

© Copyright SEK. Reproduction in any form without permission is prohibited.

Lågspänningssäkringar – Del 4: Tilläggsfordringar på säkringspatroner för skydd av halvledarkomponenter

*Low-voltage fuses –
Part 4: Supplementary requirements for fuse-links
for the protection of semiconductor devices*

Som svensk standard gäller europastandarden EN 60269-4:2007. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60269-4:2007.

Nationellt förord

Europastandarden EN 60269-4:2007

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60269-4, Fourth edition, 2006 - Low-voltage fuses - Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices**

utarbetad inom International Electrotechnical Commission, IEC.

Standarden ska användas tillsammans med SS-EN 60269-1, utgåva 3, 2008.

Tidigare fastställd svensk standard SS-EN 60269-4, utgåva 1, 1997, SS-EN 60269-4/A1, utgåva 1, 1997, SS-EN 60269-4/A2, utgåva 1, 2003 och SS-EN 60269-4-1, utgåva 1, 2002, gäller ej fr o m 2010-03-01.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

**Low-voltage fuses -
Part 4: Supplementary requirements for fuse-links
for the protection of semiconductor devices
(IEC 60269-4:2006)**

Fusibles basse tension -
Partie 4: Exigences supplémentaires
concernant les éléments
de remplacement utilisés
pour la protection des dispositifs
à semiconducteurs
(CEI 60269-4:2006)

Niederspannungssicherungen -
Teil 4: Zusätzliche Anforderungen
an Sicherungseinsätze zum Schutz
von Halbleiter-Bauelementen
(IEC 60269-4:2006)

This European Standard was approved by CENELEC on 2007-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 32B/485/FDIS, future edition 4 of IEC 60269-4, prepared by SC 32B, Low-voltage fuses, of IEC TC 32, Fuses, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60269-4 on 2007-03-01.

This European Standard supersedes EN 60269-4:1996 + A1:1997 + A2:2003 and EN 60269-4-1:2002.

This part is to be used in conjunction with EN 60269-1:2007, Part 1:General requirements.

This Part 4 supplements or modifies the corresponding clauses or subclauses of Part 1.

Where no change is necessary, this Part 4 indicates that the relevant clause or subclause applies.

The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement | (dop) | 2008-03-01 |
| – latest date by which the national standards conflicting
with the EN have to be withdrawn | (dow) | 2010-03-01 |

Tables and figures which are additional to those in Part 1 are numbered starting from 101.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60269-4:2006 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60269-1	- ¹⁾	Low-voltage fuses - Part 1: General requirements	EN 60269-1	2007 ²⁾
IEC 60269-2 (mod)	- ¹⁾	Low-voltage fuses - Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Examples of standardized systems of fuses A to I	HD 60269-2	2007 ²⁾
IEC 60269-3 (mod)	- ¹⁾	Low-voltage fuses - Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household or similar applications) - Examples of standardized systems of fuses A to F	HD 60269-3	2007 ²⁾
IEC 60417	data- base	Graphical symbols for use on equipment	-	-
ISO 3	- ¹⁾	Preferred numbers - Series of preferred numbers	-	-

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

CONTENTS

1	General	15
1.1	Scope.....	15
1.2	Object	8
2	Terms and definitions	15
2.2	General terms	17
3	Conditions for operation in service.....	17
3.4	Voltage.....	17
3.4.1	Rated voltage	17
3.4.2	Applied voltage in service.....	19
3.5	Current.....	19
3.6	Frequency, power factor and time constant	19
3.6.1	Frequency	19
3.6.3	Time constant (τ).....	19
3.10	Temperature inside an enclosure	21
4	Classification	21
5	Characteristics of fuses	21
5.1	Summary of characteristics	21
5.1.2	Fuse-links.....	21
5.2	Rated voltage	21
5.4	Rated frequency	21
5.5	Rated power dissipation of the fuse-link	21
5.6	Limits of time-current characteristics	23
5.6.1	Time-current characteristics, time-current zones	23
5.6.2	Conventional times and currents.....	23
5.6.3	Gates	25
5.6.4	Overload curves	25
5.7.1	Breaking range and utilization category	25
5.7.2	Rated breaking capacity	27
5.8	Cut-off current and I^2t characteristics.....	27
5.8.1	Cut-off current characteristics.....	27
5.8.2	I^2t characteristics	27
5.9	Arc voltage characteristics	29
6	Markings	29
6.2	Markings on fuse-links.....	29
7	Standard conditions for construction.....	31
7.3	Temperature rise and power dissipation of the fuse-link	31
7.4	Operation	31
7.5	Breaking capacity.....	31
7.7	I^2t characteristics	31
7.14	Arc voltage characteristics	31
7.15	Special operating conditions.....	31

