

Australian Standard™

Low-voltage fuses

**Part 3.1: Supplementary requirements
for fuses for use by unskilled persons
(fuses mainly for household and similar
applications)—Sections I to IV:
Examples of types of standardized fuses**

This Australian Standard was prepared by Committee EL-007, Power Switchgear. It was approved on behalf of the Council of Standards Australia on 20 December 2004.
This Standard was published on 20 January 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 Standards may also be withdrawn.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 5420, Sydney, NSW 2001.

This Standard was issued in draft form for comment as DR 04501.

Australian Standard™

Low-voltage fuses

Part 3.1: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)—Sections I to IV: Examples of types of standardized fuses

Originated as part of AS 2005.3—1978.
Previous edition AS/NZS 60269.3.1:2002.
Revised and dejointed as AS 60269.3.1—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 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 6440 1

PREFACE

This Standard was prepared by the Standards Australia Committee EL-007, Power Switchgear to supersede AS/NZS 60269.3.1:2002, when used in conjunction with AS 60269.3.0.

AS 60269.3.0:2005 provides generic supplementary requirements to those stated in AS 60269.1:2005 for fuses for use by unskilled persons.

The objective of this Standard is to provide specific examples of the application of these supplementary requirements stated in AS 60269.3.0:2005.

This Standard is Part 3.1 of a series which, when complete, will consist of the following:

AS

60269	Low-voltage fuses
60269.1	Part 1: General requirements
60269.2.0	Part 2.0: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)
60269.2.1	Part 2.1: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)—Sections I to VI: Examples of types of standardized fuses
60269.3.0	Part 3.0: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)
60269.3.1	Part 3.1: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)—Sections I to IV: Examples of types of standardized fuses (this Standard)
60269.4.0	Part 4.0: Supplementary requirements for fuse-links for the protection of semiconductor devices
60269.4.1	Part 4.1: Supplementary requirements for fuse-links for the protection of semiconductor devices—Sections I to III: Examples of types of standardized fuse-links

The requirements of this Standard do not apply to fuses manufactured to AS 3135—1997.

This Standard is identical with, and has been reproduced from, IEC 60269-3-1, Ed. 2.0(2004), *Low-voltage fuses - Part 3-1: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications) - Sections I to IV: Examples of types of standardized fuses*.

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

- (a) Standard is now Australian only to reflect the withdrawal of New Zealand participation in Committee EL-007.
- (b) Introduction of push-in gauge-rings in addition to screw-in gauge-rings in Section I (D type fuse-system).
- (c) Addition of a special test for cable overload protection in the informative Annex A of Section I (D type fuse-system).
- (d) Introduction of preferred rated currents 3 A and 13 A in Section IV (BS plugtop fuse system).

In view of the fact that this standard should be read together with AS 60269.1 and AS 60269.3.0, the numbering of its clauses and subclauses are made to correspond to these publications. Regarding the tables, their numbering also corresponds to that of AS 60269.1; however, when additional tables appear they are referred to by capital letters, for example, Table A, Table B, etc

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
2	Normative references 1
SECTION 1 - D-TYPE FUSES	
1.1	Scope 3
5	Characteristics of fuses 3
5.2	Rated voltage 3
5.3.1	Rated current of the fuse-link 3
5.3.2	Rated current of the fuse-holder 3
5.5	Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder 3
5.6	Limits of time-current characteristics 3
5.6.1	Time-current characteristics, time-current zones and overload curves 3
5.6.2	Conventional times and currents 4
5.6.3	Gates 4
5.7	Breaking range and breaking capacity 5
5.7.2	Rated breaking capacity 5
6	Markings 5
7	Standard conditions for construction 5
7.1	Mechanical design 5
7.1.2	Connections including terminals 5
7.1.3	Fuse-contacts 5
7.1.4	Non-interchangeability 6
7.1.5	Construction of a fuse-base 6
7.1.6	Construction of a fuse-carrier 6
7.1.7	Construction of a fuse-link 7
7.1.8	Construction of a gauge-piece 7
7.2	Insulating properties 7
7.3	Temperature rise, power dissipation of the fuse-link and acceptable power dissipation of the fuse-holder 8
7.7	I^2t characteristics 8
7.7.1	Pre-arcing I^2t values 8
7.7.2	Operating I^2t values 9
7.8	Overcurrent discrimination of "gG" fuse-links 9
7.9	Protection against electric shock 9
8	Tests 10
8.1.4	Arrangement of the fuse and dimensions 10
8.2	Verification of insulating properties 11
8.2.1	Arrangement of the fuse-holder 11
8.2.6	Creepage distances, clearances and distances through sealing compound 11
8.3	Verification of temperature rise and power dissipation 11
8.3.1	Arrangement of the fuse 11
8.3.3	Measurement of the power dissipation of the fuse-link 12
8.3.5	Acceptability of test results 12
8.5.2	Characteristics of the test circuit 13

