BS EN 60127-3:2015

BSI Standards Publication

Miniature fuses

Part 3: Sub-miniature fuse-links

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National foreword

This British Standard is the UK implementation of EN 60127-3:2015. It is identical to IEC 60127-3:2015. It supersedes BS EN 60127-3:1996 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/32, Fuses.

A list of organizations represented on this committee can be obtained on request to its secretary.

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

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Foreword

The text of document 32C/501/FDIS, future edition 3 of IEC 60127-3, prepared by SC 32C "Miniature fuses" of IEC/TC 32 "Fuses" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60127-3:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-11-24
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-02-24

This document supersedes EN 60127-3:1996.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60127-3:2015 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60068-2-21	-	Environmental testing -- Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21	-
IEC 60127-1	2006	Miniature fuses -- Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links	EN 60127-1	2006
IEC 60695-11-5	-	Fire hazard testing -- Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance	EN 60695-11-5	-
IEC 61249-2-7	-	Materials for printed boards and other interconnecting structures -- Part 2-7: Reinforced base materials, clad and unclad - Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad	EN 61249-2-7	-
			+EN 61249-2-7:2002/corrigendum Sep. 2005	2005
ISO 3	-	Preferred numbers; Series of preferred numbers	-	-

CONTENTS

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 and subclauses containing general requirements need not be repeated.

The new IEC 60127 series is thus subdivided as follows:

IEC 60127, *Miniature fuses* (general title)

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

IEC 60127-2, *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 (UMF) – Through-hole and surface mount types*

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, *Miniature fuses – Part 7: Miniature fuse-links for special applications*

IEC 60127-8, (Free for further documents)

IEC 60127-9, (Free for further documents)

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

This part of IEC 60127 covers additional requirements, test equipment and standard sheets.

The SI system of units is used throughout this standard.

MINIATURE FUSES –

Part 3: Sub-miniature fuse-links

1 Scope

This part of IEC 60127 is 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.

This standard applies in addition to the requirements of IEC 60127-1.

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 IEC 60127-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-21, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60127-1:2006, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*
Amendment 1:2011

IEC 60695-11-5, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 61249-2-7, *Materials for printed boards and other interconnecting structures – Part 2-7: Reinforced base materials clad and unclad – Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions in Clause 3 of IEC 60127-1:2006 apply.

4 General requirements

Clause 4 of IEC 60127-1:2006 applies.

5 Standard ratings

Clause 5 of IEC 60127-1:2006 applies.

6 Marking

Clause 6 of IEC 60127-1:2006 applies except as follows:

Addition:

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.

Additional subclause:

6.5 Where marking is impractical due to space limitations, the relevant information should appear on the smallest package and in the manufacturer's technical literature.

7 General notes on tests

Clause 7 of IEC 60127-1:2006 applies except as follows:

Addition:

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.

In addition to the test mentioned in 7.2.1 of IEC 60127-1:2006, sub-miniature fuse-links shall be taken and shall be tested or inspected in accordance with the following item e):

e) Sub-miniature fuse-link terminations (8.3)

Replacement:

7.3 Fuse-bases for testing

Fuse-links shall be mounted upon the appropriate test board (see Figure 1) by soldering.

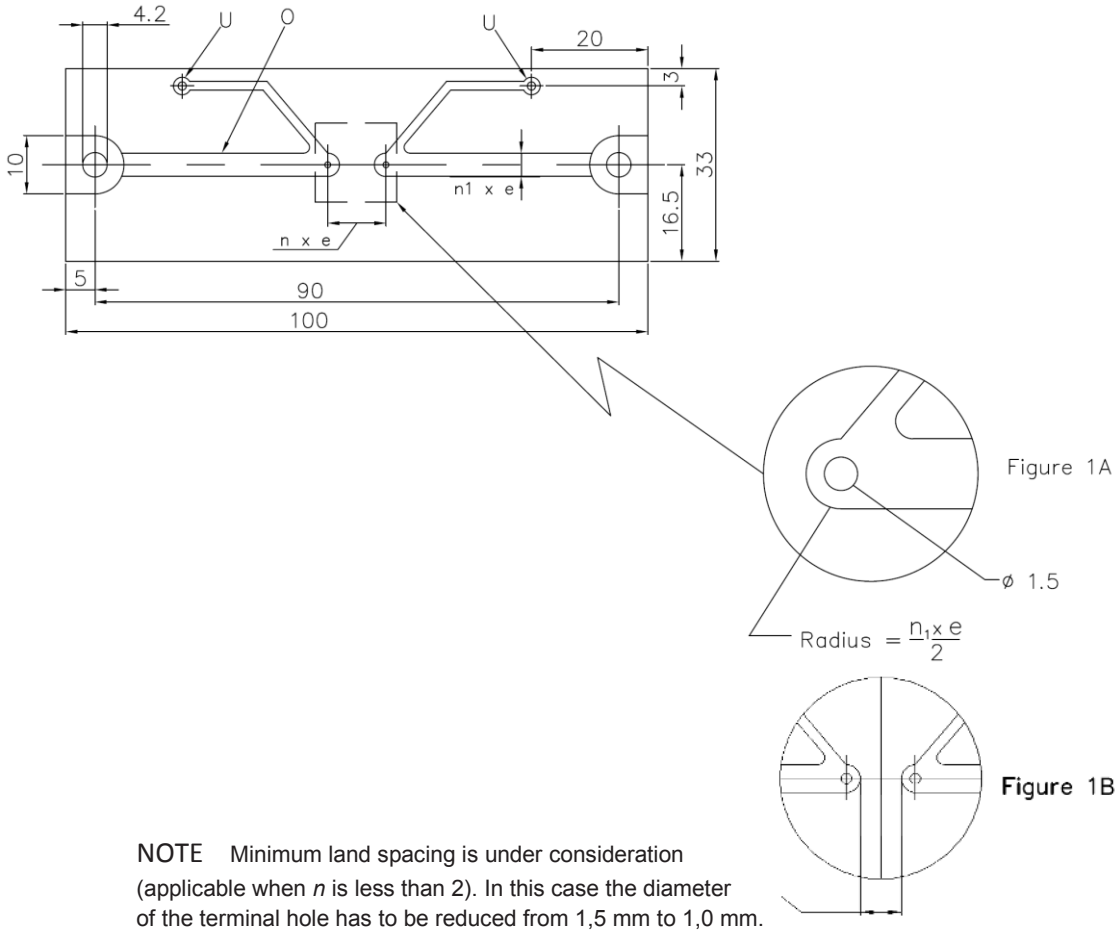
This test board shall then be mounted on the test fuse-base (Figure 2). The test board shall be made of epoxide woven glass fabric copper-clad laminated sheet, as defined in IEC 61249-2-7.

