

High-voltage switchgear and controlgear —

Part 2: Seismic qualification for rated voltages of 72,5 kV and above

The European Standard EN 62271-2:2003 has the status of a
British Standard

ICS 29.130.10

National foreword

This British Standard is the official English language version of EN 62271-2:2003. It is identical with IEC 62271-2:2003.

The UK participation in its preparation was entrusted to Technical Committee PEL/17/1, High-voltage switchgear and controlgear, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 24, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 24 June 2003

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Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 42087 6

EUROPEAN STANDARD

EN 62271-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2003

ICS 29.130.10

English version

High-voltage switchgear and controlgear
Part 2: Seismic qualification for rated voltages of 72,5 kV and above
(IEC 62271-2:2003)

Appareillage à haute tension
Partie 2: Qualification sismique
pour tension assignée
égale ou supérieure à 72,5 kV
(CEI 62271-2:2003)

Hochspannungs-Schaltgeräte und
-Schaltanlagen
Teil 2: Erdbebenqualifikation für
Bemessungsspannungen
von 72,5 kV und darüber
(IEC 62271-2:2003)

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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.

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Ref. No. EN 62271-2:2003 E



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Foreword

The text of document 17C/291/FDIS, future edition 1 of IEC 62271-2, 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 was approved by CENELEC as EN 62271-2 on 2003-04-01.

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) 2004-01-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2006-04-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A and ZA are normative and annex B is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62271-2:2003 was approved by CENELEC as a European Standard without any modification.

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**COMMON NUMBERING OF IEC 62271 PUBLICATIONS FALLING UNDER
THE RESPONSIBILITY OF SUBCOMMITTEES SC 17A AND SC 17C**

In accordance with the decision taken at the joint SC 17A/SC 17C meeting in Frankfurt, June 1998 (item 20.7 of 17A/535/RM), a common numbering system has been established for the publications falling under the responsibility of SC 17A and SC 17C. IEC 62271 - *High-voltage switchgear and controlgear* is the publication number and main title element for the common publications.

Numbering of these publications will apply the following principle:

- a) Common standards prepared by SC 17A and SC 17C will start with IEC 62271-1;
- b) Standards of SC 17A will start with IEC 62271-100;
- c) Standards of SC 17C will start with number IEC 62271-200;
- d) Publications prepared by SC 17A and SC 17C will start with number IEC 62271-300.

The table below relates the new numbers to the old numbers. The parts numbered (xxx) will be given a final number pending the decision to publish the revised publication as standard or technical report.

**Common numbering of IEC 62271 publications falling under
the responsibility of subcommittees SC 17A and SC 17C**

IEC 62271	HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR -	Old IEC number, if any
Part	Title	
1	Common specifications	IEC 60694
2	Seismic qualification for rated voltages of 72,5 kV and above	-
100	High-voltage alternating current circuit-breakers	IEC 60056
101	Synthetic testing	IEC 60427
102	High-voltage alternating current disconnectors and earthing switches	IEC 60129
103	Switches for rated voltages above 1 kV and less than 52 kV	IEC 60265-1
104	Switches for rated voltages of 52 kV and above	IEC 60265-2
105	Alternating current switch-fuse combinations	IEC 60420
106	Alternating current contactors and contactor based motor-starters	IEC 60470
107	Alternating current switchgear-fuse combinations	-
108	Switchgear having combined functions	-
109	Series capacitor by-pass switches	-
200	Metal enclosed switchgear and controlgear for rated voltages up to and including 52 kV	IEC 60298
201	Insulation-enclosed switchgear and controlgear for rated voltages up to and including 52 kV	IEC 60466
202	High-voltage/low voltage prefabricated substations	IEC 61330
203	Gas-insulated metal enclosed switchgear for rated voltages above 52 kV	IEC 60517
204	High-voltage gas-insulated transmission lines for rated voltages of 72,5 kV and above	IEC 61640
(300)	Guide for seismic qualification of high-voltage alternating current circuit-breakers	IEC 61166
(301)	Guide for inductive load switching	IEC 61233
(302)	Guide for short-circuit and switching test procedures for metal-enclosed and dead tank circuit-breakers	IEC 61633
(303)	Use and handling of sulphur hexafluoride (SF ₆) in high-voltage switchgear and controlgear	IEC 61634
(304)	Additional requirements for enclosed switchgear and controlgear from 1 kV to 72,5 kV to be used in severe climatic conditions	IEC 60932
(305)	Cable connections for gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	IEC 60859
(306)	Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	IEC 61639
(307)	The use of electronic and associated technologies in auxiliary equipment of switchgear and controlgear	IEC 62063
308	Guide for asymmetrical short-circuit breaking test duty T100a	-
309	TRV parameters for high-voltage switchgear and controlgear for rated voltages above 1 kV and less than 100 kV	-
310	Electrical endurance testing for circuit-breakers rated 72,5 kV and above	-

