

INTERNATIONAL STANDARD

NORME INTERNATIONALE

High-voltage switchgear and controlgear –
Part 103: Switches for rated voltages above 1 kV up to and including 52 kV
(standards.iteh.ai)

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

ITEH STANDARD PREVIEW

IEC 62271-103:2011

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CONTENTS

FOREWORD.....	6
1 General.....	8
1.1 Scope.....	8
1.2 Normative references.....	8
2 Normal and special service conditions.....	9
3 Terms and definitions.....	9
3.1 General terms.....	9
3.2 Assemblies of switchgear and controlgear.....	9
3.3 Parts of assemblies.....	9
3.4 Switching devices.....	9
3.5 Parts of switchgear and controlgear.....	11
3.6 Operation.....	11
3.7 Characteristic quantities.....	11
3.8 Index of definitions.....	13
4 Ratings.....	14
4.1 Rated voltage (U_r).....	14
4.2 Rated insulation level.....	15
4.3 Rated frequency (f_r).....	15
4.4 Rated normal current and temperature rise.....	15
4.5 Rated short-time withstand current (I_k).....	15
4.6 Rated peak withstand current (I_p).....	15
4.7 Rated duration of short-circuit (t_k).....	15
4.8 Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U_a).....	15
4.9 Rated supply frequency of closing and opening devices and of auxiliary circuits.....	15
4.10 Rated pressure of compressed gas supply for controlled pressure systems.....	15
4.11 Rated filling levels for insulation and/or operation.....	15
4.101 Rated mainly active load-breaking current (I_{load}).....	15
4.102 Rated closed-loop breaking current (I_{loop} and I_{pptr}).....	16
4.103 Rated cable-charging breaking current (I_{cc}).....	16
4.104 Rated line-charging breaking current (I_{lc}).....	16
4.105 Rated single capacitor bank breaking current for special purpose switches (I_{sb}).....	16
4.106 Rated back-to-back capacitor bank breaking current for special purpose switches (I_{bb}).....	16
4.107 Rated back-to-back capacitor bank inrush making current for special purpose switches (I_{in}).....	16
4.108 Rated earth fault breaking current (I_{ef1}).....	16
4.109 Rated cable- and line-charging breaking current under earth fault conditions (I_{ef2}).....	17
4.110 Rated motor breaking current for special purpose switches (I_{mot}).....	17
4.111 Rated short-circuit making current (I_{ma}).....	17
4.112 Rated breaking and making currents for a general purpose switch.....	17
4.113 Ratings for limited purpose switches.....	18
4.114 Ratings for special purpose switches.....	18
4.115 Ratings for switches backed by fuses.....	18

4.116	Type and classes for general purpose, limited purpose and special purpose switches	18
5	Design and construction	19
5.1	Requirements for liquids in switchgear and controlgear	19
5.2	Requirements for gases in switchgear and controlgear	19
5.3	Earthing of switchgear and controlgear	19
5.4	Auxiliary and control equipment	19
5.5	Dependent power operation	19
5.6	Stored energy operation	19
5.7	Independent manual or power operation (independent unlatched operation)	19
5.8	Operation of releases	19
5.9	Low- and high-pressure interlocking and monitoring devices	19
5.10	Nameplates	19
5.11	Interlocking devices	21
5.12	Position indication	21
5.13	Degrees of protection provided by enclosures	21
5.14	Creepage distances for outdoor insulators	21
5.15	Gas and vacuum tightness	21
5.16	Liquid tightness	21
5.17	Fire hazard (flammability)	22
5.18	Electromagnetic compatibility (EMC)	22
5.19	X-ray emission	22
5.20	Corrosion	22
5.101	Making and breaking operations	22
5.102	Requirements for switch-disconnectors	22
5.103	Mechanical strength	22
5.104	Securing the position	22
5.105	Auxiliary contacts for signalling	22
5.106	No-load transformer breaking	23
6	Type tests	23
6.1	General	23
6.1.1	Grouping of tests	23
6.1.2	Information for identification of specimens	24
6.1.3	Information to be included in the type-test reports	24
6.1.101	Reference no-load test	24
6.2	Dielectric tests	24
6.3	Radio interference voltage (r.i.v.) test	24
6.4	Measurement of the resistance of circuits	24
6.5	Temperature-rise tests	24
6.6	Short-time withstand current and peak withstand current tests	24
6.7	Verification of the protection	25
6.8	Tightness tests	25
6.9	Electromagnetic compatibility (EMC) tests	25
6.10	Additional tests on auxiliary and control circuits	25
6.10.1	General	25
6.10.2	Functional tests	25
6.10.3	Electrical continuity of earthed metallic parts test	25
6.10.4	Verification of the operational characteristics of auxiliary contacts	25
6.10.5	Environmental tests	25

