

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Miniature fuses –  
Part 2: Cartridge fuse-links**

**Coupe-circuit miniatures –  
Partie 2: Cartouches**

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**Miniature fuses –  
Part 2: Cartridge fuse-links**

**Coupe-circuit miniatures –  
Partie 2: Cartouches**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
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## MINIATURE FUSES –

### Part 2: Cartridge fuse-links

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International Standard IEC 60127-2 has been prepared by subcommittee 32C: Miniature fuses, of IEC technical committee 32: Fuses.

The major changes are as follows:

- Addition of Standard Sheet 6: Enhanced breaking capacity fuse-links 5 mm × 20 mm
- Addition of Annex A: Miniature fuse-links with wire terminations
- Addition of homogeneous series testing.

This consolidated version of IEC 60127-2 consists of the second edition (2003) [documents 32C/326/FDIS and 32C/333/RVD], its amendment 1 (2003) [documents 32C/338/FDIS and 32C/344/RVD] and its amendment 2 (2010) [documents 32C/432/FDIS and 32C/433/RVD].

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 2.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

This standard should be read in conjunction with IEC 60127-1 (hereinafter referred to as Part 1).

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability 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

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## INTRODUCTION

According to the wish expressed by the users of miniature fuses, all standards, recommendations and other documents relating to miniature fuses should have the same publication number in order to facilitate reference to fuses in other specifications, for example, equipment specifications.

Furthermore, a single publication number and subdivision into parts would facilitate the establishment of new standards, because Clauses containing general requirements need not be repeated.

The new IEC 60127 series, under the general heading *Miniature fuses*, is thus subdivided as follows:

IEC 60127-1:1988, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*

IEC 60127-2:2002, *Miniature fuses – Part 2: Cartridge fuse-links*

IEC 60127-3, *Miniature fuses – Part 3: Sub-miniature fuse-links*

IEC 60127-4, *Miniature fuses – Part 4: Universal modular fuse-links*

IEC 60127-5, *Miniature fuses – Part 5: Guidelines for quality assessment of miniature fuse-links*

IEC 60127-6, *Miniature fuses – Part 6: Fuse-holders for miniature fuse-links*

IEC 60127-7, (Free for further documents)

IEC 60127-8, (Free for further documents)

IEC 60127-9, (Free for further documents)

IEC 60127-10, *Miniature fuses – Part 10: User guide*

This Part 2 covers additional requirements, test equipment and standard sheets.

The SI system of units is used throughout this standard.

# MINIATURE FUSES –

## Part 2: Cartridge fuse-links

### 1 Scope and object

This part of IEC 60127 relates to special requirements applicable to cartridge fuse-links for miniature fuses with dimensions measuring 5 mm × 20 mm and 6,3 mm × 32 mm for the protection of electric appliances, electronic equipment and component parts thereof, normally intended for use indoors.

It does not apply to fuses for appliances intended to be used under special conditions, such as in corrosive or explosive atmospheres.

This standard applies in addition to the requirements of Part 1.

The object of this standard is to define special and additional test methods for cartridge fuse-links applying in addition to the requirements of Part 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 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering*

<https://www.it-ebooks.info> IEC 60068-2-21:1999, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60127-1:1988, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*<sup>1</sup>  
Amendment 1 (1999)

IEC 60249-2-5:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 5: Epoxide woven glass fabric copper-clad laminated sheet of defined flammability (vertical burning test)*

ISO 3:1973, *Preferred numbers – Series of preferred numbers*

### 3 Definitions

For the purposes of this part of IEC 60127, the definitions contained in Clause 3 of Part 1 apply.

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<sup>1</sup> There is a consolidated edition 1.1 (1999) including IEC 60127-1 (1988) and Amendment 1 (1999).



#### 4 General requirements

Clause 4 of Part 1 applies.

#### 5 Standard ratings

Clause 5 of Part 1 applies.

#### 6 Marking

In addition to the requirements of Clause 6, Part 1, the following criterion shall be observed:

**6.1** In addition to the requirements of 6.1 in Part 1 each fuse-link shall be marked with:

- e) A symbol denoting the rated breaking capacity. This symbol shall be placed between the marking for the rated current and the marking for the rated voltage.

