

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Coupe-circuits miniatures –
Partie 7: Éléments de remplacement miniatures pour applications spéciales**

<https://standards.iteh.ai/catalog/standards/sist/7d1126d6-8d05-4334-994f-0d7c24e316bb/iec-60127-7-2013>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2013 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.
If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc/iec-

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente. un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Coupe-circuits miniatures –
Partie 7: Eléments de remplacement miniatures pour applications spéciales**

<https://standards.iteh.ai/catalog/standards/sist/7d1226d6-8d05-4334-994f-0d7c24e31f6bb/iec-60127-7-2013>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

S

ICS 29.120.50

ISBN 978-2-83220-670-6

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 General requirements	7
5 Standard ratings	8
6 Marking	8
7 General notes on tests	9
8 Dimensions and construction.....	12
9 Electrical requirements.....	13
9.1 Voltage drop.....	13
9.2 Time/current characteristic	13
9.2.1 Time/current characteristic at normal ambient temperature.....	13
9.2.2 Test at elevated temperature	13
9.3 Breaking capacity.....	13
9.3.1 Operating conditions.....	13
9.3.2 Criteria for satisfactory performance.....	15
9.4 Endurance tests	15
9.4.101 Endurance test at normal ambient temperature	16
9.4.102 Test method A.....	16
9.4.103 Test method B.....	16
9.5 Maximum sustained dissipation	16
9.6 Pulse tests	16
9.7 Fuse-link temperature	16
9.7.101 Fuse-links for use on printed circuit boards	16
9.7.102 Fuse-links for use in fuse-holders.....	17
Annex AA (informative) Guidance on ratings to be specified by the manufacturer or to be agreed upon with the testing house.....	23
Figure 1 – Standard test board	10
Figure 2 – Standard test base for printed circuit board.....	11
Figure 3 – Test circuits for breaking capacity tests.....	14
Table 1 – Power factor and time constant	15
Table 2 – Testing schedule for a.c. or d.c. breaking capacity fuse-links	18
Table 3 – Testing schedule for a.c. and d.c. breaking capacity fuse-links.....	19

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MINIATURE FUSES –

Part 7: Miniature fuse-links for special applications

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60127-7 has been prepared by subcommittee 32C: Miniature fuses, of IEC technical committee 32: Fuses.

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

CDV	Report on voting
32C/458/CDV	32C/467/RVC

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 2.

This International Standard is to be used in conjunction with IEC 60127-1:2006, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links* and its Amendment 1 (2011).

The clauses of this standard supplement, modify or replace the corresponding clauses in IEC 60127-1.

Where there is no corresponding clause or subclause in this standard, the clause or subclause of IEC 60127-1 applies without modification as far as is reasonable. When this standard states “addition” or “replacement”, the relevant text in IEC 60127-1 is to be adapted accordingly.

Subclauses which are additional to those in Part 1 are numbered starting from 101. Additional annexes are numbered AA, BB, etc.

A list of all parts in the IEC 60127 series, published under the general title *Miniature fuses*, can be found on the IEC website.

The committee has decided that the contents of this publication 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

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[iec-60127-7-2013](https://standards.iteh.ai/catalog/standards/sist/7d1126d6-8d05-4334-994f-0d7c24e3f6bb/iec-60127-7-2013)

<https://standards.iteh.ai/catalog/standards/sist/7d1126d6-8d05-4334-994f-0d7c24e3f6bb/iec-60127-7-2013>

Withdrawn

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

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*

MINIATURE FUSES –

Part 7: Miniature fuse-links for special applications

1 Scope

This part of IEC 60127 covers requirements for miniature fuse-links for special applications.

It does not apply to fuses completely covered by the subsequent parts of IEC 60269-1.

It does not apply to miniature fuse-links 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 IEC 60127-1.

This standard is applicable to fuse-links with a rated voltage not exceeding 1000 V, a rated current not exceeding 20 A and a rated breaking capacity not exceeding 50 kA.

Miniature fuse-links for special applications are not intended to be replaced by the end-user of an electrical / electronic appliance.