6.10.6	Dielectric test	25
6.11	X-radiation test procedure for vacuum interrupters	25
6.101	Making and breaking tests	26
6.101.1	Test duties for general purpose switches	26
6.101.2	Test duties for limited purpose switches	28
6.101.3	Test duties for special purpose switches	28
6.101.4	Arrangement of the switch for tests	30
6.101.5	Earthing of test circuit and switch	30
6.101.6	Test parameters	31
6.101.7	Test circuits	33
6.101.8	Behaviour of switch during breaking tests	46
6.101.9	Condition of switch after breaking tests and short-circuit making tests	47
6.101.10	Type-test reports	48
6.102	Mechanical and environmental tests	49
6.102.1	Miscellaneous provisions for mechanical and environmental tests	49
6.102.2	Mechanical operation test at ambient air temperature	51
6.102.3	Low and high temperature tests	52
6.102.4	Humidity test on auxiliary and control circuits	52
6.102.5	Operation under severe ice conditions	58
6.102.6	Tests to verify the proper functioning of the position indicating device	58
7	Routine tests	59
7.101	Mechanical operating tests	59
8	Guide to the selection of switchgear and controlgear	60
8.101	General	60
8.102	Conditions affecting application	60
8.103	Insulation coordination	60
8.104	Selection of class of switch	60
8.104.1	General purpose switch	60
8.104.2	Limited purpose switch	61
8.104.3	Special purpose switch	61
8.105	Tests for special applications	61
9	Information to be given with inquiries, tenders and orders	61
9.1	Information to be given with inquiries and orders	61
9.2	Information to be given with tenders	62
10	Transport, storage, installation, operation and maintenance	63
11	Safety	63
12	Influence of the product on the environment	63
Annex A (normative)	Tolerances on test quantities for type tests	64
Bibliography	66
Figure 1	– Three-phase test circuit for mainly active load current switching for test duty TD_{load}	34
Figure 2	– Single-phase test circuit for mainly active load current switching for test duty TD_{load}	35
Figure 3	– Three-phase test circuit for distribution line closed-loop and parallel transformer current switching test for test duties TD_{loop} and TD_{ptr}	37

Figure 4 – Single-phase test circuit for distribution line closed-loop and parallel transformer current switching test, for test duties TD_{loop} and TD_{pptr}	37
Figure 5 – General test circuit for three- and single-phase capacitive switching tests.....	42
Figure 6 – Prospective TRV parameter limits for capacitor bank current breaking tests.....	44
Figure 7 – Three-phase test circuit for earth fault breaking current tests, for test duty TD_{ef1}	45
Figure 8 – Three-phase test circuit for cable-charging breaking current tests under earth fault conditions, for test duty TD_{ef2}	45
Figure 9 – Three-phase test circuit for short-circuit making current test for test duty TD_{ma}	46
Figure 10 – Single-phase test circuit for short-circuit making current test for test duty TD_{ma}	46
Figure 11 – Test sequences for low and high temperature tests	53
Figure 12 – Humidity test.....	57
Table 1 – Preferred values of rated line- and cable-charging breaking currents for general purpose switch	17
Table 2 – Product information	20
Table 3 – Test duties for general purpose switches – Test duties for three-phase tests on three-pole operated, switches	26
Table 4 – Test duties for general purpose switches – Single phase tests on three-pole switches operated pole-after-pole and single-pole switches applied on three-phase systems	27
Table 5 – Test duties for special purpose switches – Three-phase tests on three-pole operated, switches	29
Table 6 – Test duties for special purpose switches – Single phase tests on three-pole switches operated pole-after-pole and single-pole switches applied on three-phase systems	29
Table 7 – Supply circuit TRV parameters for mainly active load current breaking tests ^a	36
Table 8 – TRV parameters for distribution line closed loop breaking tests.....	38
Table 9 – TRV parameters for parallel power transformer current breaking tests.....	39
Table 10 – Prospective recovery voltage parameter limits for capacitor bank current breaking tests	43
Table A.1 – Tolerances on test quantities for type tests	64

