

# SLOVENSKI STANDARD SIST EN 60269-4:2010

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Low-voltage fuses - Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices (IEC 60269-4:2009)

Niederspannungssicherungen STeil 4: Zusätzliche Anforderungen an Sicherungseinsätze zum Schutz von Halbleiter-Bauelementen (IEC 60269-4:2009)

Fusibles basse tension - Partie 4: Exigences supplémentaires concernant les éléments de remplacement utilisés pour la protection des dispositifs à semiconducteurs (CEI 60269-4:2009) e1904d078bac/sist-en-60269-4-2010

Ta slovenski standard je istoveten z: EN 60269-4:2009

# ICS:

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Fuses and other overcurrent protection devices

SIST EN 60269-4:2010

en,fr



# iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 60269-4:2010 https://standards.iteh.ai/catalog/standards/sist/84230847-95fc-4bde-a069e1904d078bac/sist-en-60269-4-2010

### SIST EN 60269-4:2010

# EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

# EN 60269-4

November 2009

ICS 29.120.50

Supersedes EN 60269-4:2007

English version

# Low-voltage fuses -Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices (IEC 60269-4:2009)

Fusibles basse tension -Partie 4: Exigences supplémentaires concernant les éléments de remplacement utilisés pour la protection des dispositifs à semiconducteurs (CEI 60269-4:2009) Niederspannungssicherungen -Teil 4: Zusätzliche Anforderungen an Sicherungseinsätze zum Schutz von Halbleiter-Bauelementen (IEC 60269-4:2009)

# iTeh STANDARD PREVIEW (standards.iteh.ai)

This European Standard was approved by CENELEC on 2009-09-01. 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.sist/84230847-95fc-4bde-a069-

e1904d078bac/sist-en-60269-4-2010

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: Avenue Marnix 17, B - 1000 Brussels

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## Foreword

The text of document 32B/535/FDIS, future edition 5 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 2009-09-01.

This European Standard supersedes EN 60269-4:2007.

The significant technical changes to EN 60269-4:2007 are:

- the introduction of voltage source inverter fuse-links, including test requirements;
- coverage of the tests on operating characteristics for a.c. by the breaking capacity tests;
- the updating of examples of standardised fuse-links for the protection of semiconductor devices.

This standard is to be used in conjunction with EN 60269-1:2007, *Low-voltage fuses – 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.

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

Additional annexes are lettered AA, BB, etc.

Th	e following dates were fixed. STANDARD PREV	<b>IEW</b>	
_	latest date by which the EN has to be implemented <b>iteh.ai</b> ) at national level by publication of an identical		
	national standard or by endorsement <u>SIST EN 60269-4:2010</u>	(dop)	2010-06-01
	https://standards.iteh.ai/catalog/standards/sist/84230847-95	5fc-4bde-a0	69-
-	latest date by which the national standards conflicting 269-4-2010	<i></i>	
	with the EN have to be withdrawn	(dow)	2012-09-01

Annex ZA has been added by CENELEC.

# **Endorsement notice**

The text of the International Standard IEC 60269-4:2009 was approved by CENELEC as a European Standard without any modification.

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# 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.

Publication	Year	<u>Title</u>	<u>EN/HD</u>	Year
IEC 60269-1	2006	Low-voltage fuses - Part 1: General requirements	EN 60269-1	2007
IEC 60269-2 (mod)	2006	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
IEC 60269-3 (mod)	2006 iTe	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
IEC 60417	Data- base	Graphical symbols for use on equipment	-	-
ISO 3	_1) https://star	Preferred numbers - Series of preferred humbers i/catalog/standards/sist/84230847-95fc-4bde e1904d078bac/sist-en-60269-4-2010	-a069-	-

<sup>&</sup>lt;sup>1)</sup> Undated reference.



