

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Low voltage fuses –**

**Part 7: Supplementary Requirements for fuse-links for the protection of batteries and battery systems**

**Fusibles basse tension –**

**Partie 7: Exigences supplémentaires concernant les éléments de remplacement utilisés pour la protection des batteries et des systèmes de batterie**

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**Part 7: Supplementary Requirements for fuse-links for the protection of**  
**batteries and battery systems**

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## LOW VOLTAGE FUSES –

**Part 7: Supplementary Requirements for fuse-links  
for the protection of batteries and battery systems**

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IEC 60269-7 has been prepared by subcommittee 32B: Low-voltage fuses, of IEC technical committee 32: Fuses. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
32B/700/CDV	32B/709/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

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

This Part 7 supplements or modifies the corresponding clauses or subclauses of Part 1. Where no change is necessary, this Part 7 indicates that the relevant clause or subclause of Part 1 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 document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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 document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

This document specifically supports the UN goals:

- No. 7: Affordable and clean energy
- No. 9: Industry, innovation and infrastructure
- No. 11: Sustainable cities and communities
- No. 12: Responsible consumption and communities

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## LOW VOLTAGE FUSES –

### Part 7: Supplementary Requirements for fuse-links for the protection of batteries and battery systems

#### 1 General

Fuse-links for the protection of battery energy systems 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 the protection of batteries and battery systems, including, but not limited to terminology, for electricity storage in equipment for circuits of nominal voltages up to 1 500 V DC.

Their rated voltage can be higher than 1 500 V DC.

The object of these supplementary requirements is to establish the characteristics of battery 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.

##### 1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 - Part 1: General requirements*

IECEE OD-5014, *IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System), Committee of Testing Laboratories (CTL), Instrument Accuracy Limits*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

#### 2 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60269-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>



## 2.1 General terms

### 2.1.101

#### **battery**

one or more cells fitted with devices necessary for use, for example case, terminals, markings and protective devices etc., as necessary for use

[SOURCE: IEC 60050-482:2004, 482-01-04, modified (replacement of "marking and protective devices" by "markings and protective devices etc., as necessary for use")]

### 2.1.102

#### **cell**

basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004, 482-01-01, modified (removal of NOTE)]

### 2.1.103

#### **battery module**

group of cells connected together, either in a series and/or parallel configuration with or without protective devices (e.g. fuse or PTC: Positive Temperature Coefficient) and monitoring circuitry

### 2.1.104

#### **battery system**

battery system which incorporates one or more cells, modules or battery packs including associated devices

Note 1 to entry: It has battery management unit to cut off in case of overcharging, over current, and overheating. It may have cooling or heating units.

### 2.1.105

#### **rated energy**

quantity of energy, declared by the manufacturer, which under the specified conditions can be discharged from fully charged flow battery energy storage system, to fully discharge

Note 1 to entry: The rated energy is expressed in watt hour (Wh).

### 2.1.106

#### **rated output power**

electrical power, declared by the manufacturer, which under the specified operating conditions is the maximum output power designed to be achieved

Note 1 to entry: The rated output power is normally expressed in watt (W).

### 2.1.107

#### **short-circuit current**

maximum current which can be delivered by a cell or battery into an external circuit with zero electric resistance, or an external circuit which depresses the cell or battery voltage to approximately zero volts

[SOURCE: IEC 60050-482:2004, 482-03-26, modified (replacement of "should" by "can" and "volt" by "volts", removal of NOTE)]

### 2.1.108

#### **open circuit voltage OCV**

#### **off-load voltage $U_{OC}$**

voltage across the terminals of a cell or battery when no external current is flowing

[SOURCE; IEC 60050-482:2004, 482-03-32, modified (original definition reads "voltage of a cell or battery when the discharge current is zero")]

#### **2.1.109**

##### **overcurrent protective device**

device provided to interrupt an electrical circuit in case the conductor current in the electrical circuit exceeds a predetermined value for a specified duration

[SOURCE: IEC 60050-826:2004, 826-14-14]

#### **2.1.110**

##### **rated capacity**

capacity value of a cell or battery determined under specified conditions and declared by the manufacturer

[SOURCE: IEC 60050-482:2004, 482-03-15, modified (addition of "cell or")]

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

#### **3.4 Voltage**

The DC system voltage has a maximum value not exceeding 100% of the rated voltage of the fuse.