The object of this standard is to establish uniform test methods for miniature fuse-links for special applications, so as to allow verification of the values (for example melting time and breaking capacity values) specified by the manufacturer.

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 60068-2-21:2006, *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*

IEC 60127-6:1994, *Miniature fuses – Part 6: Fuse-holders for miniature cartridge fuse-links*
Amendment 1:1996
Amendment 2:2002

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60695-2-12:2010, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-2-13:2010, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials*

IEC 60695-4:2012, *Fire hazard testing – Part 4: Terminology concerning fire tests for electrotechnical products*

IEC 61249-2-7:2002, *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 3:1973, *Preferred numbers – Series of preferred numbers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Clause 3 of IEC 60127-1:2006, except 3.5, as well as the following apply.

3.1

miniature fuse-link for special applications

enclosed fuse-link which is not covered in IEC 60127-2, IEC 60127-3 or IEC 60127-4 and of rated breaking capacity not exceeding 50 kA, with a width and height not exceeding 12 mm and a length not exceeding 50 mm

Note 1 to entry: Special precautions may be necessary to ensure that the fuse-links will be replaced by a fuse-link with the same technical parameters.

3.2

t_1 to t_8

limit values for time/current characteristic

3.3

I_{70}

test current for testing at elevated temperature of 70 °C

Note 1 to entry: Preferred values are 0,8 I_N or 1,0 I_N or 1,1 I_N .

3.4

$I_{\text{test}} (A)$

test current for endurance testing according to method A

Note 1 to entry: Preferred values are 1,0 I_N or 1,05 I_N or 1,2 I_N .

3.5

$I_{\text{test}} (B)$

test current for endurance testing according to method B

Note 1 to entry: Preferred values are 0,8 I_N or 1,0 I_N .

3.6

$I_{\text{OVL}} (A)$

test current for measuring the maximum sustained dissipation according to method A

Note 1 to entry: Preferred values are 1,25 I_N or 1,35 I_N or 1,5 I_N .

3.7

$I_{\text{OVL}} (B)$

test current for measuring the maximum sustained dissipation according to method B

Note 1 to entry: Preferred values are 1,0 I_N or 1,25 I_N .

4 General requirements

Clause 4 of IEC 60127-1:2006 applies.

5 Standard ratings

Clause 5 of IEC 60127-1:2006 does not apply.

Replacement:

The following ratings shall be agreed upon between the testing house and the manufacturer:

- rated voltage;
- rated current (see standard sheet 1 for preferred ratings);
- rated breaking capacity (a.c. and/or d.c.);
- time/current characteristic (at least at $2,0 I_N$ or $2,1 I_N$ and $10 I_N$).

The following may be agreed upon on an optional basis:

- test at elevated temperature;
- time/current characteristic (additionally at $2,75 I_N$ and $4 I_N$).

Any additional specified values are given in standard sheet 1.

6 Marking

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

6.1

Replacement:

d) Not applicable.

NOTE A symbol denoting the time/current characteristic cannot be stated, because this part of IEC 60127 does not specify any values for this parameter.

Addition:

- e) Type designation.
- f) Rated breaking capacity in amperes (A) or in kilo amperes (kA).

6.2

Deletion of NOTE 2.

6.3

Addition after first paragraph:

Furthermore the rated breaking capacity in amperes (A) or in kilo amperes (kA) shall be marked on the package label.

6.4

Addition of heading title and replacement of text:

6.4 Colour coding for miniature fuse-links for special applications

Marking of fuse-links by means of colour bands according to IEC 60127-1:2006, Annex A, is not permitted. It is, however, possible to use colour markings that clearly differ from this colour band system. In this case, the manufacturer shall provide the relevant information, for example colour key.

Additional subclause:

6.101 Where marking is impracticable 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.

7.2 Type tests

7.2.1

Replacement:

For testing the individual current ratings of fuses with a.c. or d.c. breaking capacity, the number of fuse-links required is 51, of which 12 are kept as spares.

The testing schedule is shown in Table 2.

For testing the individual current ratings of fuses with a.c. and d.c. breaking capacity, the number of fuse-links required is 63, of which 9 are kept as spares.

The testing schedule is shown in Table 3.