	<i>Page</i>
8.5.8	Acceptability of test results 13
8.7.4	Verification of overcurrent discrimination 13
8.9	Verification of resistance to heat..... 14
8.9.1	Fuse-base 14
8.9.2	Fuse-carrier 15
8.10	Verification of non-deterioration of contacts 16
8.10.1	Arrangement of the fuse 16
8.10.2	Test method 16
8.10.3	Acceptability of test results 17
8.11	Mechanical and miscellaneous tests 17
8.11.1	Mechanical strength..... 17
	Figures 1 to 10 20
	Annex A (informative) Special tests for cable overload protection 48
 SECTION IIA - CYLINDRICAL FUSES TYPE A (NF CYLINDRICAL FUSE SYSTEM)	
1.1	Scope 49
2	Definitions 49
5	Characteristics of fuses 49
5.2	Rated voltage 49
5.3.1	Rated current of the fuse-link..... 49
5.3.2	Rated current of the fuse-holder 49
5.5	Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder 49
5.6.2	Conventional times and currents..... 50
5.6.3	Gates 50
7	Standard conditions for construction 50
7.1	Mechanical design 50
7.1.2	Connections including terminals 50
7.2	Insulating properties 51
7.7	I^2t characteristics 52
7.7.1	Pre-arcing I^2t values 52
7.7.2	Operating I^2t values 52
7.8	Overcurrent discrimination of "gG" fuse-links 53
7.9	Protection against electric shock 53
8	Tests 53
8.1.6	Testing of fuse-holders 53
8.3.1	Arrangement of the fuse 54
8.3.3	Measurement of the power dissipation of the fuse-link 54
8.4	Verification of operation..... 55
8.4.1	Arrangement of the fuse 55
8.5	Verification of the breaking capacity 55
8.5.1	Arrangement of the fuse 55
8.5.8	Acceptability of test results 56
8.7.4	Verification of overcurrent discrimination 56
8.8	Verification of the degree of protection of enclosures..... 56
8.8.1	Verification of protection against electric shock 56
8.9	Verification of resistance to heat..... 57
8.10	Verification of non-deterioration of contacts 57
8.10.1	Arrangement of the fuse 57

	<i>Page</i>
8.10.2 Test method	57
8.10.3 Acceptability of test results	58
8.12 Verification of the reliability of terminals	60
Figures 10 to 16	61
 SECTION IIB - CYLINDRICAL FUSES TYPE B (BS CYLINDRICAL FUSE SYSTEM)	
1.1 Scope	68
5 Characteristics of fuses	68
5.3 Rated current	68
5.3.1 Rated current of the fuse-link	68
5.3.2 Rated current of the fuse-holder	68
5.5 Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder	68
5.6 Limits of time-current characteristics	68
5.6.1 Time-current characteristics, time-current curves and overload curves	68
5.6.2 Conventional times and currents	68
5.7 Breaking range and breaking capacity	68
5.7.2 Rated breaking capacity	68
7 Standard conditions for construction	69
7.1 Mechanical design	69
7.1.2 Connections including terminals	69
7.9 Protection against electric shock	69
8 Tests	69
8.1 General	69
8.1.4 Arrangement of the fuse	69
8.3 Verification of temperature rise and power dissipation	69
8.3.1 Arrangement of the fuse	69
8.3.3 Measurement of the power dissipation of the fuse-link	69
8.4 Verification of operation	69
8.4.1 Arrangement of fuse	69
8.5 Verification of breaking capacity	69
8.5.1 Arrangement of the fuse	69
8.5.8 Acceptability of test results	69
8.10 Verification of non-deterioration of contacts	70
8.10.1 Arrangement of the fuse	70
8.10.2 Test method	70
8.10.3 Acceptability of test results	70
Figures 17 to 22	71
 SECTION IIC - CYLINDRICAL FUSES TYPE C (ITALIAN CYLINDRICAL FUSE SYSTEM)	
1.1 Scope	77
5 Characteristics of fuses	77
5.3.1 Rated current of the fuse-link	77
5.3.2 Rated current of the fuse-holder	77
5.5 Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder	77

	<i>Page</i>
5.6	Limits of time-current characteristics 78
5.6.1	Time-current characteristics, time-current zones and overload curves 78
5.6.2	Conventional times and currents..... 78
5.6.3	Gates 78
7	Standard conditions for construction..... 79
7.1	Mechanical design..... 79
7.1.2	Connections including terminals 79
7.2	Insulating properties 79
7.3	Temperature rise, power dissipation of the fuse-link and acceptable power dissipation of the fuse-holder 79
7.7	I^2t characteristics 80
7.7.1	Minimum pre-arcing I^2t values at 0,01 s 80
7.7.2	Maximum operating I^2t values at 0,01 s 80
8	Tests 80
8.1.6	Testing of the fuse-holder 80
8.3	Verification of temperature rise and power dissipation 80
8.3.1	Arrangement of the fuse 80
8.3.3	Measurement of the power dissipation of the fuse-link 81
8.4	Verification of operation..... 81
8.4.1	Arrangement of the fuse 81
8.5	Verification of the breaking capacity 82
8.5.1	Arrangement of the fuse 82
8.5.8	Acceptability of test results 82
8.7.4	Verification of discrimination 82
8.9	Verification of resistance to heat..... 82
8.9.1	Test in heating cabinet 82
8.9.2	Ball pressure test..... 82
8.10	Verification of non-deterioration of contacts 83
8.10.1	Arrangement of the fuse 83
8.10.2	Test method 83
8.10.3	Acceptability of test results 83
8.11	Mechanical and miscellaneous tests 83
Figures	23 to 28 86