These symbols are

H denoting high breaking capacity,

L denoting low breaking capacity,

E denoting enhanced breaking capacity.

EXAMPLES of marking:

T	3	1	5	L	2	5	0	V
---	---	---	---	---	---	---	---	---

		F	4	H	2	5	0	V
--	--	---	---	---	---	---	---	---

T	3	1	5	E	2	5	0	V
---	---	---	---	---	---	---	---	---

**6.4** The values for “d” and “s” shall be 0,8 mm ± 0,2 mm.

#### 7 General notes on tests

In addition to the requirements of Clause 7 in Part 1, the following criteria are to be observed:

**7.2.1** For testing individual fuse ratings, the number of fuse-links required is 48, of which 12 are kept as spares. The testing schedule is shown in Table 1.

For the maximum ampere rating of a homogeneous series, the number of fuse-links required is 48, of which 22 are kept as spares. The testing schedule is shown in Table 2.

For the minimum ampere rating of a homogeneous series the number of fuse-links required is 33, of which 16 are kept as spares. The testing schedule is shown in Table 3.

### 7.3.1 Fuse-bases for tests

For tests that require a fuse-base for mounting the fuse-links, bases according to Figures 1, 2 or 3, shall be used as appropriate.

The contact resistance between each contact and a silvered brass piece having the same nominal dimensions and shape as the fuse-link to be tested shall not exceed 3 m $\Omega$  and is measured under the following conditions:

- a) in order to prevent the breakdown of thin insulating layers on the contacts, the e.m.f. of the circuit shall not exceed 20 mV (d.c. or a.c. peak);
- b) in order to prevent undue heating of the contacts, the current flowing shall not exceed 1 A.

Metal parts of the fuse-base, except the spring and connections, shall be made of brass. Brass parts of the fuse-base and of the gauge for measuring contact resistance shall have a copper content of between 58 % and 70 %. Contacts shall be silver-plated.

For fuse-links with rated currents up to and including 6,3 A, a fuse-base according to Figure 1 shall be used. The contact force shall be between 4 N and 6 N. The flexible lead and terminal wires shall be of copper and shall have a cross-sectional area of 1 mm<sup>2</sup>; the length of each of the terminal wires being approximately 500 mm.

For fuse-links with rated currents exceeding 6,3 A, a fuse-base according to Figure 2 shall be used. The contact force shall be between 8 N and 12 N. The flexible lead and terminal wires shall be of copper and shall have a cross-sectional area of 6 mm<sup>2</sup>; the length of each of the terminal wires being approximately 500 mm.

For breaking capacity tests, a fuse-base according to Figure 3, with the same contact force and conductor cross-sectional area as for the base in Figure 2, shall be used.

## 8 Dimensions and construction

In addition to the requirements of Clause 8 in Part 1, the following criteria and tests shall be observed:

### 8.2 Construction

Where a “non-transparent” fuse-link is specified, a transparent case (body) may be used provided that there is an opaque filler.

This standard is based on the assumption that the case (body) is made of glass, ceramic or similar non-combustible material.

### 8.3 Terminations

Fuse-links shall have at each end a metallic cap of cylindrical form.

The outer ends of the cylindrical caps shall be substantially flat and at right angles to the axis.

The end caps shall be firmly attached so that it is not possible to remove them without damaging the fuse-link.

Compliance is checked by inspection and by the following test:

The samples are immersed in water for 24 h at a temperature of between 15 °C and 35 °C. After removal from the water, and axial pull steadily increasing to 5 N is applied to each cap for 1 min.

The caps shall remain firmly attached.

A suitable test apparatus for this purpose is given in Figure 7 and shall be used in cases of dispute. By using this apparatus, the test can be performed without distorting the end caps.

#### **8.4 Alignment and configuration of terminations**

The end caps and the body of the fuse-link shall be in reasonable alignment.

Compliance is checked by means of the gauge shown in Figure 4.

The entire length of the fuse-link shall pass through the gauge by the fuse-link's own weight.

