

Miniature fuses —

Part 3: Specification for sub-miniature fuse-links

The European Standard EN 60127-3:1996, with the incorporation of amendment A2:2003 has the status of a British Standard

ICS 29.120.50

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee PEL/32, Fuses, to Subcommittee PEL/32/3, Miniature fuses, upon which the following bodies were represented:

- British Electrotechnical Approvals Board
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Electrical Installation Equipment Manufacturers Association (BEAMA Ltd.)
- Federation of the Electronics Industry
- Ministry of Defence

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 November 1996

© BSI 3 September 2003

First published July 1991
Second edition November 1996

The following BSI references relate to the work on this standard:
Committee reference PEL/32/3
Draft announced in *BSI Update* July 1996

ISBN 0 580 26081 X

Amendments issued since publication

Amd. No	Date	Comments
14530	3 September 2003	See national foreword

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60127-3	3

National foreword

This British Standard has been prepared by Subcommittee PEL/32/3 and is the English language version of EN 60127-3:1996, Miniature fuses.

Part 3: Sub-miniature fuse-links, including amendment A2:2003, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 60127-3:1988, together with its amendment 1:1991 and corrigendum October 1994, including amendment 2:2002, published by the International Electrotechnical Commission (IEC).

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CENELEC text carry the number of the amendment. For example, text altered by CENELEC amendment A1 is indicated by **A1** **A1**.

This British Standard supersedes BS EN 60127-3:1991 which will be withdrawn on 1996-12-01.

This British Standard is one of a series. The other parts are as follows:

BS EN 60127-1	<i>Definitions for miniature fuses and general requirements for miniature fuse-links</i>
BS EN 60127-2	<i>Specification for cartridge fuse-links</i>
BS EN 60127-5	<i>Guide for the quality assessment of miniature fuse-links</i>
BS EN 60127-6	<i>Fuse holders for miniature cartridge fuse-links</i>

It is anticipated that when IEC 60127-4 is published it will be approved by CENELEC as EN 60127-4.

For the purposes of this British Standard, any reference to IEC page numbers in the text should be ignored.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 23 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Descriptors: Miniature fuse, sub-miniature fuse, specification, rated characteristic, dimension, test

English version

Miniature fuses — Part 3: Sub-miniature fuse-links

(includes amendment A2:2003)
(IEC 60127-3:1988 + A1:1991 + A2:2002)

Coupe-circuit miniatures —
Partie 3: Eléments de remplacement subminiatures
(inclut l'amendement A2:2003)
(CEI 60127-3:1988 + A1:1991 + A2:2002)

Geräteschutzsicherungen —
Teil 3: Kleinstsicherungseinsätze
(enthält Änderung A2:2003)
(IEC 60127-3:1988 + A1:1991 + A2:2002)

This European Standard was approved by CENELEC on 1996-03-05 and amendment A2 was approved by CENELEC on 2003-02-01. 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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

Foreword

The text of amendment 1:1991 (with the corrigendum October 1994) to the International Standard IEC 60127-3:1988, prepared by SC 32C, Miniature fuses, of IEC TC 32, Fuses, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A1 to EN 60127-3:1991 without any modification.

The ratification of this amendment A1 was changed on 1996-03-05 into the ratification of a new edition of EN 60127-3 based on the text of IEC 60127-3:1988 + A1:1991 + corrigendum October 1994.

This European Standard replaces EN 60127-3:1991.

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) 1996-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-12-01

For products which have complied with EN 60127-3:1991 before 1996-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-12-01.

Annexes designated “normative” are part of the standard. In this standard, Annex ZA is normative. Annex ZA has been added by CENELEC.

Foreword to amendment A2

The text of document 32C/323/FDIS, future, amendment 2 to IEC 60127-3:1988, prepared by SC 32C, Miniature fuses, of IEC TC 32, Fuses, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60127-3:1996 on 2003-02-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-11-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2006-02-01