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 103: Switches for rated voltages above 1 kV
up to and including 52 kV**

FOREWORD

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

This standard cancels and replaces the third edition of IEC 60265-1, published in 1998. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 60265-1:1998:

- the rated voltage of 52 kV is now included;
- the document is aligned with IEC 62271-1 and IEC 62271-100;
- addition of a test procedure for short-circuit making tests;
- introduction of notion of NSDD (non-sustained disruptive discharge) as defined in IEC 62271-1 and restrikes;
- new classes C1 and C2 for capacitive switching;

– new Annex A defining tolerances.

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

FDIS	Report on voting
17A/961/FDIS	17A/966/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 standard is to be read in conjunction with IEC 62271-1:2007, to which it refers and which is applicable unless otherwise specified in this standard. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC 62271-1. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101.

The 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.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
- replaced by a revised edition, or [IEC 62271-103:2011](http://standards.iteh.ai/catalog/standards/sist/14208a6c-ca9c-497e-b754-4c2d24e03ad6/iec-62271-103-2011)
- amended. <https://standards.iteh.ai/catalog/standards/sist/14208a6c-ca9c-497e-b754-4c2d24e03ad6/iec-62271-103-2011>

The contents of the corrigendum of October 2013 have been included in this copy.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 103: Switches for rated voltages above 1 kV up to and including 52 kV

1 General

1.1 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 standard is also applicable to single-pole switches used on three phase systems.

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

Switch-disconnectors are also covered by IEC 62271-102 for their disconnecting function.

Devices that require a dependent manual operation are not covered by this standard.

General principles and provisions of this standard may also be applicable to single pole switches intended for application in single-phase systems. The requirements for dielectric tests and making and breaking tests should be in accordance with the requirements of the specific application. <https://standards.iteh.ai/catalog/standards/sist/14208a6c-ea9c-497e-b754-4c2d24e03ad6/iec-62271-103-2011>

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

It is assumed that opening and closing operations are performed according to the manufacturer's instructions. A making operation may immediately follow a breaking operation but a breaking operation should not immediately follow a making operation since the current to be broken may then exceed the rated breaking current of the switch.

NOTE 1 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 standard.

NOTE 2 Earthing switches are not covered by this standard. Earthing switches forming an integral part of a switch are covered by IEC 62271-102.

NOTE 3 This standard is not applicable to switching devices attached as an accessory to a high-voltage fuse assembly or its mounting and operated by opening and closing the fuse assembly.

1.2 Normative references

The following referenced documents are indispensable for the application 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) – Chapter 441: Switchgear, controlgear and fuses*

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

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications*

IEC 62271-100:2008, *High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers*

IEC 62271-102:2001, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

IEC 62271-110:2009, *High-voltage switchgear and controlgear – Part 110: Inductive load switching*

2 Normal and special service conditions

Clause 2 of IEC 62271-1 is applicable.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-441 and IEC 62271-1, as well as the following apply.

NOTE 1 Some terms and definitions are recalled hereunder for easier use or for the necessity of some precision or adaptation for the interpretation of this standard.

