



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/COR1:2015, MOD)**



AS 62271.200:2019

This Australian Standard® was prepared by EL-007, Power Switchgear. It was approved on behalf of the Council of Standards Australia on 21 October 2019.

This Standard was published on 22 November 2019.

The following are represented on Committee EL-007:

Australian Industry Group
Energy Networks Australia
Engineers Australia
University of New South Wales

This Standard was issued in draft form for comment as DR AS IEC 62271.200:2019.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

ISBN 978 1 76072 636 2



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/COR1:2015, MOD)

Originated as AS 2086—1977.
Previous edition 1995.
Revised and designated AS 62271.200—2005.
Second edition 2019.

COPYRIGHT

© IEC 2019 — All rights reserved
© Standards Australia Limited 2019

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth).

Preface

This Standard was prepared by the Standards Australia Committee EL-007, Power Switchgear, to supersede AS 62271.200—2005, *High-voltage switchgear and controlgear, Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV* (IEC 62271-200, Ed. 1 (2003) MOD).

The objective of this Standard is to specify requirements for prefabricated metal-enclosed switchgear and controlgear for the following:

- (a) Alternating current of rated voltages above 1 kV and up to and including 52 kV for indoor and outdoor installation.
- (b) 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.

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

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

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.

This Standard is an adoption with national modifications, and has been reproduced from, IEC 62271-200:2011, *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* and its Corrigendum 1 (2015). The modifications are additional requirements and are set out in Appendix ZZ, which has been added at the end of the source text.

Appendix ZZ lists the variations to IEC 62271-200:2011/COR1:2015 for the application of this Standard in Australia.

As this document has been reproduced from an International Standard, the following applies:

- (A) In the source text “this part of IEC 62271” should read “this Australian Standard”.
- (B) A full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

CONTENTS

FOREWORD.....	5
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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**

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.

International Standard IEC 62271-200 has been prepared by subcommittee 17C: High-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

This second edition cancels and replaces the first edition, published in 2003. It is a technical revision.

This second edition of IEC 62271-200 has been further updated and improved to the experience gained with the first edition of IEC 62271-200. As maintenance result, this second edition of IEC 62271-200 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.

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

FDIS	Report on voting
17C/523/FDIS	17C/534/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 International Standard should be read in conjunction with IEC 62271-1:2007, 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 IEC 62271-1. Amendments to these clauses and subclauses are given under the same numbering, whilst additional subclauses, are numbered from 101.

A list of all parts of the IEC 62271 series can be found, under the general title *High-voltage switchgear and controlgear*, 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of June 2015 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.