SLOVENSKI STANDARD

SIST EN 60282-1:2004

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High-voltage fuses - Part 1: Current-limiting fuses IEC 60282-1:2002)

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English version

High-voltage fuses
Part 1: Current-limiting fuses
(IEC 60282-1:2002)

Fusibles à haute tension
Partie 1: Fusibles limiteurs de courant
(CEI 60282-1:2002)

Hochspannungssicherungen
Teil 1: Strombegrenzende Sicherungen
(IEC 60282-1:2002)

This European Standard was approved by CENELEC on 2002-05-01. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and 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

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Foreword

The text of document 32A/207/FDIS, future edition 5 of IEC 60282-1, prepared by SC 32A, High-voltage fuses, of IEC TC 32, Fuses, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60282-1 on 2002-05-01.

This European Standard supersedes EN 60282-1:1996 + corrigendum December 1997 + A1:1996 + A1:1996/corrigendum December 1997 + A2:1997.

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) 2003-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-05-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, E and ZA are normative and annexes B, C, D and F are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60282-1:2002 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60890 NOTE Harmonized as HD 528 S2:1997 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

Publication	Year	Title	EN/HD	Year
IEC 60050-151	2001	International Electrotechnical Vocabulary (IEV) Part 151: Electrical and magnetic devices	-	-
IEC 60050-441	1984	Chapter 441: Switchgear, controlgear and fuses	-	-
IEC 60050-604	1987	Chapter 604: Generation, transmission and distribution of electricity - Operation	-	-
IEC 60056 (mod)	1987	High-voltage alternating-current circuit-breakers	HD 348 S7 [1]	1998
IEC 60060-1 + corr. March	1989 1990	High-voltage test techniques Part 1: General definitions and test requirements	HD 588.1 S1	1991
IEC 60071-1	1993	Insulation co-ordination Part 1: Definitions, principles and rules	EN 60071-1	1995
IEC 60085	1984	Thermal evaluation and classification of electrical insulation	HD 566 S1	1990
IEC 60265-1	1998	High-voltage switches Part 1: Switches for rated voltages above 1 kV and less than 52 kV	EN 60265-1	1998
IEC 60420	1990	High-voltage alternating current switch-fuse combinations	EN 60420	1993
IEC 60549	1976	High-voltage fuses for the external protection of shunt power capacitors	-	-
IEC 60644	1979	Specification for high-voltage fuse-links for motor circuit applications	EN 60644	1993

[1] HD 348 S7 is superseded by EN 62271-100:2001, which is based on IEC 62271-100:2001.

Publication	Year	Title	EN/HD	Year
IEC 60694	1996	Common specifications for high-voltage switchgear and controlgear standards	EN 60694 + corr. May	1996 1999
IEC 60787	1983	Application guide for the selection of fuse-links of high-voltage fuses for transformer circuit applications	-	-
ISO 148-2	1998	Metallic materials Charpy pendulum impact test Part 2: Verification of test machines	-	-
ISO 179	Series	Plastics - Determination of Charpy impact properties	EN ISO 179	Series

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INTERNATIONAL STANDARD

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Fusibles à haute tension –

Partie 1:
Fusibles limiteurs de courant

High-voltage fuses –

Part 1:
Current-limiting fuses

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For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE FUSES –

Part 1: Current-limiting fuses

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60282-1 has been prepared by subcommittee 32A: High-voltage fuses, of IEC technical committee 32: Fuses.

This fifth edition cancels and replaces the fourth edition, published in 1994, amendment 1 (1996), and amendment 2 (1997).

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

FDIS	Report on voting
32A/207/FDIS	32A/209/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A and E form an integral part of this standard.

Annexes B, C, D and F are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

HIGH-VOLTAGE FUSES –

Part 1: Current-limiting fuses

1 General

1.1 Scope

This part of IEC 60282 applies to all types of high-voltage current-limiting fuses designed for use outdoors or indoors on alternating current systems of 50 Hz and 60 Hz and of rated voltages exceeding 1 000 V.

Some fuses are provided with fuse-links equipped with an indicating device or a striker. These fuses come within the scope of this standard, but the correct operation of the striker in combination with the tripping mechanism of the switching device is outside the scope of this standard; see IEC 60420.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60282. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60282 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(151):2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60050(441):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*

IEC 60050(604):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 604: Generation, transmission and distribution of electricity – Operation*

IEC 60056:1987, *High-voltage alternating-current circuit-breakers*

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1:1993, *Insulation coordination – Part 1: Definitions, principles and rules*

IEC 60085:1984, *Thermal evaluation and classification of electrical insulation*

IEC 60265-1:1998, *High-voltage switches – Part 1: Switches for rated voltages above 1 kV and less than 52 kV*

IEC 60420:1990, *High-voltage alternating current switch-fuse combinations*

IEC 60549:1976, *High-voltage fuses for the external protection of shunt power capacitors*

IEC 60644:1979, *Specification for high-voltage fuse-links for motor circuit applications*

IEC 60694:1996, *Common specifications for high-voltage switchgear and controlgear standards*

IEC 60787:1983, *Application guide for the selection of fuse-links of high-voltage fuses for transformer circuit application*

ISO 148-2:1998, *Metallic materials – Charpy pendulum impact test – Part 2: Verification of test machines*

ISO 179 (all parts), *Plastics – Determination of Charpy impact properties*

2 Normal and special service conditions

2.1 Normal service conditions

Fuses complying with this standard are designed to be used under the following conditions.

a) The maximum ambient air temperature is 40 °C and its mean measured over a period of 24 h does not exceed 35 °C.

The minimum ambient air temperature is –25 °C.

NOTE 1 The time-current characteristics of fuses will be modified at the minimum and maximum temperatures.

b) The altitude does not exceed 1 000 m (3 300 ft).

