with IEC 62271-1:2017 and IEC 62271-102:2018;
b) clarifications regarding the behaviour of the switch during breaking tests regarding current interruption and restrikes have been added;
c) conditions of the switch after making and breaking tests have been clarified;
d) a new informative Annex B intended to provide guidance for the calculation of I_{ef1} and I_{ef2} has been added;

e) new rules for the combination of 50 Hz and 60 Hz switching tests have been defined and a new table (Table 7) has been added;

f) tests with specified TRV have been modified to be in accordance with the practice described in IEC 62271-100;

g) the behaviour of the switch during breaking tests has been clarified and boundaries for restrike allowance have been defined;

h) explanations for short-circuit making tests have been added;

i) vacuum integrity check after mechanical operations has been defined;

j) all test voltages for single-phase capacitive testing have been grouped under 7.101.7.3.2 and have been confirmed by simulation and calculation.

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

Draft	Report on voting
17A/1297/FDIS	17A/1303/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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This document 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 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 in the IEC 62271 series, published under the general title *High-voltage switchgear and controlgear*, can be found on the IEC website.

The reader's attention is drawn to the fact that Annex C lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 103: Alternating current switches for rated voltages above 1 kV up to and including 52 kV

1 Scope

This part of IEC 62271 is applicable to three-phase, alternating current switches and switch-disconnectors for their switching function, having making and breaking current ratings, for indoor and outdoor installations, for rated voltages above 1 kV up to and including 52 kV and for rated frequencies from 16 2/3 Hz up to and including 60 Hz. This document is also applicable to single-pole switches used on three-phase systems.

This document is also applicable to the operating devices of these switches and to their auxiliary equipment.

For switch-disconnectors, refer also to IEC 62271-102 for their disconnecting function.

Devices not covered by this document are:

– devices that require a dependent manual operation;
– earthing switches. Earthing switches forming an integral part of a switch are covered by IEC 62271-102;
– switching devices attached as an element of a high-voltage fuse assembly or its mounting and operated by opening and closing the fuse assembly.

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General principles and provisions of this document can also be applicable to single pole switches intended for application in single-phase systems, the requirements for dielectric tests and making and breaking tests being in accordance with the requirements of the specific application.

This document establishes requirements for general, limited and special purpose switches used in distribution systems.

NOTE Except where special clarification is required, the term "switch" is used to refer to all kinds of switches and switch-disconnectors within the scope of this document.

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 60050-441, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses* (available at http://www.electropedia.org)

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

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 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

IEC 62271-110:2017, *High-voltage switchgear and controlgear – Part 110: Inductive load switching*

3 Terms and definitions

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

NOTE Terms and definitions are classified in accordance with IEC 62271-1:2017.

3.1 General terms and definitions

Subclause 3.1 of IEC 62271-1:2017 is applicable with the following additions:

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3.1.101
effectively earthed neutral system
system earthed through a sufficiently low impedance such that for all system conditions the ratio of the zero-sequence reactance to the positive-sequence reactance (X_0/X_1) is positive and less than 3, and the ratio of the zero-sequence resistance to the positive-sequence reactance (R_0/X_1) is positive and less than 1

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Note 1 to entry: Normally such systems are solidly earthed (neutral) systems or low impedance earthed (neutral) systems.

Note 2 to entry: The earthing conditions depend not only on the physical earthing conditions around the relevant location but also on the total system.

3.1.102
non-effectively earthed neutral system
system other than effectively earthed neutral system, not meeting the conditions given in 3.1.101

Note 1 to entry: Normally such systems are isolated neutral systems, high impedance earthed (neutral) systems or resonant earthed (neutral) systems

Note 2 to entry: The earthing conditions depend not only on the physical earthing conditions around the relevant location but also on the total system.

3.2 Assemblies of switchgear and controlgear

Subclause 3.2 of IEC 62271-1:2017 applies.

3.3 Parts of assemblies

Subclause 3.3 of IEC 62271-1:2017 applies.