The nominal sheet thickness shall be 1,6 mm.

The nominal thickness of the cooper layer shall be 0,035 mm (0,070 mm above 5 A).

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 cross-sectional area of the wire shall be approximately 1 mm^2.



NOTE Minimum land spacing is under consideration (applicable when *n* is less than 2). In this case the diameter of the terminal hole has to be reduced from 1,5 mm to 1,0 mm.

Dimensions in millimetres

Key

O copper layer, thickness 0,035 mm (0,070 mm for rated currents above 5 A)

U connection for voltage drop measurement

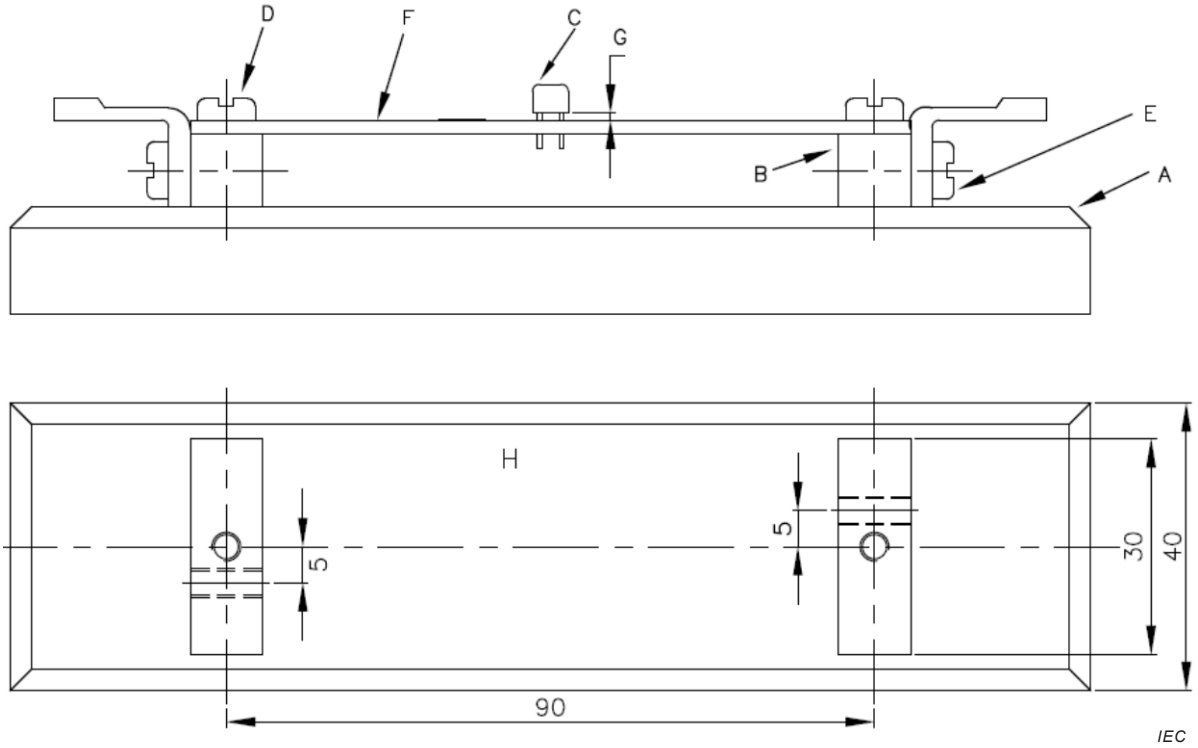
e 2,54 mm

n 1,2,3 … (to be adapted depending on the length of the fuse-link)

n_1 1 for fuse-links up to and including 5 A

2 for fuse-links above 5 A

Figure 1 – Standard test board (see 7.3)



Dimensions in millimetres

Key

A base of low heat conducting material, thickness 10 mm
B brass electrodes 10 mm square
C sub-miniature fuse-link soldered in place
D fixing screws
E contact screws holding solder terminal
F printed circuit board (see Figure 1)
G space between sub-miniature fuse-link enclosure and board equals (0,5 ± 0,25) mm or for tubular fuse-link 1 mm
H top view of base with 10 mm square brass electrodes

Figure 2 – Standard test base for test board (see 7.3)

8 Dimensions and construction

Clause 8 of IEC 60127-1:2006 applies except as follows.

8.2 Construction

Addition:

The sub-miniature fuse-link shall be resistant to heat according to 9.7 of IEC 60127-1:2006 and to fire in accordance with IEC 60695-11-5 (needle-flame test).

The duration of the application of the test flame is 10 s.

Not required for glass or ceramic.

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, 3 or 4 additional tests are under consideration.

Addition:

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 (Ua_1), the force applied shall be 10 N.
– For the thrust test (Ua_2), the force applied shall be 2 N.
– For the bending test (Ub), 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 Alignment and configuration of terminations

Replacement:

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 Attention is drawn to the fact that in some parts of the world the value e = 2,54 mm is still in use by printed circuit designers. (See IEC 60127-4:2012, 8.4, NOTE 1.)

9 Electrical requirements

Clause 9 of IEC 60127-1:2006 applies except as follows.

9.1 Voltage drop

Addition:

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.