7.3 Fuse-bases for tests

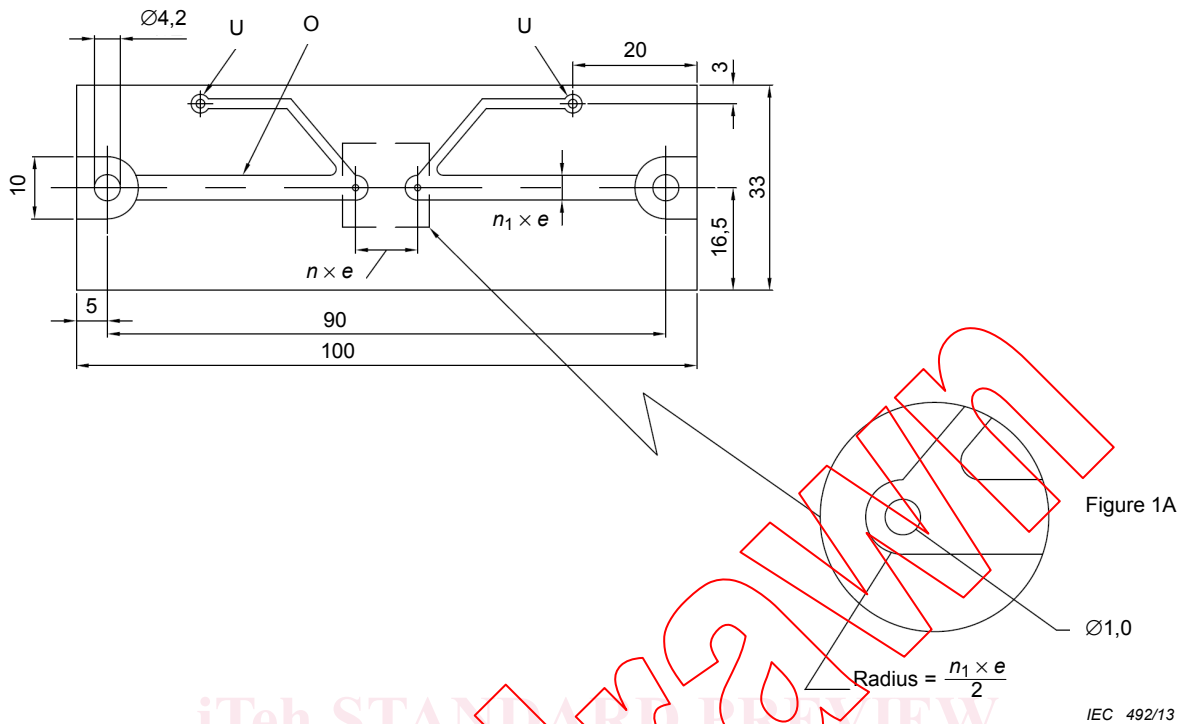
Addition:

For fuse-links designed for use in a special type of fuse-holder, testing shall be performed in that fuse-holder.

For tests that require a printed circuit board for mounting and connection of the fuse-links, a test board according to Figure 1 shall be used.

NOTE Fuse-bases for surface-mounted fuse-links are under consideration.