Contents

	Page
Foreword	2
Introduction	3
Section 1. Additional requirements and test equipment	3
1 Scope	3
2 Object	3
3 Definitions	3
4 General requirements	3
5 Standard ratings	3
6 Marking	3
7 General notes on tests	4
8 Dimensions and construction	4
9 Electrical requirements	5
Section 2. Standard sheets	15
Annex ZA (normative) Normative references to international publications with their corresponding European publications	23
Figure 1 — Standard printed wiring test board (for rated currents up to 5 A) (see Subclause 7.3)	12
Figure 2 — Standard test base for printed wiring board (see Subclause 7.3)	13
Figure 3 — Typical circuit for breaking capacity tests for low breaking capacity sub-miniature fuse-links (see Subclause 9.3)	14
Table 1 — Testing schedule for individual ampere ratings, standard sheets 1 and 2	7
Table 2 — Testing schedule for individual ampere ratings, standard sheets 3 and 4	8
Table 3 — Testing schedule for maximum ampere rating of a homogeneous series, standard sheets 1 and 2	9
Table 4 — Testing schedule for maximum ampere rating of a homogeneous series, standard sheets 3 and 4	10
Table 5 — Testing schedule for minimum ampere rating of a homogeneous series, standard sheets 1 to 4	11

Section 1. Additional requirements and test equipment

Introduction

The users of miniature fuses express the wish that 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, e.g. equipment specifications.

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

The new IEC Publication 60127 series is intended to be subdivided as follows:

Publications Nos.	60127:	Miniature fuses (general title)
	60127-1:	Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links.
	60127-2:	Part 2: Cartridge fuse-links.
	60127-3:	Part 3: Sub-miniature fuse-links.
	60127-4:	Part 4: Universal modular fuse-links.
	60127-5:	Part 5: Guidelines for quality assessment of miniature fuse-links.
	60127-6:	Part 6: Fuse-holders (until now IEC 60257).
	60127-7:	(free for further documents).
	60127-8:	(free for further documents).
	60127-9:	Part 9: Test-holders and test circuits.
	60127-10:	Part 10: User guide.

The third part of this standard covers additional requirements, test equipment and Standard Sheets.

1 Scope

This standard relates to special requirements applicable to sub-miniature fuse-links adapted to printed circuits and used for the protection of electric appliances, electronic equipment and component parts thereof, normally intended to be used indoors.

It does not apply to sub-miniature fuse-links for appliances intended to be used under special conditions, such as in a corrosive or explosive atmosphere.

NOTE Electrical and electronic circuit designers and printed circuit board manufacturers are advised to allow a 10 mm cube space for all sub-miniature fuse-links.

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

2 Object

The object of this standard is:

to define special and additional test methods for sub-miniature fuse-links applying in addition to the requirements of Part 1.

3 Definitions (see Part 1)

4 General requirements (see Part 1)

5 Standard ratings (see Part 1)

6 Marking

Additionally to the requirements of Clause 6 in Part 1, the following criterion is to be observed.

6.4 Sub-miniature fuse-links according to standard sheets 3 and 4 may be provided with markings for the rated current, the rated voltage and the time/current characteristic on the top so that they are visible when the fuse-link is mounted.

7 General notes on tests

Additionally to the requirements of Clause 7 in Part 1 the following criteria are to be observed.

7.2.1  For testing individual fuse ratings according to standard sheets 1 and 2, the number of sub-miniature fuse-links required is 66, of which 12 are kept as spares. The testing schedule is shown in Table 1.

For testing individual fuse ratings according to standard sheets 3 and 4, the number of fuse-links required is 51, of which 12 are kept as spares. The testing schedule is shown in Table 2.

For the maximum ampere rating of a homogeneous series, the number of fuse-links required in the case of fuse-links in accordance with standard sheets 1 and 2 is 56, of which 22 are kept as spares. The testing schedule is shown in Table 3. The number of fuse-links required in the case of fuse-links in accordance with standard sheets 3 and 4 is 51, of which 22 are kept as spares. The testing schedule is shown in Table 4.

For the minimum ampere rating of a homogeneous series the number of fuse-links required is 38, of which 16 are kept as spares. The test schedule is shown in Table 5. 

Additionally to the test mentioned in subclause 7.2.1 of Part 1, sub-miniature fuse-links shall be taken and shall be tested or inspected in accordance with the following subclause:

5. Sub-miniature fuse-link terminations (subclause 8.3)

7.3 Fuse-bases for testing

For tests that require a printed wiring board for mounting and connection of the sub-miniature fuse-link, a standard test board as shown in Figure 1, page 20, shall be used. This standard printed wiring board shall be mounted on the standard test base of Figure 2, page 21. The base material for the board shall be phenolic cellulose paper, copperclad, laminated sheet.

The nominal sheet thickness shall be 1,6 mm.

The nominal thickness of the copper layer shall be 0,035 mm.