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Edition 5.0 2009-05

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Low-voltage fuses Teh STANDARD PREVIEW Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices

SIST EN 60269-4:2010

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Partie 4: Exigences supplémentaires concernant les éléments de remplacement utilisés pour la protection des dispositifs à semiconducteurs

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE



ICS 29.120.50

ISBN 2-8318-1041-8

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### INTERNATIONAL ELECTROTECHNICAL COMMISSION

## LOW-VOLTAGE FUSES -

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

### 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 committee; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60269-4 has been prepared by subcommittee 32B: Low-voltage fuses, of IEC technical committee 32: Fuses.

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

FDIS	Report on voting
32B/535/FDIS	32B/541/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 fifth edition cancels and replaces the fourth edition published in 2006. It constitutes a technical revision. The significant technical changes to the fourth edition are:

the introduction of voltage source inverter fuse-links, including test requirements;

- coverage of the tests on operating characteristics for a.c. by the breaking capacity tests;
- the updating of examples of standardised fuse-links for the protection of semiconductor devices.

This part is to be used in conjunction with IEC 60269-1:2006, *Low-voltage fuses – 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.

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

Additional annexes are lettered AA, BB, etc.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60269 series, under the general title: *Low-voltage fuses*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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 (standards.iten.al)

- reconfirmed,
- withdrawn,
- SIST EN 60269-4:2010
- replaced by a revised edition clori/catalog/standards/sist/84230847-95fc-4bde-a069-
- amended.

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# 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.

#### SIST EN 60269-4:2010

The object of these supplementary arequirements 843 007 establish a 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  $l^2t$  characteristics;
  - 7) their arc voltage characteristics;
- 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).

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### 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 60269-1:2006, Low-voltage fuses – General requirements

IEC 60269-2:2006, Low-voltage fuses – Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to I

IEC 60269-3:2006, Low-voltage fuses – Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications) – Examples of standardized systems of fuses A to F

IEC 60417, Graphical symbols for use on equipment

ISO 3, Preferred numbers – Series of preferred numbers

# 2 Terms and definitions

IEC 60269-1 applies with the following supplementary definitions.

# 2.2 General terms (standards.iteh.ai)

### 2.2.101

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semiconductor device <u>standards itch aj/catalog/standards/sist/84230847-95fc-4bde-a069</u> device whose essential characteristics are due to the flow of charge carriers within a semiconductor

[IEV 521-04-01]

#### 2.2.102 semiconductor fuse-lir

semiconductor fuse-link

current-limiting fuse-link capable of breaking, under specific conditions, any current value within the breaking range (see 7.4)

### 2.2.103

### signalling device

device forming part of the fuse and signalling the fuse operation to a remote place

NOTE A signalling device consists of a striker and an auxiliary switch. Electronic devices may also be used.

## 2.2.104 voltage source inverter VSI

a voltage stiff inverter

[IEV 551-12-11]

NOTE Also referred to as a voltage stiff inverter i.e. an inverter that supplies current without any practical change in its output voltage.

# 2.2.105 voltage source inverter fuse-link VSI fuse-link

current-limiting fuse-link capable of breaking, under specified conditions, the short circuit current supplied by the discharge of a d.c.-link capacitor in a voltage source inverter

NOTE 1 The abbreviation "VSI fuse-link" is used in this document.

NOTE 2 A VSI fuse-link usually operates under a short circuit current supplied by the discharge of a d.c.-link capacitor through a very low inductance, in order to allow high frequency in normal operation. This short circuit condition leads to a very high rate of rise of current equivalent to a low value of time constant, typically 1 ms to 3 ms. The supply voltage is d.c., even though the applied voltage decreases as the current increases during the short circuit.

NOTE 3 In some multiple a.c. drive applications, individual output inverters may be remote from the main input rectifier. In these cases, the associated fault circuit impedances may influence the operation of the fuse-links - the associated time constant and the size of the capacitors need to be considered when choosing the appropriate short circuit protection.

#### **3** Conditions for operation in service

IEC 60269-1 applies with the following supplementary requirements.

