

Australian Standard™

**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)**



This Australian Standard was prepared by Committee EL-007, Power Switchgear. It was approved on behalf of the Council of Standards Australia on 11 April 2005. This Standard was published on 15 July 2005.

The following are represented on Committee EL-007:

Australian British Chamber of Commerce
Australian Electrical and Electronic Manufacturers Association
Energy Networks Association
Engineers Australia
Testing interests (Australia)

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Web Shop at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Global Standard*, has a full listing of revisions and amendments published each month.

Australian Standards™ and other products and services developed by Standards Australia are published and distributed under contract by SAI Global, which operates the Standards Web Shop.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to the Chief Executive, Standards Australia, GPO Box 476, Sydney, NSW 2001.

This Standard was issued in draft form for comment as DR 05007.

Australian Standard™

**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)**

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

COPYRIGHT

© Standards Australia

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.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia
ISBN 0 7337 6742 7

PREFACE

This Standard was prepared by the Standards Australia Committee EL-007, Power Switchgear, to supersede AS 2086—1995.

The objective of this Standard is to provide requirements for 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 installations.

This Standard is an adoption with national modifications and has been reproduced from IEC 62271-200, Ed. 1 (2003), *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*, and has been varied as indicated to take account of Australian/New Zealand conditions.

Variations to IEC 62271-200, Ed. 1 (2003) are indicated at the appropriate places throughout this standard. Strikethrough (~~example~~) identifies IEC text, tables and figures which, for the purposes of this Australian Standard, are deleted. Where text, tables or figures are added, each is set in its proper place and identified by shading (example). Added figures are not themselves shaded, but are identified by a shaded border.

Common numbering of standards falling under the responsibility of EL-007

In accordance with the decision taken by the committee EL-007 a common numbering system will be established in order to align the numbering of Australian Standards falling under the responsibility of EL-007, with IEC standards. All high-voltage switchgear and controlgear Standards will, at their next revision (or as equivalent Standards become available in IEC), become parts of the AS 62271 (High-voltage switchgear and controlgear) series. The table below gives the relationship between future numbering and existing Standard numbers. Standards current at the time of publication of this Standard are marked with an asterick (*).

| AS 62271 Series | High-voltage switchgear and controlgear | Old AS Number |
|-----------------|---|-----------------|
| 1 | Common specifications | *AS 2650 |
| 100* | High-voltage alternating current circuit-breakers | AS 2006 |
| 102* | Alternating current disconnectors and earthing switches | AS 1306 |
| 103 | Switches for rated voltages above 1 kV and less than 52 kV | *AS/NZS 60265.1 |
| 104 | Switches for rated voltages of 52 kV and above | *AS 60265.2 |
| 106 | Alternating current contactors and contactor based motor-starters | *AS 2024 |
| 110 | Inductive load switching | *AS 4372 |
| 200* | A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV | AS 2086 |
| 201 | A.C. insulation-enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 38 kV | *AS 2264 |
| 202 | High-voltage/low voltage prefabricated substations | *AS 61330 |
| 203* | Gas-insulated metal enclosed switchgear for rated voltages above 52 kV | AS 2263 |
| 301* | Dimensional standardization of terminals | AS 2395 |

| AS 62271 Series | High-voltage switchgear and controlgear | Old AS Number |
|-----------------|---|---------------|
| 303 | Use and handling of sulphur hexafluoride (SF ₆) in high-voltage switchgear and controlgear | *AS 2791 |
| 304 | Additional requirements for enclosed switchgear and controlgear from 1 kV to 72,5 kV to be used in severe climatic conditions | *AS 4243 |

This Standard differs from the Standard it supersedes in the following major areas:

- (a) The Standard has been basically changed to be updated to today's use of high voltage switchgear and controlgear up to 52 kV.
- (b) Adopting the content to AS 2650 'Common Clauses'.
- (c) New definitions are added; classification of equipment and introduction of internal arc (IAC) and it's testing.
- (d) Appendices are now called Annexes in keeping with the latest style.
- (e) Annex ZA 'Items subject to agreement between the manufacturer and user' has been updated.
- (f) References have been updated.

This Standard shall be read in conjunction with AS 2650, which is applicable unless otherwise specified in this Standard. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in AS 2650. Amendments to these clauses and subclauses are given under the same references, whilst additional subclauses are numbered from 101.

As this Standard is reproduced from an International Standard, the following applies:

- (i) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (ii) In the source text 'this international standard' should read 'this Australian Standard'.
- (iii) A full point should be substituted for a comma when referring to a decimal marker.
- (iv) Any French text on figures should be ignored.

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral Part of a standard, whereas an informative annex is only for information and guidance.