NOTE 2 The terms and definitions given below are classified in accordance with IEC 60050-441. The additional terms and definitions are classified so as to be aligned with the classification used in IEC 60050-441.

3.1 General terms

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

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. Normally such systems are solidly earthed (neutral) systems or low impedance earthed (neutral) systems

NOTE For the correct assessment of the earthing conditions not only the physical earthing conditions around the relevant location but the total system is to be considered.

3.1.102

non-effectively earthed neutral system

system other than effectively earthed neutral system, not meeting the conditions given in 3.1.101. Normally such systems are isolated neutral systems, high impedance earthed (neutral) systems or resonant earthed (neutral) systems

NOTE For the correct assessment of the earthing conditions not only the physical earthing conditions around the relevant location but the total system is to be considered.

3.2 Assemblies of switchgear and controlgear

Subclause 3.2 of IEC 62271-1 applies.

3.3 Parts of assemblies

Subclause 3.3 of IEC 62271-1 applies.

3.4 Switching devices

Subclause 3.4 of IEC 62271-1 applies with the following addition.

**3.4.101
switch**

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

[IEC 60050-441:1984, 441-14-10, modified]

**3.4.102
switch-disconnector**

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

[IEC 60050-441:1984, 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. The switch is also capable of carrying and making short-circuit currents

**3.4.103.1
class E1 general purpose switch**

general purpose switch capable of performing a basic electrical endurance of load breaking currents and short-circuit makings

NOTE This class is typically adequate for applications where infrequent switching operations are performed or where appropriate inspection and replacement of switching parts is permissible.

**3.4.103.2
class E2 general purpose switch** [IEC 62271-103:2011](#)

general purpose switch capable of performing a medium electrical endurance of load breaking currents and short-circuit makings

NOTE This class is typically adequate for applications where infrequent switching operations are performed but where inspection and replacement of switching parts is not permissible or possible.

**3.4.103.3
class E3 general purpose switch**

general purpose switch capable of performing a high electrical endurance of load breaking currents and short-circuit makings

NOTE This class is typically adequate for applications where frequent switching operations are performed and inspection and replacement of switching parts is not permissible or possible.

**3.4.103.4
class M1 switch**

switch suitable for applications requiring a mechanical endurance of 1 000 operations

**3.4.103.5
class M2 switch**

switch suitable for special service applications and for frequent operation having an extended mechanical endurance of 5 000 operations

**3.4.103.6
class C1 switch**

switch with capability of capacitive current breaking as demonstrated by specific type tests (test duties I_{CC} , I_{IC} , I_{sb} and I_{bb})

**3.4.103.7
class C2 switch**

switch with very low probability of restrike during capacitive current breaking as demonstrated by specific type tests (test duties I_{CC} , I_{IC} , I_{sb} and I_{bb})

3.4.104**limited purpose switch**

switch which has a rated normal 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 closed-loop circuits consisting of large power transformers in parallel;
- switching of motors under steady-state and stalled conditions

3.4.105.1**single capacitor bank switch**

special purpose switch intended for switching of a single capacitor bank with charging currents up to its rated single capacitor bank breaking current

3.4.105.2**back-to-back capacitor bank switch**

special purpose switch intended for breaking capacitor bank charging currents with one or more capacitor banks connected to the supply side of the switch up to its rated back-to-back capacitor bank breaking current. The switch is capable of making the associated inrush current up to its rated capacitor bank inrush making current.

3.4.105.3**motor switch**

special purpose switch intended for switching of motors under steady-state and stalled conditions

3.4.105.4**parallel power transformer closed-loop switch**

special purpose switch intended for switching a closed-loop circuit consisting of large power transformers in parallel

NOTE The switch is typically applied as a medium voltage tie switch on the transformer secondary circuit such that the breaking current is high and the transient recovery voltage (TRV) conditions are severe

3.5 Parts of switchgear and controlgear

Subclause 3.5 of IEC 62271-1 applies.

