

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

## **Kopplingsapparater för spänning över 1 kV – Del 200: Metallkapslade ställverk för växelström med märkspänning 1 kV t o m 52 kV**

*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*

Som svensk standard gäller europastandarden EN 62271-200:2012. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62271-200:2012.

### **Nationellt förord**

Europastandarden EN 62271-200:2012

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62271-200, Second edition, 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**

utarbetad inom International Electrotechnical Commission, IEC.

Standarden ska användas tillsammans med SS-EN 62271-1, utgåva 1, 2009.

Tidigare fastställd svensk standard SS-EN 62271-200, utgåva 1, 2004, gäller ej fr o m 2014-11-28.

### *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](http://www.elstandard.se)

**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 62271-200:2011)**

Appareillage à haute tension -  
Partie 200: Appareillage sous enveloppe  
métallique pour courant alternatif de  
tensions assignées supérieures à 1 kV et  
inférieures ou égales à 52 kV  
(CEI 62271-200:2011)

Hochspannungs-Schaltgeräte und -  
Schaltanlagen -  
Teil 200: Metallgekapselte Wechselstrom-  
Schaltanlagen für  
Bemessungsspannungen über 1 kV bis  
einschließlich 52 kV  
(IEC 62271-200:2011)

This European Standard was approved by CENELEC on 2011-11-28. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre 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, Turkey 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 17C/523/FDIS, future edition 2 of IEC 62271-200, prepared by SC 17C, "High-voltage switchgear and controlgear assemblies", of IEC/TC 17, "Switchgear and controlgear" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62271-200:2012.

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) | 2012-08-28 |
| • latest date by which the national standards conflicting with the document have to be withdrawn   | (dow) | 2014-11-28 |

This document supersedes EN 62271-200:2004.

EN 62271-200:2012 has been further updated and improved to the experience gained with EN 62271-200:2004. As maintenance result, EN 62271-200:2012 introduces the following significant changes:

- definitions, classifications and testing procedures are specified more precisely;
- categories LSC2A and LSC2B have been clarified and LSC2 has been assigned a separate definition;
- specific ratings related to fault level to earth (4.5 to 4.7) are introduced;
- solid insulated high-voltage parts are no longer considered as compartments on their own;
- an optional rating "cable test voltage" and the associated requirements and type tests are introduced;
- for testing the internal arc classification, when assigned by the manufacturer, more specific guidance is provided regarding the test arrangement, room simulation and arc initiation;
- a single phase to earth ignition is also recognised for internal arc testing;
- the Annexes A and B are renumbered Annexes AA and BB.

The level of severity of internal arc testing is maintained without changes.

This European Standard should be read in conjunction with EN 62271-1:2008, 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 EN 62271-1. Amendments to these clauses and subclauses are given under the same numbering, whilst additional subclauses, are numbered from 101.

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

### **Endorsement notice**

The text of the International Standard IEC 62271-200:2011 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 60059:1999	NOTE Harmonized as EN 60059:1999 (not modified).
IEC 60243-1:1998	NOTE Harmonized as EN 60243-1:1998 (not modified).
IEC 60909-0:2001	NOTE Harmonized as EN 60909-0:2001 (not modified).
IEC 62271-203:2003	NOTE Harmonized as EN 62271-203:2004 (not modified).
IEC/TR 62271-303:2008	NOTE Harmonized as CLC/TR 62271-303:2009 (not modified).

## 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 60050-151	-	International Electrotechnical Vocabulary (IEV) - Part 151: Electrical and magnetic devices	-	-
IEC 60050-441	1984	International Electrotechnical Vocabulary (IEV) - Chapter 441: Switchgear, controlgear and fuses	-	-
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60470	1999	High-voltage alternating current contactors and contactor-based motor starters	EN 60470 <sup>1)</sup> + corr. June	2000 2000
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 62262	-	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)	EN 62262	-
IEC 62271-1	2007	High-voltage switchgear and controlgear - Part 1: Common specifications	EN 62271-1	2008
IEC 62271-100	-	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers	EN 62271-100	-
IEC 62271-102 + corr. April + corr. February + corr. May	2001 2002 2005 2003	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	EN 62271-102 + corr. July + corr. March	2002 2008 2005
IEC 62271-103	-	High-voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV up to and including 52 kV	EN 62271-103	-
IEC 62271-105	-	High-voltage switchgear and controlgear - Part 105: Alternating current switch-fuse combinations	EN 62271-105	-
IEC 62271-201	2006	High-voltage switchgear and controlgear - Part 201: AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	EN 62271-201 + corr. November	2006 2006