#### 3.4 Voltage

#### 3.4.1 Rated voltage

# For a.c., the rated voltage of a fuse-link is related to the applied voltage; it is based on the r.m.s. value of a sinusoidal a.c. voltage. It is further assumed that the applied voltage retains

r.m.s. value of a sinusoidal a.c. voltage. It is further assumed that the applied voltage retains the same value throughout the operation of the fuse-link. All tests to verify the ratings are based on this assumption.

#### <u>SIST EN 60269-4:2010</u>

NOTE In many applications, the applied voltage will be sufficiently close to the sinusoidal form for the significant part of the operating time, but there are many cases where this condition is not satisfied.

The performance of a fuse-link subjected to a non-sinusoidal applied voltage can be evaluated by comparing, for the first approximation, the arithmetic mean values of the nonsinusoidal and sinusoidal applied voltages.

For d.c. and VSI fuse-links, the rated voltage of a fuse-link is related to the applied voltage. It is based on the mean value. When d.c. is obtained by rectifying a.c., the ripple is assumed not to cause a variation of more than 5 % above or 9 % below the mean value.

#### 3.4.2 Applied voltage in service

Under service conditions, the applied voltage is that voltage which, in the fault circuit, causes the current to increase to such proportions that the fuse-link will operate.

For a.c., consequently, the value of the applied voltage in a single-phase a.c. circuit is usually identical to the power-frequency recovery voltage. For all cases other than the sinusoidal a.c. voltage, it is necessary to know the applied voltage as a function of time.

For a unidirectional voltage and for VSI fuse-links, the important values are:

- the average value over the entire period of the operation of the fuse-link;
- the instantaneous value near the end of the arcing period.

#### 3.5 Current

The rated current of a semiconductor fuse-link is based on the r.m.s. value of a sinusoidal a.c. current at rated frequency.

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For d.c., the r.m.s. value of current is assumed not to exceed the r.m.s. value based on a sinusoidal a.c. current at rated frequency.

NOTE The thermal response time of the fuse-element may be so short that it cannot be assumed that operation under conditions which deviate much from sinusoidal current can be estimated on the basis of the r.m.s. current alone. This is so, in particular at lower frequency values and when the current presents salient peaks separated by appreciable intervals of insignificant current; for example, in the case of frequency converters and traction applications.

### 3.6 Frequency, power factor and time constant

#### 3.6.1 Frequency

The rated frequency refers to the frequency of the sinusoidal current and voltage that form the basis of the type tests.

NOTE In particular, where service frequency deviates significantly from rated frequency the manufacturer should be consulted.

### 3.6.3 Time constant ( $\tau$ )

For d.c., the time constants expected in practice are considered to correspond to those in Table 105.

NOTE 1 Some service conditions may be found which exceed the specified performance shown in the table as regards time constant. In such a case, a design of fuse-link which has been tested and/marked accordingly should be used or the suitability of such a fuse-link be subject to agreement between manufacturer and user. In some service conditions, the time constant is significantly lower than the values stated in the table. In such a case, the applied voltage can be higher than the rated voltage defined according to Table 105.

For VSI fuse-links, equivalent time constants expected in practice are considered to correspond to those in Table 106. <u>DISTEN 00207-4.2010</u> https://standards.iteh.ai/catalog/standards/sist/84230847-95fc-4bde-a069-

NOTE 2 The high rate of rise of short circuit current is due to the low inductance, which is considered to be equivalent to a low time constant.

#### 3.10 Temperature inside an enclosure

Since the rated values of the fuse-links are based on specified conditions that do not always correspond to those prevailing at the point of installation, including the local air conditions, the user may have to consult the manufacturer concerning the possible need for re-rating.

#### Classification 4

IEC 60269-1 applies.

#### Characteristics of fuses 5

IEC 60269-1 applies with the following supplementary requirements.

### 5.1 Summary of characteristics

#### 5.1.2 Fuse-links

- a) Rated voltage (see 5.2)
- b) Rated current (see 5.3 of IEC 60269-1)
- c) Kind of current and frequency (see 5.4 of IEC 60269-1)
- d) Rated power dissipation (see 5.5 of IEC 60269-1)
- e) Time-current characteristics (see 5.6)