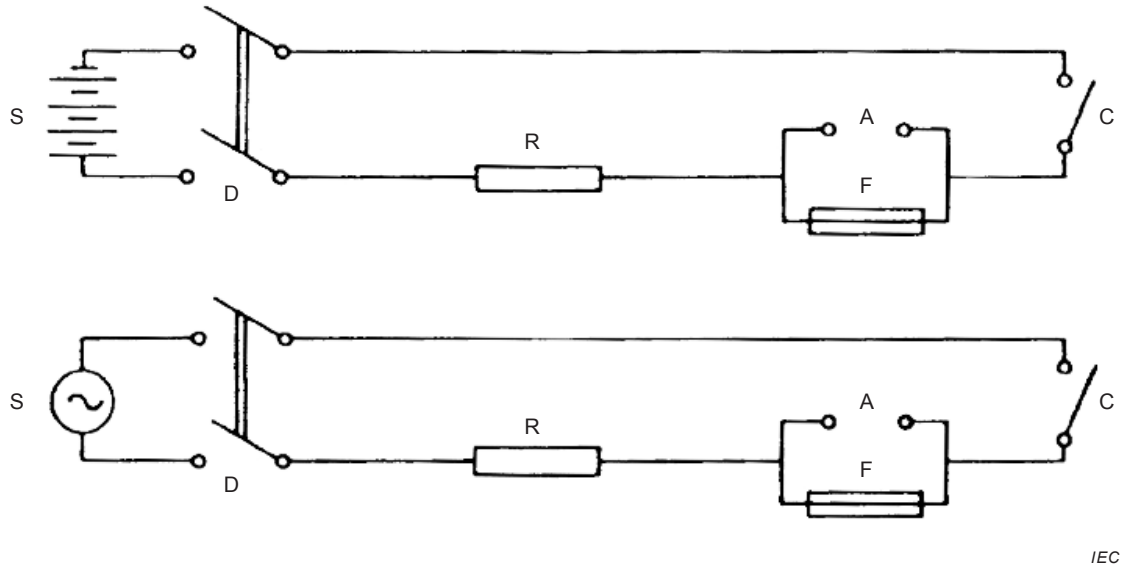
9.3 Breaking capacity

9.3.1 Operating conditions

Addition:

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

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.



Key

A = removable link used for calibration

C = contactor that makes the circuit

D = switch to disconnect the source of supply

F = fuse-link under test

S – source of supply, impedance less than 10 % of total impedance of the circuit

R = series resistor, adjusted to obtain correct prospective current

Figure 3 – Typical circuit for breaking capacity tests for low breaking capacity sub-miniature fuse-links (see 9.3)

9.3.2 Criteria for satisfactory performance

Addition:

In addition to the criteria of failure prescribed in IEC 60127-1, in each of the tests, the subminiature 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

Addition:

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.

9.4.2 Test method A

As specified in IEC 60127-1:2006, 9.4 a) to d).

9.4.3 Test method B

a) A direct current as specified in the relevant standard sheets is passed through the sub-miniature fuse-link for a period of 100 h. The current stability during the test shall be maintained within ±1% of the adjustable value.

   A current of 1 I_N is then passed through the sub-miniature fuse-link for 1 h.

b) The voltage drop across the sub-miniature fuse-link at the end of this test is measured and used for the calculation of the maximum sustained power dissipation.

c) The voltage drop measured in item b) of 9.4.3 shall not have increased by more than 10 % of the value measured before the test and shall not exceed the maximum allowed value in the relevant standard sheet.

d) After the test, the marking shall still be legible and soldered joints on end caps etc. shall not show any appreciable deterioration.

NOTE Changes in colour are not considered as a failure.

9.7 Fuse-link temperature

Addition:

Fuse-links shall be tested according to 9.7 of IEC 60127-1:2006 with the following modifications:

Replacement of second paragraph of 9.7 by the following:

The temperature rise shall not exceed 150 K when measured on the terminations where they enter the test board, and 135 K when measured on the plastic fuse body (not necessary for glass or ceramic materials), the fuse-link being tested as follows:

Replacement of text of the last dash by:

– the temperature during the last 30 seconds prior to opening shall be ignored;

Add an additional dash and text as follows:

– the thermocouple size shall be no larger than 0,05 mm^2 (30 AWG).

Deletion of NOTE 1 and change NOTE 2 to NOTE.

Table 1 – Testing schedule for individual ampere ratings, standard sheet 1 and 2

Sub-clause	Description		Sub-miniature fuse-link no.																							
			1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	55	58	61	64	E1[b]	E4[b]
			2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47	50	53	56	59	62	65	E2[b]	E5[b]
			3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	E3[b]	E6[b]
9.7	Fuse-link temperature																					×				
9.4	Endurance test		×	×																						
9.2.1 [a]	Time/current characteristic at normal ambient temperature	10 I_N									×															
		4,0 I_N											×													
		2,75 I_N																			×					
		2,0 I_N																						×		
		1,0 I_N			×																					
9.3	Breaking capacity Rated breaking capacity	50A ~					×																			
	Rated breaking capacity	50A ⎓						×																		
	5 times the rated current	5 I_N ~							×																	
	5 times the rated current	5 I_N ⎓								×																
	10 times the rated current	10 I_N ~												×												
	10 times the rated current	10 I_N ⎓													×											
	50 times the rated current	50 I_N ~														×										
	50 times the rated current	50 I_N ⎓															×									
	250 times the rated current	250 I_N ~																	×							
	250 times the rated current	250 I_N ⎓																		×						
9.3.3 [a]	Insulation resistance						×	×	×	×				×	×	×	×		×	×							
8.3	Terminations																								×	×
8.5 [a]	Soldered joints		×	×							×		×								×	×		×		
6.2 [a]	Legibility and indelibility of marking										×		×								×	×		×		

[a] Subclause to be found in IEC 60127-1

[b] the extra samples for termination test (E1 to E6) will be chosen by random and not sorted by voltage drop.

Table 2 – Testing schedule for individual ampere ratings, standard sheet 3 and 4

Sub-clause	Description		Sub-miniature fuse-link no.																		
			1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	E1[d]	E4[d]
			2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47	50	E2[d]	E5[d]
			3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	E3[d]	E6[d]
9.7	Fuse-link temperature																×				
9.4	Endurance test		×	×																	
9.2.2 [c]	Test at elevated temperature [a]					×															
9.2.1 [c]	Time/current characteristic at normal ambient temperature	10 I_N							×												
		4,0 I_N									×										
		2,75 I_N														×					
		2,1 I_N																	×		
9.3	Breaking capacity																				
	Rated breaking capacity [b]	35A or 10 I_N					×														
	5 times the rated current	5 I_N						×													
	10 times the rated current	10 I_N										×									
	50 times the rated current	50 I_N											×								
	250 times the rated current	250 I_N													×						
9.3.3 [c]	Insulation resistance						×	×				×	×		×						
8.3	Terminations																			×	×
8.5 [c]	Soldered joints		×	×					×		×					×	×		×		
6.2 [c]	Legibility and indelibility of marking								×		×					×	×		×		

[a] Applicable only when specified in the relevant standard sheet.

[b] Whichever is greater.

[c] Subclause to be found in IEC 60127-1.

[d] The extra samples for termination test (E1 to E6) will be chosen by random and not sorted by voltage drop.