NOTE 2 The rated voltages and insulation levels specified in this standard apply to fuses intended for use at altitudes not exceeding 1 000 m (3 300 ft). When fuses incorporating external insulation are required for use at altitudes above 1 000 m (3 300 ft), one or other of the following procedures should be adopted.

a) The test voltages for insulating parts in air should be determined by multiplying the standard test voltages given in tables 4 and 5 by the appropriate correction factor given in column (2) of table 1.

b) The fuses may be selected with a rated voltage which, when multiplied by the appropriate correction factor given in column (3) of table 1 is not lower than the highest voltage of the system.

For altitudes between 1 000 m (3 300 ft) and 1 500 m (5 000 ft) and between 1 500 m (5 000 ft) and 3 000 m (10 000 ft), the correction factors can be obtained by linear interpolation between the values in table 1.

Table 1 – Altitude correction factors – Test voltage and rated voltage

Maximum altitude m	ft	Correction factor for test voltages referred to sea-level	Correction factor for rated voltages
(1)		(2)	(3)
1 000	(3 300)	1,0	1,0
1 500	(5 000)	1,05	0,95
3 000	(10 000)	1,25	0,80

Where the dielectric characteristics are identical at any altitude, no special precautions need to be taken.

NOTE 3 The rated current or the temperature rise specified in this standard can be corrected for altitudes exceeding 1 000 m (3 300 ft) by using the appropriate factors given in table 2, columns (2) and (3) respectively. Use one correction factor from columns (2) or the (3), but not both, for any one application.

For altitudes between 1 000 m (3 300 ft) and 1 500 m (5 000 ft) and between 1 500 m (5 000 ft) and 3 000 m (10 000 ft), the correction factors can be obtained by linear interpolation between the values in table 2.

Table 2 – Altitude correction factors – Rated current and temperature rise

Maximum altitude m	ft	Correction factor for rated current	Correction factor for temperature rise
(1)		(2)	(3)
1 000	(3 300)	1,0	1,0
1 500	(5 000)	0,99	0,98
3 000	(10 000)	0,96	0,92

c) The ambient air is not excessively (or abnormally) polluted by dust, smoke, corrosive or flammable gases, vapour or salt.

d) For indoor installations, the conditions of humidity are under consideration but, in the meantime, the following figures can be used as a guide:

– the average value of the relative humidity, measured during a period of 24 h, does not exceed 95 %;

– the average value of the vapour pressure, for a period of 24 h, does not exceed 22 mbar;

– the average value of the relative humidity, for a period of one month, does not exceed 90 %;

– the average value of the water vapour pressure, for a period of one month, does not exceed 18 mbar.

For these conditions, condensation may occasionally occur.

NOTE 4 Condensation can be expected where sudden temperature changes occur in periods of high humidity.

NOTE 5 To withstand the effects of high humidity and occasional condensation, such as breakdown of insulation or corrosion of metallic parts, indoor fuses designed for such conditions and tested accordingly or outdoor fuses may be used.

NOTE 6 Condensation may be prevented by special design of the building or housing, by suitable ventilation and heating of the station or by the use of dehumidifying equipment.

e) Vibrations due to causes external to fuses or earth tremors are negligible.

In addition, for outdoor installations,

f) account should be taken of the presence of condensation or rain and rapid temperature changes;

g) the wind pressure does not exceed 700 Pa (corresponding to 34 m/s wind speed);

h) the solar radiation does not exceed 1,1 kW/m^2.

2.2 Special service conditions

By agreement between the manufacturer and the user, high-voltage fuses may be used under conditions different from the normal service conditions given in 2.1. For any special service condition, the manufacturer shall be consulted.

2.3 Environmental behaviour

Fuses complying with this standard are inert devices during normal service. It is also a requirement of 5.1.3 that no significant external emission takes place. Therefore, they are regarded as environmentally safe devices in service and operation.

3 Definitions

For the purpose of this part of IEC 60282, certain definitions taken from IEC 60050(151), IEC 60050(441) and IEC 60050(604), together with the following definitions apply.

3.1 Electrical characteristics

3.1.1
rated value
value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment, or system
[IEV 151-16-08]

NOTE Examples of rated values usually stated for fuses, voltage, current and breaking current.

3.1.2
rating
set of rated values and operating conditions
[IEV 151-16-11]

3.1.3
prospective current (of a circuit and with respect to a fuse)
current that would flow in the circuit if the fuse were replaced by a conductor of negligible impedance
[IEV 441-17-01, modified]

NOTE For the method to evaluate and to express the prospective current, see 6.6.2.1 and 6.6.2.2.

3.1.4
prospective peak current
peak value of a prospective current during the transient period following initiation

NOTE The definition assumes that the current is made by an ideal switching device, i.e. with instantaneous transition from infinite to zero impedance. For circuits where the current can follow several different paths, for example polyphase circuits, it further assumes that the current is made simultaneously in all poles, even if only the current in one pole is considered.
[IEV 441-17-02]

3.1.5
prospective breaking current
prospective current evaluated at a time corresponding to the instant of the initiation of the breaking process
[IEV 441-17-06]

NOTE For the fuses, this instant is usually defined as the moment of the initiation of the arc during the breaking process. Conventions relating to the instant of the initiation of the arc are given in 6.6.2.3.

3.1.6
breaking capacity
value of prospective current that a fuse is capable of breaking at a stated voltage under prescribed conditions of use and behaviour
[IEV 441-17-08, modified]

3.1.7
cut-off current;
let-through current
maximum instantaneous value of current attained during the breaking operation of a fuse
[IEV 441-17-12, modified]

NOTE This concept is of particular importance when the fuse operates in such a manner that the prospective peak current of the circuit is not reached.