<sup>1)</sup> EN 60470:2000 is superseded by EN 62271-106:2011, which is based on IEC 62271-106:2011.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC/TS 62271-304	-	High-voltage switchgear and controlgear - Part 304: Design classes for indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV to be used in severe climatic conditions	CLC/TS 62271-304	-
ISO/IEC Guide 51	1999	Safety aspects - Guidelines for their inclusion in standards		-

## CONTENTS

1	General .....	7
1.1	Scope.....	7
1.2	Normative references .....	8
2	Normal and special service conditions .....	8
3	Terms and definitions .....	9
4	Ratings.....	15
4.1	Rated voltage ( $U_r$ ) .....	15
4.2	Rated insulation level .....	16
4.3	Rated frequency ( $f_r$ ).....	16
4.4	Rated normal current and temperature rise .....	16
4.5	Rated short-time withstand currents ( $I_k$ ).....	16
4.6	Rated peak withstand current ( $I_p$ ) .....	16
4.7	Rated durations of short circuit ( $t_k$ ) .....	17
4.8	Rated supply voltage of closing and opening devices and of auxiliary and control circuits ( $U_a$ ).....	17
4.9	Rated supply frequency of closing and opening devices and of auxiliary circuits.....	17
4.10	Rated pressure of compressed gas supply for controlled pressure systems .....	17
4.11	Rated filling levels for insulation and/or operation .....	17
4.101	Ratings of the internal arc classification (IAC).....	17
4.102	Rated cable test voltages .....	19
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 .....	20
5.4	Auxiliary and control equipment .....	21
5.5	Dependent power operation .....	21
5.6	Stored energy operation .....	21
5.7	Independent manual or power operation (independent unlatched operation) .....	21
5.8	Operation of releases .....	21
5.9	Low- and high-pressure interlocking and monitoring devices.....	21
5.10	Nameplates .....	21
5.11	Interlocking devices .....	23
5.12	Position indication .....	23
5.13	Degrees of protection by enclosures .....	24
5.14	Creepage distances for outdoor insulators .....	24
5.15	Gas and vacuum tightness.....	24
5.16	Liquid tightness .....	24
5.17	Fire hazard (flammability) .....	24
5.18	Electromagnetic compatibility (EMC) .....	24
5.19	X-ray emission.....	24
5.20	Corrosion.....	24
5.101	Internal arc fault .....	25
5.102	Enclosure .....	25
5.103	High-voltage compartments .....	27



5.104	Removable parts .....	30
5.105	Provisions for dielectric tests on cables .....	30
6	Type tests .....	31
6.1	General .....	31
6.2	Dielectric tests .....	32
6.3	Radio interference voltage (r.i.v.) test .....	35
6.4	Measurement of the resistance of circuits .....	35
6.5	Temperature-rise tests .....	36
6.6	Short-time withstand current and peak withstand current tests .....	37
6.7	Verification of the protection .....	38
6.8	Tightness tests .....	39
6.9	Electromagnetic compatibility tests (EMC) .....	39
6.10	Additional tests on auxiliary and control circuits .....	39
6.11	X-radiation test procedures for vacuum interrupters .....	40
6.101	Verification of making and breaking capacities .....	40
6.102	Mechanical operation tests .....	41
6.103	Pressure withstand test for gas-filled compartments .....	42
6.104	Tests to verify the protection of persons against dangerous electrical effects .....	43
6.105	Weatherproofing test .....	44
6.106	Internal arc test .....	44
7	Routine tests .....	47
7.1	Dielectric test on the main circuit .....	48
7.2	Tests on auxiliary and control circuits .....	48
7.3	Measurement of the resistance of the main circuit .....	48
7.4	Tightness test .....	48
7.5	Design and visual checks .....	48
7.101	Partial discharge measurement .....	48
7.102	Mechanical operation tests .....	49
7.103	Pressure tests of gas-filled compartments .....	49
7.104	Tests of auxiliary electrical, pneumatic and hydraulic devices .....	49
7.105	Tests after erection on site .....	49
7.106	Measurement of fluid condition after filling on site .....	50
8	Guide to the selection of switchgear and controlgear .....	50
8.101	General .....	50
8.102	Selection of rated values .....	50
8.103	Selection of design and construction .....	50
8.104	Internal arc fault .....	55
8.105	Summary of technical requirements, ratings and optional tests .....	59
8.106	Ratings of earthing circuits .....	61
8.107	Ratings for cable testing .....	61
9	Information to be given with enquiries, tenders and orders .....	61
9.1	Information with enquiries and orders .....	61
9.2	Information with tenders .....	62
10	Transport, storage, installation, operation and maintenance .....	63
10.1	Conditions during transport, storage and installation .....	63
10.2	Installation .....	63
10.3	Operation .....	63