SECTION III - PIN-TYPE FUSES

1.1	Scope 92
2	Definitions 92
2.3	Characteristic quantities 92
5	Characteristics of fuses 92
5.5	Rated power dissipation of the fuse-link..... 92
5.6	Limits of time-current characteristics 92
5.6.2	Conventional times and currents..... 92
5.6.3	Gates 93
6	Markings..... 93
6.1	Markings of fuse-holders 93
6.2	Markings of fuse-links..... 93
6.4	Markings of the gauge-pieces 93

	<i>Page</i>
7	Standard conditions for construction 93
7.1	Mechanical design 93
7.1.8	Construction of the gauge-piece 93
7.3	Temperature rise, power dissipation of the fuse-link and acceptable power dissipation of the fuse-holder 93
8	Tests 94
8.3	Verification of temperature rise and power dissipation 94
8.3.1	Arrangement of the fuse 94
8.3.3	Measurement of the power dissipation of the fuse-link 94
8.3.4	Test method 94
8.3.4.1	Temperature rise of the fuse-holder 95
8.10	Verification of non-deterioration of contacts 96
8.10.1	Arrangement of the fuse 96
8.10.2	Test method 96
8.10.3	Acceptability of test results 97
Figures	29 to 32 98
SECTION IV - CYLINDRICAL FUSE-LINKS FOR USE IN PLUGS (BS PLUGTOP FUSE SYSTEM)	
1.1	Scope 102
5	Characteristics of fuses 102
5.2	Rated voltage 102
5.3.1	Rated current of the fuse-link 102
5.5	Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder 102
5.6.1	Time-current characteristics, time-current zones and overload curves 102
5.6.2	Conventional times and currents 102
5.6.3	Gates 102
6	Markings 103
7	Standard conditions for construction 103
7.7	I^2t characteristics 103
7.7.1	Pre-arcing I^2t values 103
8	Tests 103
8.1.4	Arrangement of the fuse-link for tests 103
8.1.5	Testing of fuse-links 103
8.1.5.2	Testing of fuse-links of a homogeneous series 104
8.2.5	Acceptability of test results 105
8.3	Verification of temperature rise and power dissipation 105
8.3.1	Arrangement of the fuse 105
8.3.4	Test method 105
8.3.5	Acceptability of test results 105
8.4	Verification of operation 105
8.4.1	Arrangement of the fuse 105
8.5	Breaking-capacity tests 106
8.5.1	Arrangement of the fuse 106
8.5.2	Characteristics of the test circuit 106
8.5.4	Calibration of the test circuit 106
8.5.8	Acceptability of test results 107

	<i>Page</i>
8.7 Verification of I^2t characteristics and overcurrent discrimination.....	107
8.7.3 Verification of compliance for fuse-links at 0,01 s	107
8.10 Verification of non-deterioration of contacts	107
8.11.1 Mechanical strength.....	107
Figures 33 to 36	108

X

NOTES

STANDARDS AUSTRALIA

Australian Standard
Low-voltage fuses
Part 3.1: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)—Sections I to IV: Examples of types of standardized fuses

1 General

Fuses for use by unskilled persons according to the following sections shall comply with all subclauses of

IEC 60269-1: *Low-voltage fuses – Part 1: General requirements*

IEC 60269-3: *Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)*

and shall comply with the requirements laid down in the relevant sections.

This standard is divided into four sections, each dealing with a specific example of standardized fuses:

Section I	D type fuse system	
Section II	Cylindrical fuses	
	Cylindrical fuses Type A	(NF cylindrical fuse system)
	Cylindrical fuses Type B	(BS cylindrical fuse system)
	Cylindrical fuses Type C	(Italian cylindrical fuse system)
Section III	Pin-type fuses	
Section IV	Cylindrical fuse-links for use in plugs	(BS plug-top fuse system)

NOTE 1 Examples of standardized fuses complying with the requirements of IEC 60269-1 and IEC 60269-3 are listed in the present standard. Other examples may be added, provided that they comply with these requirements.

NOTE 2 The following fuse-systems are standardized systems with respect to their safety aspects.

The National Committees may select from the examples of standardized fuses one or more systems for their own standards. Colour codes are not specified for each fuse-system. Where colour codes are indicated, they apply only to that particular fuse-system.

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.

References to international standards that are struck through in this clause are replaced by references to Australian Standards that are listed immediately thereafter and identified by shading. Any Australian Standard that is identical to the International Standard it replaces is identified as such.

~~IEC 60269-1, *Low voltage fuses – Part 1: General requirements*~~