PD IEC/TS 62271-210:2013

BSI Standards Publication

High-voltage switchgear and controlgear

Part 210: Seismic qualification for metal enclosed and solid insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV

raising standards worldwide™

National foreword

This Published Document is the UK implementation of IEC/TS 62271-210:2013.

The UK participation in its preparation was entrusted by Technical Committee PEL/17, Switchgear, controlgear, and HV-LV co-ordination, to Subcommittee PEL/17/1, High-voltage switchgear and controlgear.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2013

ISBN 978 0 580 69498 1

ICS 29.130.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 28 February 2013.

Amendments issued since publication

Amd. No.	Date	Text affected

IEC/TS 62271-210

Edition 1.0 2013-02

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

High-voltage switchgear and controlgear – Part 210: Seismic qualification for metal enclosed and solid-insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV

Appareillage à haute tension – Partie 210: Qualification sismique pour ensembles d'appareillage sous enveloppe métallique pour tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX U

ICS 29.130.10

ISBN 978-2-83220-615-7

CONTENTS

FOREWORD 4
1 General 6
1.1 Scope 6
1.2 Normative references 6
2 Normal and special service conditions 7
3 Terms and definitions 7
4 Seismic qualification requirements 7
4.1 General 7
4.2 Preliminary analysis 7
4.2.1 Selection of the representative test sample 7
4.2.2 Mathematical model of the test sample 7
4.3 Severities 8
4.3.1 General 8
4.3.2 Severity level 1 8
4.3.3 Severity level 2 9
4.4 Acceptance classes 10
5 Qualification by test 10
5.1 General 10
5.2 Mounting 10
5.3 Test parameters 11
5.3.1 Measurements 11
5.3.2 Frequency range 11
5.3.3 Parameters for resonant frequency search 11
5.3.4 Parameters for time history test (seismic load test) 11
5.4 Testing procedure 12
5.4.1 General 12
5.4.2 Inspection and functional checks 12
5.4.3 Resonant frequency search 12
5.4.4 Time history test (seismic load test) 12
6 Qualification by combination of test and analysis 13
6.1 General 13
6.2 Numerical analysis 14
6.2.1 General 14
6.2.2 Static data (stiffness) 14
6.2.3 Dynamic data 14
6.2.4 Numerical model 14
6.2.5 Computation methods 15
6.3 Analysis by experience or similarity 16
7 Evaluation of the seismic qualification 16
7.1 Validity criteria of the seismic test 16
7.2 Acceptance criteria of the test results 16
7.3 Criteria of model acceptance 17
7.4 Acceptance criteria of the numerical analysis results 17
7.5 Acceptance criteria of the analysis results by similarity 17
8 Documentation 17
8.1 Information for seismic qualification 17

8.2 Test report 17
8.3 Analysis report when analysis is a numerical analysis 18
8.4 Analysis report when analysis is performed by similarity 18
Annex A (normative) Characterization of the test sample for analysis 20
Annex B (informative) Criteria for seismic adequacy of enclosed switchgear and controlgear assemblies 21
Annex C (informative) Dynamic analysis methods 24
Annex D (informative) Expected peak ground accelerations for different earthquake scales 27
Annex E (informative) Qualification process flowchart 28
Bibliography 29

Figure 1 – Severity level 1 (horizontal) – Zero period acceleration (ZPA) = 0,5 g 9
Figure 2 – Severity level 2 (horizontal) – Zero period acceleration (ZPA) = 1 g 10

Table D.1 – Earthquake zones with earthquake intensity and magnitude scales 27

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 210: Seismic qualification for metal enclosed and solid-insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62271-210, which is a technical specification, has been prepared by subcommittee 17C: High-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
17C/515/DTS	17C/548/RVC

Full information on the voting for the approval of this technical specification 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.

A list of all the parts in 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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 210: Seismic qualification for metal enclosed and solid-insulation enclosed switchgear and controlgear assemblies for rated voltages above 1 kV and up to and including 52 kV

1 General

1.1 Scope

This part of IEC 62271 applies to metal enclosed switchgear and controlgear assemblies complying with IEC 62271-200 for metal enclosed and IEC 62271-201 for solid-insulation enclosed, ground or floor mounted, intended to be used under seismic conditions.

The seismic qualification of the switchgear and controlgear assemblies takes into account any auxiliary and the control equipment mounted directly on the assembly.

It will specify seismic severity levels, acceptance levels, and give the choice of methods that may be applied to demonstrate the performance of high-voltage switchgear and controlgear assemblies for which seismic qualification is required.

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

1.2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-57:1999, *Environmental testing – Part 2-57: Tests – Test Ff: Vibration – Time-history method*

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 60068-3-3:1991, *Environmental testing – Part 3: Guidance – Seismic test methods for equipment*

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

IEC 62271-200, *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 62271-201, *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*

ISO 2041, *Mechanical vibration, shock and condition monitoring – Vocabulary*