8	Tests	33
8.1	General	33
8.1.4	Arrangement of the fuse-link	33
8.1.5	Testing of fuse-links	33
8.3	Verification of temperature rise limits and power dissipation	35
8.3.1	Arrangement of the fuse-link	35
8.3.3 and 8.3.4.2	Measurement of power dissipation of the fuse-link	37
8.3.5	Acceptability of test results	37
8.4	Verification of operation	37
8.4.1	Arrangement of fuse-link	37
8.4.3	Test method and acceptability of test results	37
8.5	Verification of the breaking capacity	41
8.5.1	Arrangement of the fuse	41
8.5.5	Test method	41
8.5.8	Acceptability of test results	45
8.6	Verification of the cut-off current characteristic	47
8.6.1	Test method	47
8.6.2	Acceptability of test results	49
8.7	Verification of the I^2t characteristics and over-current discrimination	51
8.7.1	Test method	51
8.7.2	Acceptability of test results	51
8.7.3	Verification of compliance for “gG” and “gM” fuse-links	51
8.7.4	Verification of overcurrent discrimination	51
8.7.5	Verification of arc voltage characteristics and acceptability of test results	51
Annex A	(informative) Guide for the coordination of fuse-links with semiconductor devices	61
Annex B	(normative) Survey on information to be supplied by the manufacturer in his literature (catalogue) for a fuse designed for the protection of semiconductor devices	75
Annex C	(normative) Examples of standardized fuse-links for the protection of semiconductor devices	77
Figure 101	– Conventional overload curve (example) (X and Y are points of verified overload capability)	53
Figure 102	– Example of a conventional test arrangement (<i>continued on page 57</i>)	55
Figure 103	– Example of a conventional test arrangement	59
Figure C.1	– Single body fuse-links	79
Figure C.2	– Double body fuse-links	81
Figure C.3	– Twin body fuse-links	83
Figure C.4	– Trip indicator fuse-links	83
Figure C.5	– Fuse-links with bolted connections, type B, body sizes 000 and 00	87
Figure C.6	– Fuse-links with bolted connections, type B, body sizes 0, 1, 2 and 3	89

Figure C.7– Bolted fuse-links, type C	93
Figure C.8 – Flush end fuse-links, type A.....	97
Figure C.9 – Flush end fuse-links, type B.....	101
Figure C.10 – Fuse-links with cylindrical contact caps, type A.....	105
Table 101 – Conventional times and currents for “gR” and “gS” fuse-links	25
Table 102 – List of complete tests.....	33
Table 103 – Survey of tests on fuse-links of the smallest rated current of a homogeneous series.....	35
Table 104 – Values for breaking-capacity tests on a. c. fuses	45
Table 105 – Values for breaking-capacity tests on d.c. fuses	47
Table 106 – Values for verification of cut-off current, I^2t and arc voltage characteristics tests for a.c.	49

LOW-VOLTAGE FUSES –

Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices

1 General

IEC 60269-1 applies with the following supplementary requirements.

Fuse-links for the protection of semiconductor devices shall comply with all requirements of IEC 60269-1, if not otherwise indicated hereinafter, and shall also comply with the supplementary requirements laid down below.

1.1 Scope and object

These supplementary requirements apply to fuse-links for application in equipment containing semiconductor devices for circuits of nominal voltages up to 1 000 V a.c. or 1 500 V d.c. and also, in so far as they are applicable, for circuits of higher nominal voltages.

NOTE 1 Such fuse-links are commonly referred to as “semiconductor fuse-links”.

NOTE 2 In most cases, a part of the associated equipment serves the purpose of a fuse-base. Owing to the great variety of equipment, no general rules can be given; the suitability of the associated equipment to serve as a fuse-base should be subject to agreement between the manufacturer and the user. However, if separate fuse-bases or fuse-holders are used, they should comply with the appropriate requirements of IEC 60269-1.

The object of these supplementary requirements is to establish the characteristics of semiconductor fuse-links in such a way that they can be replaced by other fuse-links having the same characteristics, provided that their dimensions are identical. For this purpose, this standard refers in particular to

a) The following characteristics of fuses:

- 1) their rated values;
- 2) their temperature rises in normal service;
- 3) their power dissipation;
- 4) their time-current characteristics;
- 5) their breaking capacity;
- 6) their cut-off current characteristics and their I^2t characteristics;
- 7) their arc voltage limits.

b) Type tests for verification of the characteristics of fuses.

c) The markings on fuses.

d) Availability and presentation of technical data (see Annex B).

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.

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