CONTENTS

| | <i>Page</i> |
|---|---|
| 1 | General..... 1 |
| | 1.1 Scope..... 1 |
| | 1.2 Normative references 1 |
| 2 | Normal and special service conditions 3 |
| 3 | Terms and definitions..... 3 |
| 4 | Ratings 8 |
| | 4.1 Rated voltage (U_r) 8 |
| | 4.2 Rated insulation level 8 |
| | 4.3 Rated frequency (f_r)..... 9 |
| | 4.4 Rated normal current and temperature rise..... 9 |
| | 4.5 Rated short-time withstand current (I_k) 9 |
| | 4.6 Rated peak withstand current (I_p) 9 |
| | 4.7 Rated duration of short circuit (t_k)..... 9 |
| | 4.8 Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U_a)..... 9 |
| | 4.9 Rated supply frequency of closing and opening devices and of auxiliary circuits 9 |
| | 4.10 Rated pressure of compressed gas supply for insulation and/or operation 10 |
| 5 | Design and construction..... 10 |
| | 5.1 Requirements for liquids in switchgear and controlgear 10 |
| | 5.2 Requirements for gases in switchgear and controlgear 10 |
| | 5.3 Earthing 10 |
| | 5.4 Auxiliary and control equipment..... 11 |
| | 5.5 Dependent power operation..... 11 |
| | 5.6 Stored energy operation 11 |
| | 5.7 Independent manual operation 12 |
| | 5.8 Operation of releases 12 |
| | 5.9 Low- and high-pressure interlocking and monitoring devices 12 |
| | 5.10 Nameplates 12 |
| | 5.11 Interlocking devices..... 14 |
| | 5.12 Position indication 14 |
| | 5.13 Degrees of protection by enclosures..... 14 |
| | 5.14 Creepage distances..... 14 |
| | 5.15 Gas and vacuum tightness 15 |
| | 5.16 Liquid tightness 15 |
| | 5.17 Flammability..... 15 |
| | 5.18 Electromagnetic compatibility (EMC) 15 |
| | 5.101 Internal fault..... 15 |
| | 5.102 Enclosure 16 |
| | 5.103 Compartments..... 17 |
| | 5.104 Removable parts 20 |
| | 5.105 Provisions for dielectric tests on cables 20 |
| 6 | Type tests 21 |
| | 6.1 General 21 |
| | 6.2 Dielectric tests 22 |
| | 6.3 Radio interference voltage (r.i.v.) test..... 25 |
| | 6.4 Measurement of the resistance of circuits..... 25 |
| | 6.5 Temperature-rise tests 26 |

| | <i>Page</i> |
|------------------------|--|
| 6.6 | Short-time withstand current and peak withstand current tests 26 |
| 6.7 | Verification of the protection 28 |
| 6.8 | Tightness tests 28 |
| 6.9 | Electromagnetic compatibility tests (EMC) 28 |
| 6.10 | Additional tests on auxiliary and control circuits 28 |
| 6.101 | Verification of making and breaking capacities 29 |
| 6.102 | Mechanical operation tests 29 |
| 6.103 | Pressure withstand test for gas-filled compartments 30 |
| 6.104 | Tests on non-metallic partitions and shutters 30 |
| 6.105 | Weatherproofing test 31 |
| 6.106 | Internal arcing test 31 |
| 7 | Routine tests 32 |
| 7.1 | Dielectric test on the main circuit 33 |
| 7.2 | Tests on auxiliary and control circuits 33 |
| 7.3 | Measurement of the resistance of the main circuit 33 |
| 7.4 | Tightness test 33 |
| 7.5 | Design and visual checks 33 |
| 7.101 | Partial discharge measurement 33 |
| 7.102 | Mechanical operation tests 33 |
| 7.103 | Pressure tests of gas-filled compartments 33 |
| 7.104 | Tests of auxiliary electrical, pneumatic and hydraulic devices 34 |
| 7.105 | Tests after erection on site 34 |
| 7.106 | Measurement of fluid condition after filling on site 34 |
| 8 | Guide to the selection of metal-enclosed switchgear and controlgear for service 34 |
| 8.1 | Selection of rated values 34 |
| 8.2 | Selection of design and construction 35 |
| 8.3 | Internal arc classification 37 |
| 9 | Information to be given with enquiries, tenders and orders 41 |
| 9.101 | Information with enquiries and orders 41 |
| 9.102 | Information with tenders 42 |
| 10 | Rules for transport, storage, installation, operation and maintenance 42 |
| 10.1 | Conditions during transport, storage and installation 42 |
| 10.2 | Installation 43 |
| 10.3 | Operation 43 |
| 10.4 | Maintenance 43 |
| 11 | Safety 43 |
| 11.101 | Procedures 43 |
| 11.102 | Internal arc aspects 43 |
| Annex A (normative) | Internal fault – Method for testing the metal-enclosed switchgear and controlgear under conditions of arcing due to an internal fault 44 |
| Annex B (normative) | Partial discharge measurement 59 |
| Annex C (informative) | Explanatory notes 65 |
| Annex ZA (informative) | Items subject to agreement between the manufacturer and user 71 |
| Annex ZZ (informative) | Variations to IEC 62271-200, Ed. 1 (2003) for application in Australia 73 |
| | Bibliography 74 |

NOTES

STANDARDS AUSTRALIA

Australian Standard**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)**

Any table, figure or text of the international standard that is struck through is not part of this standard. Any Australian table, figure or text that is added is part of this standard and is identified by shading.

1 General**1.1 Scope**

This part of IEC 62271 specifies requirements for factory-assembled 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 Although primarily dedicated to three-phase systems, this standard can also be applied to single-phase or two-phase systems.

This standard defines several types 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 2 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 3 Gas-filled compartments having a design pressure exceeding 300 kPa (relative pressure) should be designed and tested in accordance with ~~IEC 60547~~ IEC 62271-203.

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 4 Switchgear and controlgear assemblies having an insulation enclosure are covered by IEC 60466.

NOTE 5 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 60694.

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.