

© Copyright SEK. Reproduction in any form without permission is prohibited.

Kopplingsapparater för spänning över 1 kV – Del 103: Lastbrytare och lastfrånskiljare med märkspänning över 1 kV men högst 52 kV

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

Som svensk standard gäller europastandarden EN 62271-103:2011. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62271-103:2011.

Nationellt förord

Europastandarden EN 62271-103:2011

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62271-103, First edition, 2011 - High-voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 60265-1, utgåva 1, 1998, gäller ej fr o m 2014-07-21.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English version

**High-voltage switchgear and controlgear -
Part 103: Switches for rated voltages above 1 kV
up to and including 52 kV
(IEC 62271-103:2011)**

Appareillage à haute tension -
Partie 103: Interrupteurs pour tensions
assignées supérieures à 1 kV et
inférieures ou égales à 52 kV
(CEI 62271-103:2011)

Hochspannungs-Schaltgeräte und -
Schaltanlagen -
Teil 103: Lastschalter für
Bemessungsspannungen über 1 kV bis
einschließlich 52 kV
(IEC 62271-103:2011)

This European Standard was approved by CENELEC on 2011-07-21. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 17A/961/FDIS, future edition 1 of IEC 62271-103, prepared by SC 17A, High-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62271-103 on 2011-07-21.

This European Standard supersedes EN 60265-1:1998.

EN 62271-103:2011 includes the following significant technical changes with respect to EN 60265-1:1998:

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2012-04-21 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2014-07-21 |

Annexes ZA and ZB have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62271-103:2011 was approved by CENELEC as a European Standard without any modification.

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

IEC 60059	NOTE Harmonized as EN 60059.
IEC 60071-1:2006	NOTE Harmonized as EN 60071-1:2006 (not modified).
IEC 62271-105	NOTE Harmonized as EN 62271-105.
IEC 60507	NOTE Harmonized as EN 60507.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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)	EN 60529 + corr. May	1991 1993
IEC 62271-1	2007	High-voltage switchgear and controlgear - Part 1: Common specifications	EN 62271-1	2008
IEC 62271-100	2008	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers	EN 62271-100	2009
IEC 62271-102	2001	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	EN 62271-102 + corr. July + corr. March	2002 2008 2005
IEC 62271-110	2009	High-voltage switchgear and controlgear - Part 110: Inductive load switching	EN 62271-110	2009

CONTENTS

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_{ptr}).....	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

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 $16\frac{2}{3}$ 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.

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*