Table 3 – Testing schedule for maximum ampere rating of a homogeneous series, standard sheet 1 and 2

Sub-clause	Description		Fuse-link numbers in decreasing value of voltage drop															
			1-6	7 8 9	10 11 12	13-17	18-22	23-32	33 34 35	36 37 38	39 40 41	42 43 44	45 46 47	48 49 50	51 52 53	54 55 56	E1[b] E2[b] E3[b]	E4[b] E5[b] E6[b]
9.7	Fuse-link temperature													×				
9.4	Endurance test		×															
9.2.1[a]	Time/current characteristic	10 I_N							×									
		4 I_N									×							
		2,75 I_N											×					
		2,0 I_N														×		
		1,0 I_N		×														
9.3	Rated breaking capacity	50 A a. c.				×												
		50 A d. c.					×											
9.3.3[a]	Insulation resistance					×	×											
8.3	Terminations																×	×
8.5[a]	Soldered joints		×	×					×		×		×	×		×		
6.2[a]	Legibility and indelibility of marking								×		×		×	×		×		

[a] Subclause to be found in IEC 60127-1.

[b] The extra samples for termination test (E1 to E6) will be chosen by random and not sorted by voltage drop.

Table 4 – Testing schedule for maximum ampere rating of a homogeneous series, standard sheet 3 and 4

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	49 50 51	E1[c] E2[c] E3[c]	E4[c] E5[c] E6[c]
9.7	Fuse-link temperature												×				
9.4	Endurance test		×														
9.2.2[a]	Test at elevated temperature [b]				×												
9.2.1[a]	Time/current characteristic	10 I_N						×									
		4 I_N								×							
		2,75 I_N										×					
		2,1 I_N													×		
9.3	Rated breaking capacity	a.c.				×											
9.3.3[a]	Insulation resistance					×											
8.3	Terminations															×	×
8.5[a]	Soldered joints		×					×		×		×	×		×		
6.2[a]	Legibility and indelibility of marking							×		×		×	×		×		

[a] Subclause to be found in IEC 60127-1.

[b] Applicable only when specified in the relevant standard sheet.

[c] The extra samples for termination test (E1 to E6) will be chosen by random and not sorted by voltage drop.

Table 5 – Testing schedule for minimum ampere rating of a homogeneous series, standard sheet 1 to 4

Sub-clause	Description		Fuse-link numbers in decreasing value of voltage drop							
			1-6	7 8 9	10 11 12	13-17	18-22	23-32	33 34 35	36 37 38
9.4	Endurance test		×							
9.2.1[a]	Time/current characteristic	10 I_N		×						
		2.0 I_N or 2.1I_N							×	
9.3	Rated breaking capacity	a.c.				×				
		d.c. (if applicable)					×			

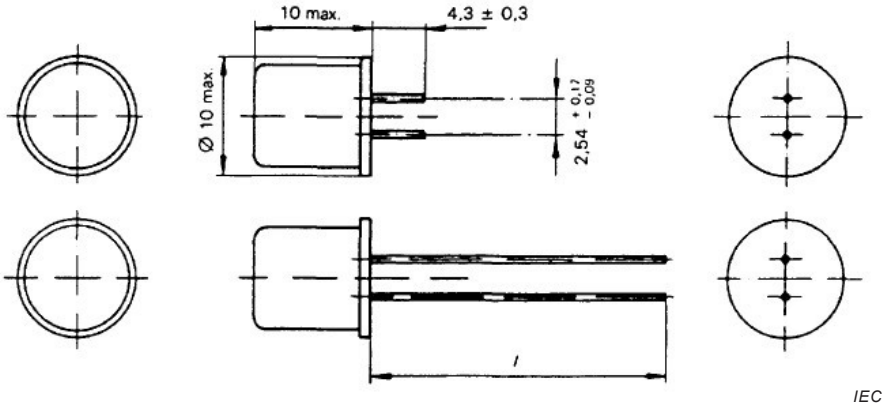
[a] Subclause to be found in IEC 60127-1.

Addition:

10 Standard sheets

	Sub-miniature fuse-links Quick-acting, low breaking capacity	Standard sheet 1 Page 1

Dimensions in millimetres



NOTE Every cross-section shape within 10 mm × 10 mm is allowed.

Terminations

a) The length *l* of the terminations may be adapted for a lead taping type of packaging.

b) The termination shall go through a 1,0 mm hole and have a rated minimum cross-sectional area of 0,150 mm².

c) The cross-sectional shape of the termination is optional.

Rated current [a]	Rated voltage V	Maximum voltage drop mV	Maximum sustained power dissipation mW[b]
2 mA	125	6 000	14
5 mA		3 000	17
10 mA		2 200	25
16 mA		1 500	27
32 mA		1 500	53
50 mA		1 000	55
63 mA		1 000	70
80 mA		1 000	88
100 mA		1 000	110
125 mA		1 000	138
160 mA		1 000	176
200 mA		700	140
250 mA		700	193
315 mA		700	243
400 mA		400	176
500 mA		400	220
630 mA		400	277
800 mA		400	372
1 A		190	209
1.25 A		190	261
1.6 A		190	334
2 A		190	418
2.5 A		190	523
3.15 A		190	658
4 A		190	836
5 A		190	1 045

[a] Intermediate values shall be chosen from the R 20 or R 40 series according to ISO 3.

[b] Measured after 1 h at 1 IN.

	Sub-miniature fuse-links Quick-acting, low breaking capacity	Standard sheet 1 Page 2

Marking

Sub-miniature fuse-links shall be marked with the following:

a) rated current

b) rated voltage

c) manufacturer's name or trade mark

Pre-arcing time/current characteristic

The pre-arcing time shall be within the following limits:

Rated current	I_N min.	2 I_N max.	2,75 I_N max.	4 I_N max.	10 I_N max.
2 mA to 5 A inclusive	4 h	5 s	300 ms	30 ms	4 ms

Breaking capacity

Rated breaking capacity: 50 A, tested with a.c. and d.c. using the circuit given in Figure 3 for the breaking capacity test.

Endurance test

100 h minimum at a continuous current of 0,8 times the rated current, according to test method B of 9.4.3.