3.4 Switching devices

Subclause 3.4 of IEC 62271-1:2017 applies with the following additions:

3.4.101
switch
mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions, which may include specified operating overload conditions and also carrying for a specified time currents under specified abnormal circuit conditions, such as those of a short-circuit

Note 1 to entry: Some switches can be capable of making short-circuit currents.

Note 2 to entry: A switch is not capable of breaking short-circuit currents.

[SOURCE: IEC 60050-441:2000, 441-14-10, modified – In the term, "(mechanical)" has been deleted and the Note has been replaced with two Notes to entry.]

3.4.102
switch-disconnector
switch which, in the open position, satisfies the isolating requirements specified for a disconnector

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

3.4.103
general purpose switch
switch capable of performing, with currents up to its rated breaking currents, all making and breaking operations which may normally occur in distribution systems, regardless of whether it is an effectively earthed neutral system or non-effectively earthed neutral system, and able to carry and make short-circuit currents

SIST Preview
IEC 62271-103:2021
https://standards.iteh.ai/catalog/standards/sist/8af7530c-3157-42c9-823a-e710d3762b0e/iec-62271-103-2021

3.4.104
limited purpose switch
switch which has a rated continuous current, a rated short-time withstand current, and one or more but not all switching capabilities of a general purpose switch

3.4.105
special purpose switch
general purpose switch or limited purpose switch suitable for one or more of the following applications:

– switching single capacitor banks;
– switching back-to-back capacitor banks;
– switching of motors under steady-state and stalled conditions;
– switching of closed-loop circuits consisting of large power transformers in parallel

Note 1 to entry: Large power transformers are different from distribution transformers (typically power higher than 2 500 KVA).

3.5 Parts of switchgear and controlgear

Subclause 3.5 of IEC 62271-1:2017 applies with the following addition:

3.5.101
main contact zone
area of the contact intended to carry its rated continuous current

3.6 Operational characteristics of switchgear and controlgear

Subclause 3.6 of IEC 62271-1:2017 applies with the following additions:

3.6.101
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

Note 1 to entry: This may be a closing operation followed by an opening operation or vice versa.

[SOURCE: IEC 60050-441:2000, 441-16-02, modified – The note to entry has been added.]

3.6.102
electrical endurance of a general purpose switch
capability of a general purpose switch to perform a defined number of making and breaking operations for a defined voltage and current under specified operation conditions

3.6.103
mechanical endurance of a switch
capability of a switch to perform a defined number of close-open operations without voltage on or current through under specified operation conditions

3.7 Characteristic quantities

Subclause 3.7 of IEC 62271-1:2017 applies with the following additions:

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3.7.101
breaking capacity
<of a switching device> current that a switching device is capable of breaking at a stated voltage under prescribed conditions of use and behaviour

IEC 62271-103:2021
https://ecommerce.sist.si/catalog/standards/sist/8af7530e-2157-42c9-823a-e710d3762b0a/iec-62271-103-2021

Note 1 to entry: The voltage to be stated and the conditions to be prescribed are dealt with in the relevant publications.

Note 2 to entry: For switching devices, the breaking capacity may be termed according to the kind of current included in the prescribed conditions, e.g. line-charging breaking capacity, cable-charging breaking capacity, single capacitor bank breaking capacity, etc.

Note 3 to entry: Any breaking capacity implies also the making capacity of the corresponding circuit.

[SOURCE: IEC 60050-441:2000, 441-17-08, modified – The domain has been limited to switching devices, "a value of prospective" and "or a fuse" have been deleted, Note 3 to entry has been added.]

3.7.102
mainly active load-breaking capacity
breaking capacity when opening a mainly active load circuit in which the load can be represented by resistors and reactors in parallel

3.7.103
no-load transformer breaking capacity
breaking capacity when opening a transformer circuit under no-load conditions

Note 1 to entry: Because of the variety of transformers and associated circuits, it is not possible to define a rating for this breaking capacity. However, all switches capable of switching an active load are capable of breaking no-load transformer breaking currents.