##### **3.4.1 Rated voltage**

The rated DC voltage of a fuse-link shall exceed the maximum value of the open circuit voltage of the Battery (OCV, UOC, off-load voltage) or of the network. See Annex BB.

#### **3.5 Current**

##### **3.5.1 Rated Current**

Rated currents are given in 5.3. These values depend upon the utilization categories and rated voltages. For specific systems and sizes, see Annex AA.

#### **3.6 Frequency, power factor and time constant**

##### **3.6.1 Frequency**

Not applicable

##### **3.6.2 Power factor**

Not applicable

##### **3.6.3 Time constant**

The time constants expected in practice are considered to correspond to those in Table 105 and Table 104.

#### **3.10 Temperature inside an enclosure**

Since the rated values of the fuse-links are based on specified conditions they 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 to define allowable continuous current under these specific conditions.

## 5 Characteristics of fuses

### 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) Rated power dissipation (see 5.5)
- d) Time-current characteristics (see 5.6)
- e) Breaking range and utilization category (see 5.7.1)
- f) Rated breaking capacity (see 5.7.2)
- g) Dimensions or size (if applicable)

#### 5.2 Rated voltage

Table 22 of IEC 60269-1 applies. If it is necessary to choose lower values or intermediate values or higher values, these values should be selected from the series R10 of ISO 3, and in exceptional cases, from R20 or R40 of ISO 3.

#### 5.3 Rated current

Subclause 5.3.1 of IEC 60269-1 applies with the addition of the following rated currents: 1 400 – 1 600 – 1 800 – 2 000 – 2 250 – 2 800 – 3 150 – 3 600 – 4 000 – 4 500 – 5 000.

#### 5.5 Rated power dissipation of the fuse-link

In addition to the requirements of IEC 60269-1, the manufacturer shall indicate the power dissipation as a function of current for the range contained between 50 % to 100 % of the rated current, or publish the load profile.

Derating-curve for increased ambient temperature has to be given in the manufacturer's literature.

#### 5.6 Limits of time-current characteristics

##### 5.6.1 Time-current characteristics, time-current zones

The manufacturer shall provide mean time-current characteristics.

The time/current curve should be plotted for DC with a time constant defined by the manufacturer within the limits of Table 104 and Table 105.

Time current zone shall be available in the manufacturer's literature for times greater than 0,001 s for aBat fuses and greater than 0,01s for gBat fuses.

##### 5.6.2 Conventional times and currents

###### 5.6.2.2 Conventional times and currents for "gBat"- fuse-links

The conventional times and currents are given in Table 101.

###### 5.6.2.3 Conventional times and currents for "aBat" – fuse-links

Minimum Breaking Current for "aBat": is given in Table 105. Conventional times are given in Table 101.

**Table 101 – Conventional times and currents for "gBat" fuse-links**

Rated current	Conventional time	Conventional current	
		Type "gBat"	
A	h	$I_{nf}$	$I_f$
$I_n \leq 63$	1	1,13 $I_n$	1,60 $I_n$
$63 < I_n \leq 160$	2		
$160 < I_n \leq 400$	3		
$I_n > 400$	4		

**5.6.3 Gates**

Due to different battery technologies, gates are to be agreed between the manufacturer and the user.

**5.7 Breaking range and breaking capacity**

IEC 60269-1 applies with the following supplementary requirement.

**5.7.1 Breaking range and utilization category**

Additionally to Part 1:

- "gBat" indicates fuse-links with a full-range DC breaking capacity for the protection of batteries and battery systems
- "aBat" indicates fuse-links with a partial range DC breaking capacity for the protection of batteries and battery systems

NOTE "Bat" (for battery) indicates fuse-links with d.c. breaking capacity for battery energy systems. These letters define with accuracy the time-current characteristics, conventional times and currents, gates.

**5.7.2 Rated breaking capacity**

Minimum value of rated breaking capacity required by this part is 30 kA. Higher breaking capacities are permissible.

**6 Markings**

IEC 60269-1 applies with the following supplementary requirements.

**6.2 Markings on fuse-links**

Subclause 6.2 of IEC 60269-1 applies with the following addition:

- utilization category "gBat" or "aBat"
- rated breaking capacity
- a combination of symbols of IEC 60417 of a fuse (5016) and a battery (5001A) as shown below