Sub-miniature fuse-link contact test

The contact leads shall be evaluated in accordance with 8.3 for:

a) tensile

b) thrust

c) bending (applicable only if the length of the terminations is over 5 mm)

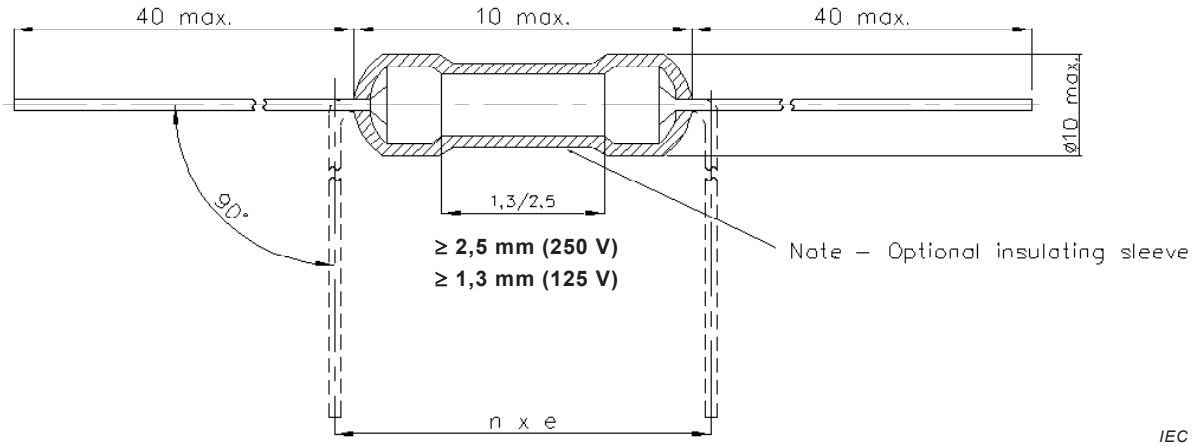
Sub-miniature fuse-link temperature-rise test

The initial current according to 9.7 shall be I_N.

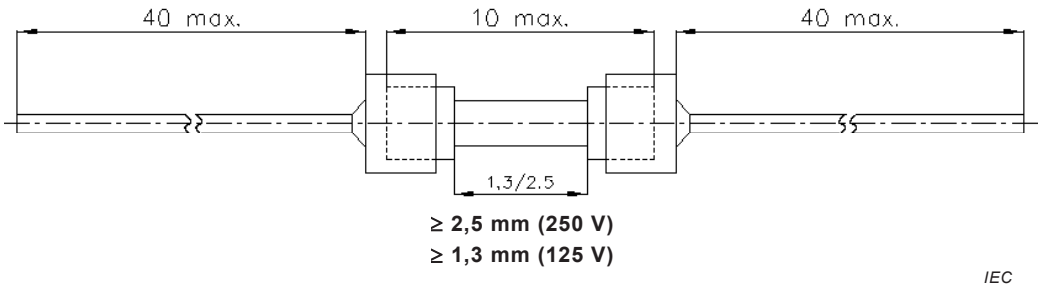
The maximum operating ambient temperature is +85 °C. When the sub-miniature fuse-link is operating under these conditions the current load should be reduced to 0,9 I_N.

	Sub-miniature fuse-links Quick-acting, low-breaking capacity	Standard sheet 2 Page 1

Dimensions in millimetres



Or as alternative



NOTE Every cross-section shape within 10 mm × 10 mm is allowed.

Terminations

a) The termination shall go through a 1,5 mm hole and have a rated minimum cross-sectional area of 0,150 mm^2.

b) The cross-sectional shape of the termination is optional.

	Sub-miniature fuse-links **Quick-acting** **Low-breaking capacity**	**Standard sheet 2** Page 2

Rated current [a]	**Rated voltage** V [c]	**Maximum voltage drop** mV	**Maximum sustained power dissipation** mW [b]
50 mA		2 250	123
63 mA		2 230	154
80 mA		2 200	194
100 mA		1 750	193
125 mA		1 500	206
160 mA		1 500	264
200 mA		1 500	330
250 mA		1 000	275
315 mA		1 000	347
375 mA		1 000	400
400 mA		1 000	440
500 mA		1 000	550
630 mA		500	347
750 mA		350	300
800 mA	125 or 250	275	242
1 A		275	303
1,25 A		275	378
1,5 A		275	420
1,6 A		275	484
2 A		250	550
2,5 A		250	688
3 A		250	750
3,15 A		250	866
4 A		225	990
5 A		225	1 238
6,3 A		190	1 300
7 A		180	1 300
8 A		160	1 400
10 A		150	1 600

[a] Intermediate values shall be chosen from the R 20 or R 40 series according to ISO 3.

[b] Measured after 1 h at 1 I_N.

[c] Rated voltage to be declared by manufacturer

	Sub-miniature fuse-links **Quick-acting** **Low-breaking capacity**	**Standard sheet 2** Page 3

Marking

Sub-miniature fuse-links shall be marked with the following:

a) rated current

b) manufacturer's name or trade mark

Where colour bands are used, the values for *d* and *s* should be $0{,}4^{+0{,}1}_{0}$ mm.

Pre-arcing time/current characteristic

The pre-arcing time shall be within the following limits:

Rated current	**I_N** **min.**	**2 I_N** **max.**	**2,75 I_N** **max.**	**4 I_N** **max.**	**10 I_N** **max.**
50 mA to 10 A inclusive	4 h	5 s	300 ms	30 ms	4 ms

Breaking capacity

Rated breaking capacity: 50 A, tested with a.c. and d.c. using the circuit given in Figure 3 for the breaking capacity test.

Endurance test

100 h minimum at a continuous current of 0,8 times the rated current, according to test method B of 9.4.3.

Sub-miniature fuse-link contact test

The contact leads shall be evaluated in accordance with 8.3 for:

a) tensile

b) bending (applicable only if the length of the terminations is over 5 mm)