10.4 Maintenance.....	63
11 Safety.....	63
11.101 Procedures.....	64
11.102 Internal arc aspects.....	64
12 Influence of the product on the environment .....	64
Annex AA (normative) Internal arc fault – Method to verify the internal arc classification (IAC).....	65
Annex BB (normative) Partial discharge measurement.....	80
Annex CC (informative) Regional deviations .....	86
Bibliography.....	87
Figure 101 – LSC1.....	54
Figure 102 – LSC2.....	54
Figure 103 – LSC2.....	54
Figure 104 – LSC2A .....	54
Figure 105 – LSC2B .....	54
Figure 106 – LSC2B .....	54
Figure AA.1 – Mounting frame for vertical indicators .....	73
Figure AA.2 – Horizontal indicator.....	73
Figure AA.3 – Position of the indicators .....	74
Figure AA.4 – Room simulation and indicator positioning for accessibility A, classified rear side, functional unit of any height .....	75
Figure AA.5 – Room simulation and indicator positioning for accessibility B, classified rear side, functional unit greater than or equal to 1 900 mm high .....	76
Figure AA.6 – Room simulation and indicator positioning for accessibility B, classified rear side, functional unit less than 1 900 mm high.....	77
Figure AA.7 – Test arrangement for overhead connected pole-mounted switchgear and controlgear.....	78
Figure AA.8 – Ceiling height stated from the floor or false floor level where the switchgear is actually placed .....	79
Figure BB.1 – Partial discharge test circuit (three-phase arrangement).....	84
Figure BB.2 – Partial-discharge test circuit (system without earthed neutral) .....	85
Table 101 – Nameplate information .....	21
Table 102 – Locations, causes and examples of measures to decrease the probability of internal arc faults .....	56
Table 103 – Single phase-to-earth arc fault current depending on the network neutral earthing .....	58
Table 104 – Summary of technical requirements, ratings and optional tests for metal-enclosed switchgear .....	59
Table AA.1 – Parameters for internal fault test according to compartment construction.....	72
Table BB.1 – Test circuits and procedures.....	83

## 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

## 1 General

### 1.1 Scope

This part of IEC 62271 specifies requirements for prefabricated metal-enclosed switchgear and controlgear for alternating current of rated voltages above 1 kV and up to and including 52 kV for indoor and outdoor installation, and for service frequencies up to and including 60 Hz. Enclosures may include fixed and removable components and may be filled with fluid (liquid or gas) to provide insulation.

NOTE 1 For the use of this document high-voltage (IEC 60050-601:1985, 601-01-27) is the rated voltage above 1 000 V. However, medium voltage (IEC 60050-601:1985, 601-01-28) is commonly used for distribution systems with voltages above 1 kV and generally applied up to and including 52 kV; refer to [1] of Bibliography

NOTE 2 Although primarily dedicated to three-phase systems, this standard can also be applied to single-phase or two-phase systems.

This standard defines several categories of metal enclosed switchgear and controlgear which differ due to

- the consequences on network service continuity in case of maintenance on the switchgear and controlgear;
- the need and convenience of maintenance of the equipment.

NOTE 3 Safety of an installation results from the design, implementation and coordination of products, installations and operations.

For metal-enclosed switchgear and controlgear containing gas-filled compartments, the design pressure is limited to a maximum of 300 kPa (relative pressure).

NOTE 4 Gas-filled compartments having a design pressure exceeding 300 kPa (relative pressure) should be designed and tested in accordance with IEC 62271-203; refer to [6] of Bibliography.

Metal-enclosed switchgear and controlgear for special use, for example, in flammable atmospheres, in mines or on board ships, may be subject to additional requirements.

Components contained in metal-enclosed switchgear and controlgear are to be designed and tested in accordance with their various relevant standards. This standard supplements the standards for the individual components regarding their installation in switchgear and controlgear assemblies.

This standard does not preclude that other equipment may be included in the same enclosure. In such a case, any possible influence of that equipment on the switchgear and controlgear is to be taken into account.

NOTE 5 Switchgear and controlgear assemblies having an insulation enclosure are covered by IEC 62271-201.

NOTE 6 Metal-enclosed switchgear and controlgear for rated voltages above 52 kV insulated by ambient air may be covered by this standard taking into account the insulation levels of IEC 62271-1.

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

IEC 60050-441:1984, *International Electrotechnical Vocabulary – Chapter 441: Switchgear, controlgear and fuses*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

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

IEC 60470:1999, *High-voltage alternating current contactors and contactor-based motor-starters*

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

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

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

IEC 62271-100, *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 62271-103, *High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV*

IEC 62271-105, *High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations*

IEC 62271-201:2006, *High-voltage switchgear and controlgear – Part 201: AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC/TS 62271-304, *High-voltage switchgear and controlgear – Part 304: Design classes for indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV to be used in severe climatic conditions*

ISO/IEC Guide 51:1999, *Safety aspects – Guidelines for their inclusion in standards*