3.6 Operation

Subclause 3.6 of IEC 62271-1 applies.

3.7 Characteristic quantities

Subclause 3.7 of IEC 62271-1 applies with the following addition.

3.7.101**breaking capacity**

value of prospective current that a switching device or a fuse is capable of breaking at a stated voltage under prescribed conditions of use and behaviour

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

NOTE 2 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.

[IEC 60050-441:1984, 441-17-08, modified]

3.7.102

mainly active load-breaking capacity

breaking capacity when opening a mainly active load circuit, the power factor of which is at least 0,75, 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

3.7.104

closed-loop breaking capacity

breaking capacity when opening a closed-loop distribution line circuit, or a power transformer in parallel with one or more power transformers, i.e., a circuit in which both sides of the switch remain energized after breaking

3.7.105

cable-charging breaking capacity

breaking capacity when opening a cable circuit under no-load conditions

3.7.106

line-charging breaking capacity

breaking capacity when opening an overhead line circuit under no-load conditions

3.7.107

single capacitor bank breaking capacity

breaking capacity when opening a single capacitor bank circuit connected to a supply that does not include another capacitor bank adjacent to the bank being switched

3.7.108

back-to-back capacitor bank breaking capacity

breaking capacity when opening a capacitor bank circuit connected to a supply that includes one or more capacitor banks adjacent to the bank being switched

3.7.109

back-to-back capacitor bank inrush making current

high-frequency and high-magnitude current occurring when closing a capacitor bank circuit onto a supply including one or more capacitor banks adjacent to the bank being switched

3.7.110

motor breaking capacity

breaking capacity when opening a motor under steady-state and stalled conditions

3.7.111

earth fault breaking capacity

breaking capacity in the faulty phase of a non-effectively earthed neutral system when clearing an earth fault on an unloaded cable or overhead line on the load side of the switch

3.7.112

cable- and line-charging breaking capacity under earth fault conditions

breaking capacity in the sound phases of a non-effectively earthed neutral system when switching off an unloaded cable or overhead line, with an earth fault on the supply side of the switch

3.7.113**breaking current**

current in a pole of a switching device or in a fuse at the instant of initiation of the arc during a breaking process

[IEC 60050-441:1984, 441-17-07]

3.7.114**(peak) making current**

peak value of the first major loop of the current in a pole of a switch during the transient period following the initiation of current during a making operation

NOTE 1 Peak value may differ from one pole to another and from one operation to another as it depends on the instant of current initiation relative to the wave of the applied voltage.

NOTE 2 Where, for a three-phase circuit, a single value of (peak) making current is referred to, it is, unless otherwise stated, the highest value in any phase.

3.7.115**short-circuit making capacity**

making capacity for which the prescribed conditions include a short circuit at the terminals of the switching device

[IEC 60050-441:1984, 441-17-10]

3.7.116**restrike performance**

expected probability of restrike during capacitive current interruption as demonstrated by specified type tests

NOTE Specific numeric probabilities cannot be applied throughout a switch service life.

3.7.117**re-ignition (of an a.c. mechanical switching device)**

resumption of current between the contacts of a mechanical switching device during a breaking operation with an interval of zero current of less than a quarter cycle of power frequency

[IEC 60050-441:1984, 441-17-45]

3.7.118**restrike (of an a.c. mechanical switching device)**

resumption of power frequency current, or in the case of capacitive current interruption a resumption of current in the main load circuit, between the contacts of a mechanical switching device during a breaking operation with an interval of zero current of a quarter cycle of power frequency or longer

[IEC 60050-441:1984, 441-17-46, modified]

3.8 Index of definitions**B**

Back-to-back capacitor bank breaking capacity	3.7.108
Back-to-back capacitor bank inrush making current	3.7.109
Back-to-back capacitor bank switch	3.4.105.2
Breaking capacity	3.7.101
Breaking current	3.7.113

C

Cable- and line-charging breaking capacity under earth fault conditions	3.7.112
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