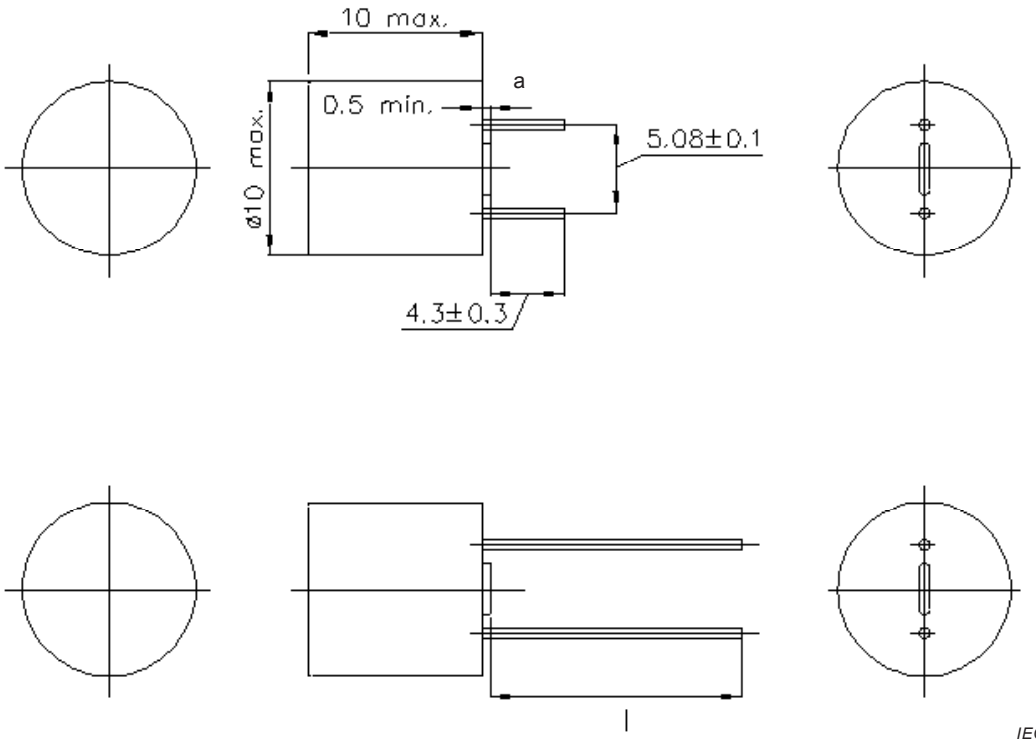
Sub-miniature fuse-link temperature-rise test

The initial current according to 9.7 shall be I_N.

The maximum operating ambient temperature is +85 °C. When the sub-miniature fuse-link is operating under these conditions the current load should be reduced to 0,9 I_N.

	Sub-miniature fuse-links Quick-acting Low-breaking capacity	Standard sheet 3 Page 1

Dimensions in millimetres



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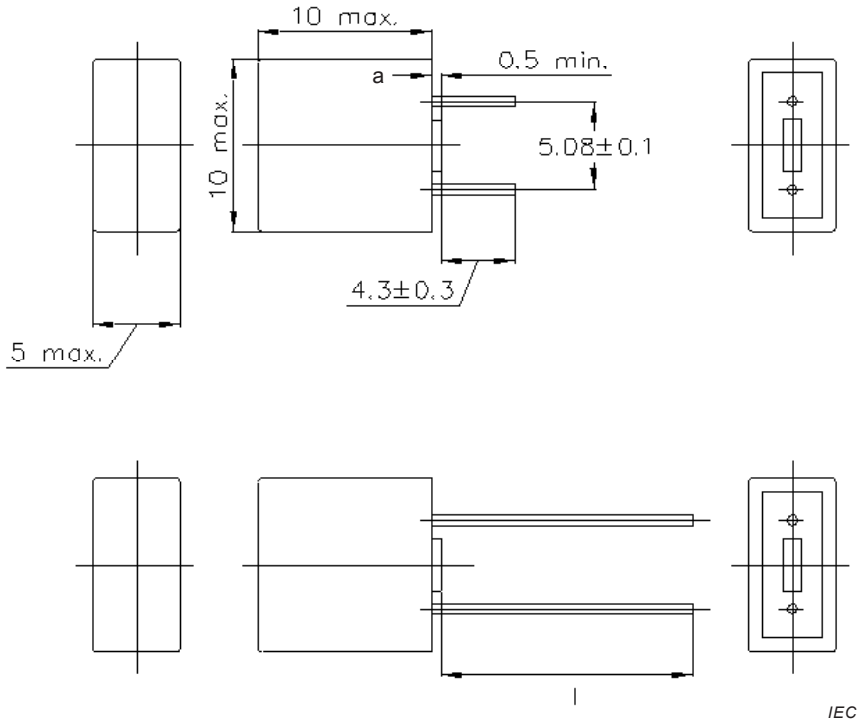


NOTE 1 Every cross-section shape within 10 mm × 10 mm is allowed.

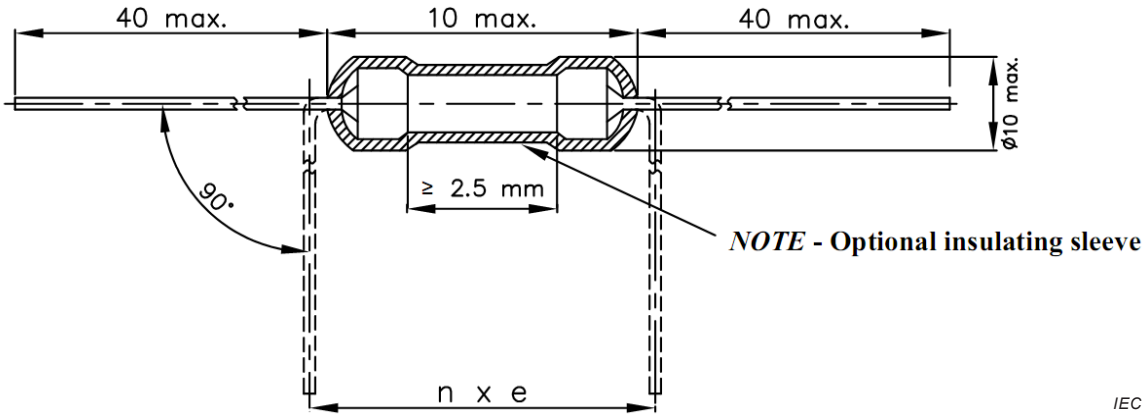
Terminations

a) Any shape and location is allowed as long as the 0,5 mm is guaranteed.

	Sub-miniature fuse-links Quick-acting Low-breaking capacity	Standard sheet 3 Page 2

Dimensions in millimetres

Or as alternative



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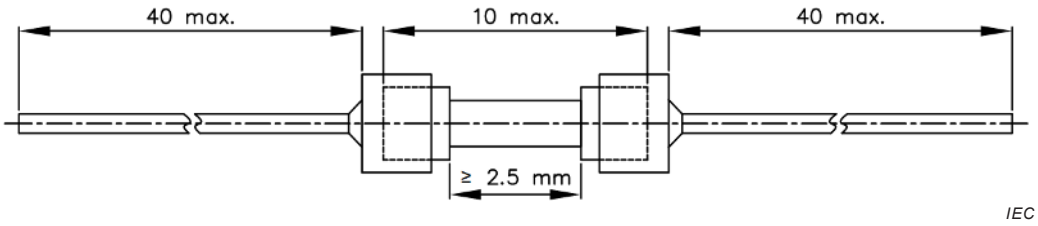


NOTE 2 Every cross-section shape within 10 mm × 10 mm is allowed.

