

Australian Standard[®]

**High-voltage switchgear and
controlgear**

**Part 100: High-voltage alternating-
current circuit-breakers
(IEC 62271-100, Ed. 1.2 (2006) MOD)**

STANDARDS
Australia



This Australian Standard® was prepared by Committee EL-007, Power Switchgear. It was approved on behalf of the Council of Standards Australia on 8 November 2007. This Standard was published on 12 March 2008.

The following are represented on Committee EL-007:

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

This Standard was issued in draft form for comment as DR 7144.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that 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Standards may also be withdrawn.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 the current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting www.standards.org.au

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

**High-voltage switchgear and
controlgear**

**Part 100: High-voltage alternating-
current circuit-breakers
(IEC 62271-100, Ed. 1.2 (2006) MOD)**

Originally as AS C89—1967.
Revised and redesignated as AS 62271.100—2005.
Second edition 2008.

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 8523 9

PREFACE

This Standard was prepared by the Standards Australia Committee EL-007, Power Switchgear to supersede AS 62271.100—2005.

The objective of this Standard is to provide requirements for a.c circuit breakers designed for indoor and outdoor service for operation on systems with frequencies up to 60 Hz and voltages higher than 1000 V.

This Standard is an adoption with national modifications and has been reproduced from IEC 62271-100, Ed. 1.2 (2006), *High-voltage switchgear and controlgear – Part 100: High-voltage alternating-current circuit-breakers*, and has been varied as indicated to take account of Australian conditions.

Variations to IEC 62271-100, Ed. 1.2 (2006) are indicated at the appropriate place 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.

Australian variations are summarized in Annex ZZ.

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 asterisk (*).

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
105	Alternating current switch-fuse combinations	*AS 2024
106	Alternating current contactors and contactor-based motor-starters	*AS 60470
110*	Inductive load switching	AS 4372
200*	AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	AS 2086
201*	AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	AS 2264
202*	High-voltage/low voltage prefabricated substation	AS 61330
203*	Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	AS 2263

AS 62271 Series	HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR	Old AS Number
301*	Dimensional standardization of terminals	AS 2395
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
308*	Guide for asymmetrical short-circuit breaking test duty T100a	-

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 'IEC 62271-100' should read 'AS 62271.100'.
- (iii) A full point should be substituted for a comma when referring to a decimal marker.

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.....	2
2 Normal and special service conditions	4
3 Definitions.....	4
3.1 General terms.....	4
3.2 Assemblies	7
3.3 Parts of assemblies	7
3.4 Switching devices	9
3.5 Parts of circuit-breakers.....	9
3.6 Operation.....	11
3.7 Characteristic quantities	13
3.8 Index of definitions.....	19
4 Ratings	23
4.1 Rated voltage (U_r).....	24
4.2 Rated insulation level.....	24
4.3 Rated frequency (f_r).....	25
4.4 Rated normal current (I_r) and temperature rise.....	25
4.5 Rated short-time withstand current (I_k).....	25
4.6 Rated peak withstand current (I_p).....	25
4.7 Rated duration of short circuit (t_k).....	25
4.8 Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U_a).....	25
4.9 Rated supply frequency of closing and opening devices and auxiliary circuits.....	25
4.10 Rated pressures of compressed gas supply for insulation, operation and/or interruption	25
5 Design and construction.....	44
5.1 Requirements for liquids in circuit-breakers.....	44
5.2 Requirements for gases in circuit-breakers	44
5.3 Earthing of circuit-breakers	44
5.4 Auxiliary equipment	44
5.5 Dependent power closing.....	45
5.6 Stored energy closing	45
5.7 Independent manual operation.....	45
5.8 Operation of releases.....	45
5.9 Low- and high-pressure interlocking devices.....	47
5.1 Nameplates.....	47
5.11 Interlocking devices	49
5.12 Position indication.....	49
5.13 Degrees of protection by enclosures	49
5.14 Creepage distances	49
5.15 Gas and vacuum tightness.....	49
5.16 Liquid tightness.....	49
5.17 Flammability	49
5.18 Electromagnetic compatibility.....	49