### **9 Electrical requirements**

In addition to the requirements of Clause 9 in Part 1, the following criteria and tests are to be observed:

#### **9.3 Breaking capacity**

**9.3.1** In addition to the requirements of 9.3.1 in Part 1, the following shall be observed:

AC shall be used for this test.

A typical test circuit for the rated high-breaking capacity test is given in Figure 5, and for the rated low-breaking capacity test, a typical test circuit is given in Figure 6. A test base according to Figure 3 shall be used.

The power factor of the test circuit at rated high-breaking capacity shall be between 0,7 and 0,8. For tests at lower prospective currents, the inductance in the circuit shall remain constant and the current shall be adjusted by changing only the resistance.

**9.3.2** In addition to the criteria of failure prescribed in Part 1, in each of the tests the fuse-link shall operate satisfactorily without any of the following phenomena:

- fusing together of the contacts;
- illegibility of marking after test;
- piercing of the external surfaces of the end caps, visible to the naked eye.

The following phenomena are neglected:

- black spots on the end caps;
- small deformation of the end caps;
- cracking of the fuse-link.

**Table 1 – Testing schedule for individual ampere ratings**

Sub-clause	Description	Fuse-link no.															
		1-6	7 9 11	8 10 13	12 14 15	16 17 18	19 20 21	22 24 26	23 25 27	28 29 30	31 32 33	34 36 38	35 37 39	40 41 42	43 44 45	46 47 48	
9.4 <sup>a</sup>	Endurance test	X															
9.2.2 <sup>a</sup>	Test at elevated temperature <sup>b</sup>					X											
9.2.1 <sup>a</sup>	Time/current characteristics		X														
	10 $I_N$		X														
	4 $I_N$							X									
	2,75 $I_N$											X					
	2,0 $I_N$ or 2,1 $I_N$														X		
9.3	Breaking capacity test: Rated breaking capacity				X												
	5 times the rated current							X									
	10 times the rated current									X							
	50 times the rated current										X						
	250 times the rated current													X			
8.3	Terminations (end cap test)		X					X				X			X		
8.5 <sup>a</sup>	Soldered joints	X	X			X		X				X			X		
6.2 <sup>a</sup>	Legibility and indelibility of marking		X					X				X			X		
<sup>a</sup> These subclauses are to be found in Part 1.																	
<sup>b</sup> Applicable only when specified on the standard sheet.																	