Terminations

a) The length *l* of the terminations may be adapted for a lead taping type of packaging.

b) The termination shall go through a 1,5 mm hole and have a rated minimum cross-sectional area of 0,150 mm^2.

c) The cross-sectional shape of the termination is optional.

Rated current [a]	Rated voltage V	Maximum voltage drop mV	Maximum sustained power dissipation mW[b]
50 mA	250	850	112
63 mA		750	124
80 mA		650	137
100 mA		600	158
125 mA		550	180
160 mA		500	210
200 mA		480	252
250 mA		440	289
315 mA		400	331
400 mA		370	389
500 mA		350	459
630 mA		320	529
800 mA		300	630
1 A		280	735
1,25 A		280	919
1,6 A		250	1 050
2 A		240	1 260
2,5 A		200	1 313
3,15 A		180	1 488
4 A		160	1 680
5 A		150	1 969
6,3 A		130	2 000
8 A		100	2 000
10 A		85	2 000

[a] Intermediate values shall be chosen from the R 20 or R 40 series according to ISO 3.

[b] Measured after 1 h at 1,5 IN.

	Sub-miniature fuse-links **Quick-acting** **Low-breaking capacity**	**Standard sheet 3** Page 3

Marking

Sub-miniature fuse-links shall be marked with the following:

a) rated current

b) rated voltage

c) manufacturer's name or trade mark

d) characteristic symbol F

Pre-arcing time/current characteristic

The pre-arcing time shall be within the following limits:

Rated current	**2,1 I_N**	**2,75 I_N**		**4 I_N**		**10 I_N**
	max.	**min.**	**max.**	**min.**	**max.**	**max.**
50 mA to 5 A inclusive	30 min	10 ms	3 s	3 ms	300 ms	20 ms
6,3 A to 10 A inclusive	30 min	50 ms	10 s	5 ms	400 ms	20 ms

Breaking capacity

Rated breaking capacity: 35 A or 10 I_N, whichever is greater, tested with a.c. and using the circuit given in Figure 3 for the breaking capacity test.

Endurance test

100 cycles at rated current according to test method A of 9.4.2, followed by 1 h at 1,5 times the rated current.

Sub-miniature fuse-link contact test

The contact leads shall be evaluated in accordance with 8.3 for:

a) tensile

b) thrust

c) bending (applicable only if the length of the terminations is over 5 mm)

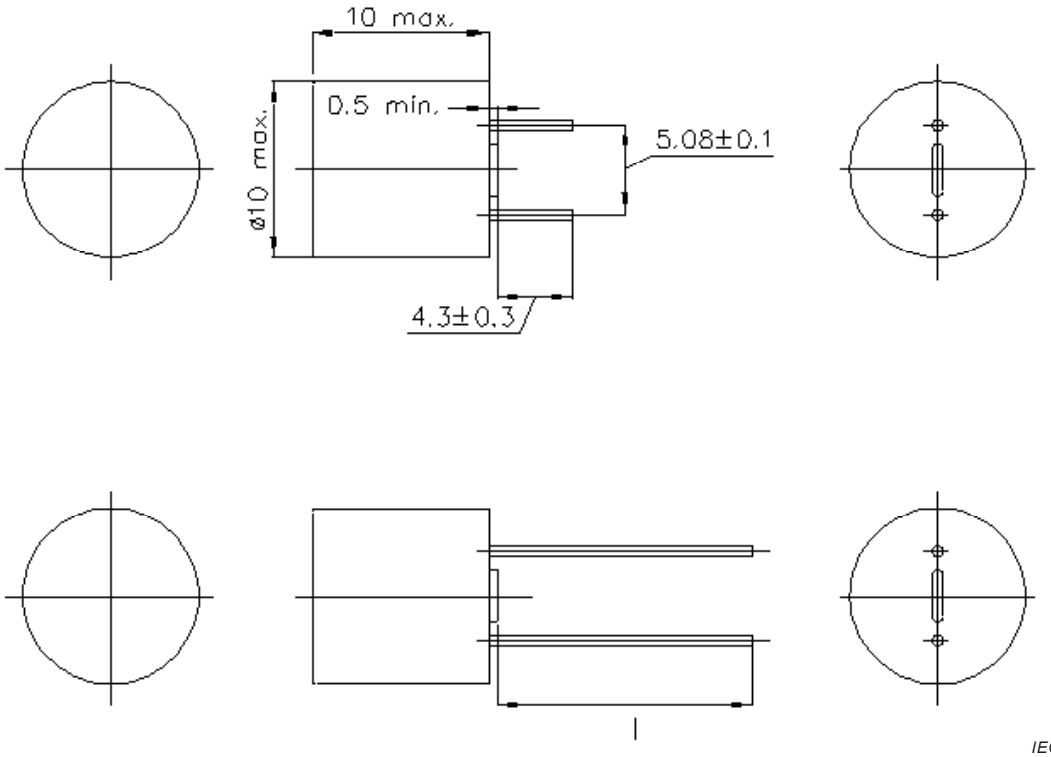
Sub-miniature fuse-link temperature-rise test

The initial current according to 9.7 shall be 1,5 I_N.

The maximum operating ambient temperature is +85 °C. When the sub-miniature fuse-link is operating under these conditions the current load should be reduced to 0,9 I_N.