	<i>Page</i>
6	Type tests 50
6.1	General 52
6.2	Dielectric tests 52
6.3	Radio interference voltage (r.i.v.) tests 55
6.4	Measurement of the resistance of the main circuit 55
6.5	Temperature-rise tests 55
6.6	Short-time withstand current and peak withstand current tests 56
6.7	Verification of the degree of protection 57
6.8	Tightness tests 57
6.9	Electromagnetic compatibility (EMC) tests 57
6.101	Mechanical and environmental tests 57
6.102	Miscellaneous provisions for making and breaking tests 68
6.103	Test circuits for short-circuit making and breaking tests 87
6.104	Short-circuit test quantities 89
6.105	Short-circuit test procedure 102
6.106	Basic short-circuit test-duties 104
6.107	Critical current tests 108
6.108	Single-phase and double earth-fault tests 109
6.109	Short-line fault tests 110
6.110	Out-of-phase making and breaking tests 114
6.111	Capacitive current switching tests 116
6.112	Special requirements for making and breaking tests on class E2 circuit-breakers 128
6.200	Dielectric dissipation factor 129
7	Routine tests 130
7.1	Dielectric test on the main circuit 130
7.2	Dielectric test on auxiliary and control circuits 130
7.3	Measurement of the resistance of the main circuit 130
7.4	Tightness test 130
7.5	Design and visual check 130
7.200	Dielectric dissipation factor 132
7.201	Partial discharge tests 132
8	Guide to the selection of circuit-breakers for service 133
9	Information to be given with enquiries, tenders and orders 141
10	Rules for transport, storage, installation, operation and maintenance 144
10.1	Conditions during transport, storage and installation 144
10.2	Installation 144
10.3	Operation 150
10.4	Maintenance 150
11	Safety 151
	Annex A (normative) Calculation of transient recovery voltages for short-line faults from rated characteristics 200
	Annex B (normative) Tolerances on test quantities during type tests 208
	Annex C (normative) Records and reports of type tests 215
	Annex D (normative) Determination of short-circuit power factor 218
	Annex E (normative) Method of drawing the envelope of the prospective transient recovery voltage of a circuit and determining the representative parameters 220
	Annex F (normative) Methods of determining prospective transient recovery voltage waves 224
	Annex G (normative) Rationale behind introduction of circuit-breakers class E2 241
	Annex H (informative) Inrush currents of single and back-to-back capacitor banks 242

	<i>Page</i>
Annex I (informative) Explanatory notes	247
Annex J (informative) Test current and line length tolerances for short-line fault testing	262
Annex K (informative) List of symbols and abbreviations used in IEC 62271-100.....	264
Annex L (informative) Explanatory notes on the revision of TRVs for circuit-breakers of rated voltages higher than 1 kV and less than 100 kV	270
Annex M (normative) Requirements for breaking of transformer-limited faults by circuit-breakers with rated voltage higher than 1 kV and less than 100 kV.....	274
Annex ZA (informative) Items subject to agreement between the manufacturer and user	277
Annex ZZ (normative) Variations to IEC 62271-100, Ed. 1.1 (2003) for application in Australia	279
Bibliography	280

STANDARDS AUSTRALIA

Australian Standard
High-voltage switchgear and controlgear
Part 100: High-voltage alternating-current circuit-breakers
(IEC 62271-100, Ed. 1.2 (2006) 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 International Standard is applicable to a.c. circuit-breakers designed for indoor or outdoor installation and for operation at frequencies of 50 Hz and 60 Hz on systems having voltages above 1 000 V.

It is only applicable to three-pole circuit-breakers for use in three-phase systems and single-pole circuit-breakers for use in single-phase systems. Two-pole circuit-breakers for use in single-phase systems and application at frequencies lower than 50 Hz are subject to agreement between manufacturer and user.

This standard is also applicable to the operating devices of circuit-breakers and to their auxiliary equipment. However, a circuit-breaker with a closing mechanism for dependent manual operation is not covered by this standard, as a rated short-circuit making-current cannot be specified, and such dependent manual operation may be objectionable because of safety considerations.

This standard does not cover circuit-breakers intended for use on motive power units of electrical traction equipment; these are covered by IEC 60077 [4]¹⁾.

Generator circuit-breakers installed between generator and step-up transformer are not within the scope of this standard.

Switching of inductive loads is covered by IEC 61233.

Circuit-breakers with an intentional non-simultaneity between the poles, with the exception of circuit-breakers providing single-pole auto-reclosing, are not within the scope of this standard.

This standard does not cover self-tripping circuit-breakers with mechanical tripping devices or devices which cannot be made inoperative.

Bypass circuit-breakers installed in parallel with line series capacitors and their protective equipment are not within the scope of this standard, these are covered by IEC 60143-2 [6].

NOTE Tests to prove the performance under abnormal conditions should be subject to agreement between manufacturer and user. Such abnormal conditions are, for instance, cases where the voltage is higher than the rated voltage of the circuit-breaker, conditions which may occur due to sudden loss of load on long lines or cables.

¹⁾ Figures in square brackets refer to the bibliography.