**Table 2 – Testing schedule for maximum ampere rating of a homogeneous series**

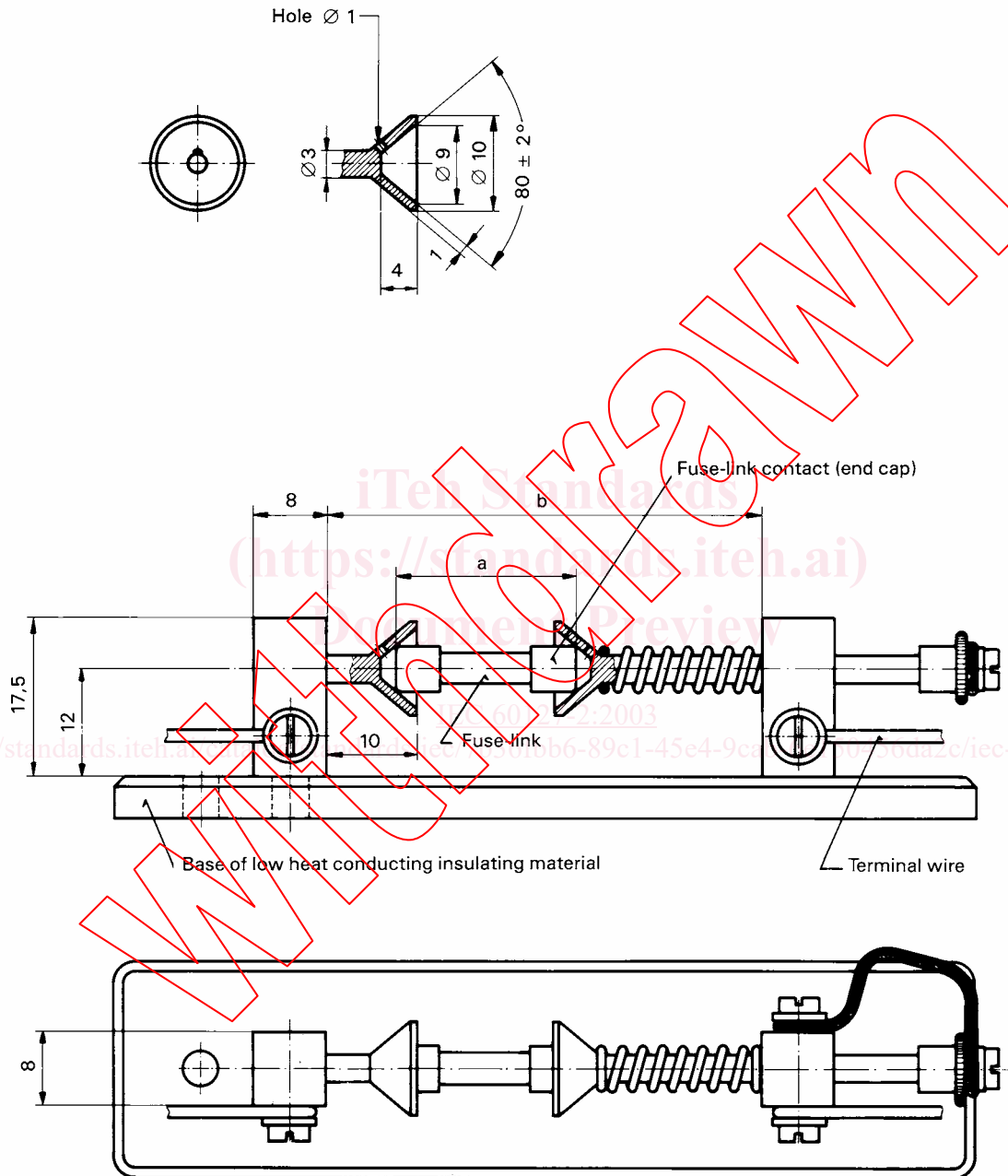
Sub-clause	Description	Fuse-link numbers in decreasing value of voltage drop											
		1-6	7 8 9	10 11 12	13-17	18-27	28 29 30	31 32 33	34 35 36	37 38 39	40 41 42	43 44 45	46 47 48
9.4 <sup>a</sup>	Endurance test	X											
9.2.2 <sup>a</sup>	Test at elevated temperature <sup>b</sup>					X							
9.2.1 <sup>a</sup>	Time/current characteristics		X										
	10 $I_N$		X										
	4 $I_N$						X						
	2,75 $I_N$								X				
	2,0 $I_N$ or 2,1 $I_N$										X		
9.3	Rated breaking capacity				X								
8.3	Terminations (end cap test)		X				X		X		X		
8.5 <sup>a</sup>	Soldered joints	X	X			X	X		X		X		
6.2 <sup>a</sup>	Legibility and indelibility of marking		X				X		X		X		
<sup>a</sup> These subclauses are to be found in IEC 60127-1.													
<sup>b</sup> Applicable only when specified on the standard sheet.													

**Table 3 – Testing schedule for minimum ampere rating of a homogeneous series**

Subclause	Description	Fuse-link numbers in decreasing value of voltage drop							
		1-6	7 8 9	10 11 12	13-17	18-27	28 29 30	31 32 33	
9.4 <sup>a</sup>	Endurance test	X							
9.2.1 <sup>a</sup>	Time/current characteristics		X						
	10 $I_N$		X						
	2,0 $I_N$ or 2,1 $I_N$						X		
9.3	Rated breaking capacity				X				
<sup>a</sup> These subclauses are to be found in IEC 60127-1.									

Dimensions in millimetres with tolerance of 0,1 mm

Fuse-links	a mm	b mm
5 mm × 20 mm	20	48
6,3 mm × 32 mm	32	60



IEC 2013/02

Figure 1 – Test fuse-base for 5 mm × 20 mm and 6,3 mm × 32 mm fuse-links – Rated currents up to and including 6,3 A (see 7.3.1)