	Sub-miniature fuse-links Time-lag Low-breaking capacity	Standard sheet 4 Page 1

Dimensions in millimetres



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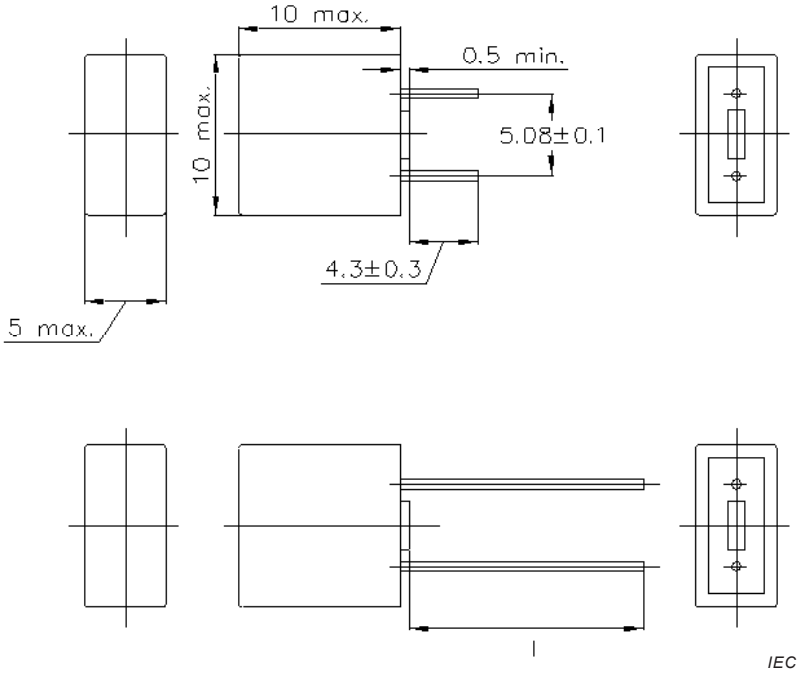
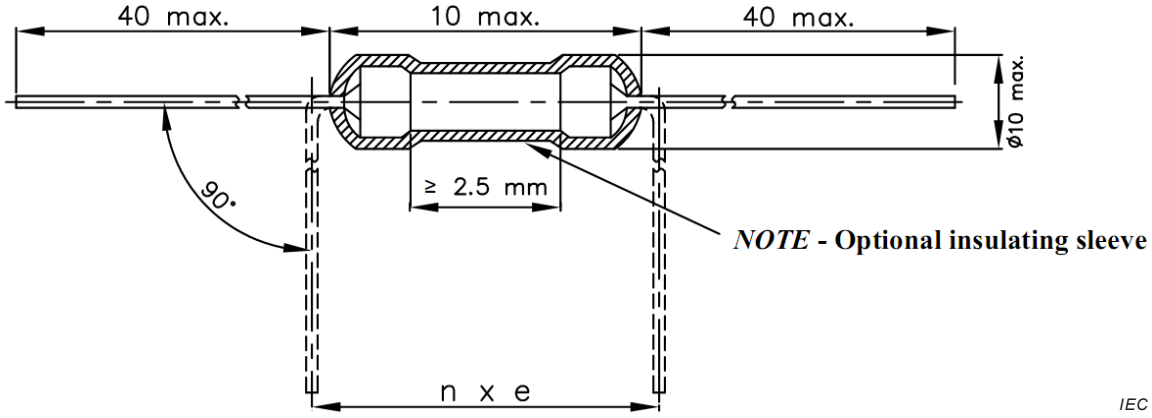


	Sub-miniature fuse-links Time-lag Low-breaking capacity	Standard sheet 4 Page 2

Dimensions in millimetres

Or as alternative



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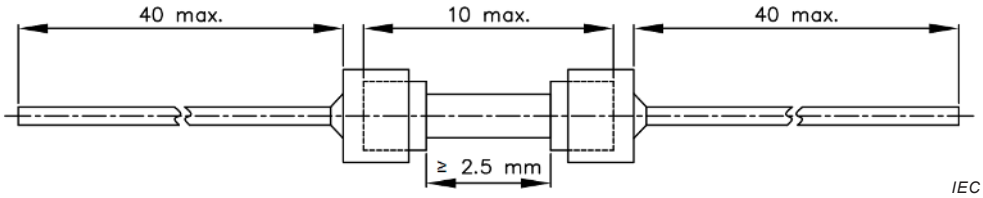

NOTE Every cross-section shape within 10 mm × 10 mm is allowed.

Terminations

a) The length *l* of the terminations may be adapted for a lead taping type of packaging.

b) The termination shall go through a 1,5 mm hole and have a rated minimum cross-sectional area of 0,150 mm².

c) The cross-sectional shape of the termination is optional.

Rated current [a]	Rated voltage V	Maximum voltage drop mV	Maximum sustained power dissipation mW[b]
40 mA	250	600	150
50 mA		550	155
63 mA		480	160
80 mA		400	165
100 mA		350	170
125 mA		300	180
160 mA		280	190
200 mA		260	200
250 mA		240	220
315 mA		220	250
400 mA		200	280
500 mA		190	310
630 mA		180	360
800 mA		160	430
1 A		140	500
1,25 A		130	600
1,6 A		120	730
2 A		100	870
2,5 A		100	1 000
3,15 A		100	1 200
4 A		100	1 400
5 A		100	1 500
6,3 A		100	1 650
8 A		80	1 800
10 A		75	2 000

[a] Intermediate values shall be chosen from the R 20 or R 40 series according to ISO 3.

[b] Measured after 1 h at 1,5 I_N.

	Sub-miniature fuse-links **Time-lag** **Low-breaking capacity**	**Standard sheet 4** Page 3

Marking

Sub-miniature fuse-links shall be marked with the following:

a) rated current

b) rated voltage

c) manufacturer's name or trade mark

d) characteristic symbol T

Pre-arcing time/current characteristic

The pre-arcing time shall be within the following limits:

Rated current	**2,1 I_N**	**2,75 I_N**		**4 I_N**		**10 I_N**	
	max.	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**
40 mA to 6,3 A inclusive	2 min	400 ms	10 s	150 ms	3 s	20 ms	150 ms
Above 6,3 A to 10 A	5 min	1 s	20 s	150 ms	3 s	20 ms	150 ms

Test at a temperature of 70 ± 2 °C

A current of 1,0 I_N shall be passed through the sub-miniature fuse-links for 1 h and they shall not operate.

Breaking capacity

Rated breaking capacity: 35 A or 10 I_N, whichever is greater, tested with a.c. and using the circuit given in Figure 3 for the breaking capacity test.

Endurance test

100 cycles at rated current according to test method A of 9.4.2, followed by 1 h at 1,5 times the rated current.

Sub-miniature fuse-link contact test

The contact leads shall be evaluated in accordance with 8.3 for:

a) tensile

b) thrust

c) bending (applicable only if the length of the terminations is over 5 mm)

Sub-miniature fuse-link temperature-rise test

The initial current according to 9.7 shall be 1,5 I_N.

The maximum operating ambient temperature is +85 °C. When the sub-miniature fuse-link is operating under these conditions the current load should be reduced to 0,9 I_N.

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