Metal parts of the fuse-base shall be made of brass with copper content between 58 % and 70 %. Contact parts shall be silver-plated.

When two or more sub-miniature fuse-links are tested in series, the fuse-bases shall be located so that there will be a spacing of not less than 50 mm between any two sub-miniature fuse-links under test. The conductor connecting the fuse-bases together and connecting the fuse-bases to the ammeter and the source of supply shall be insulated copper wire. The length of each conductor shall be 250 mm and the diameter of the wire shall be approximately 0,64 mm.

NOTE Fuse-bases for testing having equivalent electrical and thermal properties and providing for quick insertion of sub-miniature fuse-links are under consideration.

7.4 Schedule for testing sub-miniature fuse-links according to standard sheets 1 and 2, Table 1, page 17, and according to standard sheets 3 and 4, Table 2, page 19.

8 Dimensions and construction

Additionally to the requirements of Clause 8 in Part 1 the following criteria are to be observed.

8.2 Construction

The sub-miniature fuse-link shall be resistant to heat according to subclause 9.7 of Part 1 and to fire in accordance with IEC 60695.

Compliance is checked by inspection.

This standard is based on the assumption that the case of the sub-miniature fuse-link is made of glass, ceramic or similar non-combustible material. For other material, such as the optional insulating sleeve or epoxy coating or similar material shown on standard sheet 2, additional tests are under consideration.

8.3 Sub-miniature fuse-link terminations

The sub-miniature fuse-link terminations should be firmly attached so that it is not possible to remove them without damaging the sub-miniature fuse-link.

The samples are pre-conditioned by immersion in water for 24 h at a temperature between 15 °C and 35 °C.

Terminations shall withstand the mechanical forces likely to be encountered during normal use. With the sub-miniature fuse-link held in a fixed position, each terminal in turn is subjected at ambient temperature to the forces laid down in this standard. These forces shall be exerted in the direction of the axis of the terminal and applied progressively without jerks. Test sample groups shall be equally divided among the specific termination tests stipulated in the relevant standard sheets.

Present test methods are to be performed in accordance with IEC 60068-2-21.

- For the tensile test (U_{a1}), the force applied shall be 10 N.
- For the thrust test (U_{a2}), the force applied shall be 2 N.
- For the bending test (U_b), if applicable, the force applied shall be 5 N and the number of bends shall be one.

At the conclusion of testing, the sub-miniature fuse-link terminations shall remain firmly attached and the voltage drop shall not exceed the maximum allowed in the relevant standard sheet.

8.4 Termination configuration

The sub-miniature fuse-link terminations shall be designed to permit easy installation on printed circuit wiring boards having a grid system of holes located on 2,54 mm centres, or into fuse-bases having a spacing between the terminations which is compatible with the 2,54 mm grid system.

NOTE Electrical and electronic circuit designers are advised to note that grid systems for holes located on 2,54 mm centres may result in spacings between conductive tracks, in some applications, which do not provide sufficient creepage or clearance for open-circuit conditions. In such circumstances, it may be necessary to modify the land area around the mounting hole to ensure an acceptable minimum distance between conductive tracks or select a sub-miniature fuse-link with longer terminations which can be formed to fit into hole spacings offering the necessary degree of protection.

More details are given in the User Guide (under consideration as Part 10).

9 Electrical requirements

Additionally to the requirements of Clause 9 in Part 1 the following criteria are to be observed.

9.1 Voltage drop

The use of a high impedance voltmeter is recommended for measuring the voltage drop. Voltage drop shall be measured at the points marked with U in Figure 1, page 20.

9.3 Breaking capacity

9.3.1 Additionally to the requirements of subclause 9.3.1 in Part 1 the following is to be observed.

Typical test circuits for a.c. and d.c. are given in Figure 3, page 22.

When alternating current is stipulated by the relevant standard sheets, the circuit power factor shall be larger than 0,95. To obtain this result, the circuit shall be adjusted by the use of resistors with negligible inductance.

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

- fusing together of the contacts or terminations;
- illegibility of marking after test;
- piercing of the external surfaces visible to the naked eye.

The following phenomena are neglected:

- black spots on the sub-miniature fuse-link terminations;
- small deformations of the sub-miniature fuse-link terminations;
- cracking of the sub-miniature fuse-link.

9.4 Endurance tests

9.4.1 Endurance test at normal ambient temperature

Compliance is checked by subjecting the sub-miniature fuse-links to test method A or B as required in the relevant standard sheets.