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 2: Seismic qualification for rated voltages of 72,5 kV and above

1 Scope and object

This part of IEC 62271 applies to all switchgear and their assemblies for alternating current of rated voltages of 72,5 kV and above for indoor and outdoor installation, including their supporting structure rigidly connected to the ground.

Where switchgear and their assemblies are not ground mounted, e.g. in a building, conditions for application are subject to agreement between users and manufacturers.

The seismic qualification of the switchgear and their assemblies take into account any auxiliary and control equipment either directly mounted or as a separate structure.

This standard provides procedures to seismically qualify ground mounted switchgear and their assemblies for rated voltages of 72,5 kV and above.

The seismic qualification of the switchgear and their assemblies is only performed upon request.

This standard specifies seismic severity levels and gives a choice of methods that may be applied to demonstrate the performance of high-voltage switchgear and their assemblies for which seismic qualification is required.

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 60068-2-47, *Environmental testing – Part 2-47: Test methods – Mounting of components, equipment and other articles for vibration, impact and similar dynamic tests*

IEC 60068-2-57, *Environmental testing – Part 2-57: Tests – Test Ff: Vibration – Time-history method*

IEC 60068-3-3, *Environmental testing – Part 3: Guidance – Seismic test methods for equipments*

IEC 60517, *Gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above*

IEC 60694, *Common specifications for high-voltage switchgear and controlgear standards*

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

3 Terms and definitions

For the purposes of this part of IEC 62771, the terms and definitions in IEC 60068-3-3, IEC 60517 and IEC 60694 apply.

4 Seismic qualification requirements

The seismic qualification shall demonstrate the ability of the switchgear and their assemblies to withstand seismic stress.

No failure on the main circuits, the control and auxiliary circuit, including the relevant mounting structures, shall occur.

Permanent deformations are acceptable provided that they do not impair the functionality of the equipment. The equipment shall properly operate after the seismic event as defined in 8.2 and 8.3.

Analytical methods, experimental methods or a combination of both shall be used to perform the seismic qualification.

If analytical methods are used, sufficient data is required; if not, a sample test set-up representing the system for the purpose of structure and function shall be subjected to a test. This basic experimental data shall be used as input for calibration in analytical methods.

For complete switchgear assemblies (e.g. substations) the analytical method shall be considered as a sufficient demonstration for seismic qualification.

4.1 Preliminary analysis

4.1.1 Selection of the representative test-set

Due to practical reasons concerned with the available experimental facilities, the seismic qualification of switchgear and their assemblies can require the definition and the choice of different sub-sets which still meaningfully represent the whole system for the purpose of structural and functional checks.

Such test-sets shall include the switching devices with their relevant operating mechanism and control equipment, and their electrical and mechanical interfaces.

It is recommended:

- to test generic components;
- to identify the dynamic behaviour of the plant (natural frequencies and damping ratios) through the experimental activities of Annex A.

4.1.2 Mathematical model of the test-set

On the basis of technical information concerning the design characteristics of the substation, a three-dimensional model of the test-set shall be created. Such a model shall take into consideration the presence of actual compartments and of their supporting structures, and shall have sufficient sensitivity to describe the dynamic behaviour of the test-set in the frequency range being studied.