Dimensions in millimetres



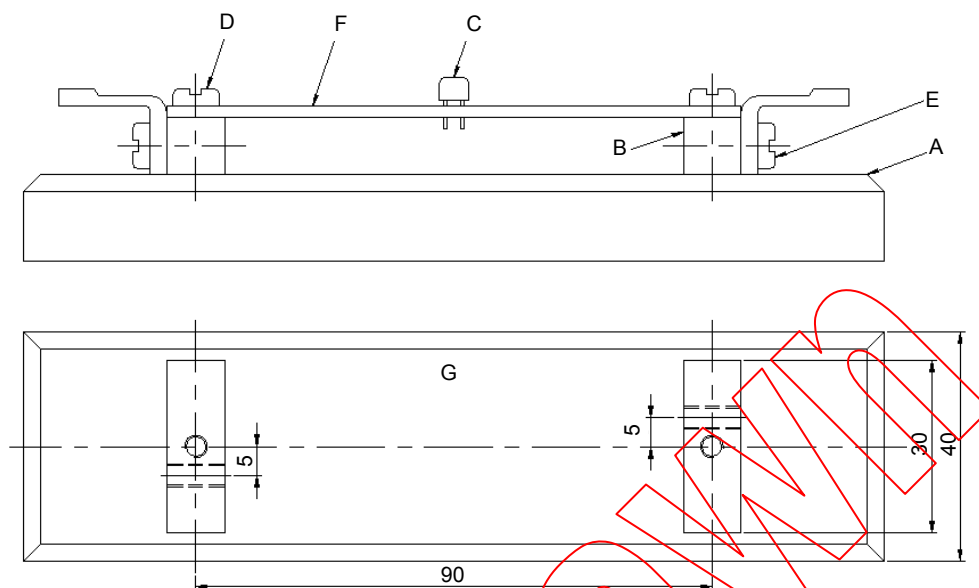
Key

- O copper layer
- U connection for voltage drop measurement
- e 2,5 mm
- n_1 1, 2, 3, 4
- n 1, 2, 3 ... (to be adapted depending on the length of the fuse-link)

Figure 1 – Standard test board

This test board shall be mounted on the fuse-base according to Figure 2.

Dimensions in millimetres



IEC 493/13

Key

- A base of low heat conducting material, thickness 10 mm
- B brass electrodes 10 mm × 10 mm
- C fuse-link soldered in place
- D fixing screws
- E contact screws holding solder terminal
- F printed circuit board according to Figure 1
- G top view of base with brass electrodes 10 mm × 10 mm

Figure 2 – Standard test base for printed circuit board

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 copper layer may be 0,035 mm or 0,070 mm.

The nominal width of copper layer may be 2,5 mm, 5 mm, 7,5 mm or 10 mm.

The nominal thickness and nominal width of applied copper layer shall be stated in the test report.

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

7.4 Nature of supply

Addition:

Schedule for testing fuse-links with a.c. or d.c. breaking capacity according to Standard Sheet 1, see Table 2.

Schedule for testing fuse-links with a.c. and d.c. breaking capacity according to Standard Sheet 1, see Table 3.

8 Dimensions and construction

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

8.2 Construction

Replacement:

The fuse-element shall be completely enclosed.

The fuse-links shall be resistant to heat according to 9.7, and to fire according to IEC 60695-2-12 and IEC 60695-2-13.

Compliance is checked by inspection. This is not applicable for fuse-links which represent small parts according to IEC 60695-4:2012, 3.78.

For fuse bodies made of plastic material or of material containing organic substances the following minimum requirements apply:

- Glow-wire ignition temperature (GWIT) = 775 °C
- Glow-wire flammability index (GWFI) = 850 °C

NOTE 1 For the glow wire tests it is necessary to use material plates with dimensions according to IEC 60695-2-12:2010, 4.2 and/or IEC 60695-2-13:2010, 4.2.

NOTE 2 For materials such as glass and ceramic whose GWIT and GWFI are thought to be higher than 775 °C and respectively 850 °C the glow-wire tests do not apply.

8.3 Fuse-link terminations

Replacement:

Subclause 8.3 applies only to fuse-links with wire terminations.

Fuse-link contacts shall be made of non-corroding material or of material suitably protected against corrosion, and shall be effectively free from flux or other non-conducting substance on their outer surfaces.

Nickel or silver plating is deemed to be adequate protection for brass end caps.

The fuse-link terminations shall be reliably attached.

The samples shall be immersed in water for 24 h at a temperature of between 15 °C and 35 °C.

Terminations shall withstand the mechanical forces likely to be encountered during normal use. With the fuse-link held in a fixed position, each terminal in turn is subjected at ambient temperature to the forces laid down in this standard. The test samples shall be equally divided among the specific termination tests.

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.

After the conclusion of testing, the fuse-link terminations shall remain firmly attached and the voltage drop shall not exceed the maximum allowed value in standard sheet 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. The voltage drop shall be measured directly at the fuse-link terminations or, where this is not possible, in the immediate vicinity of the fuse body.

If the test board according to Figure 1 is used, the voltage drop may be measured at the points marked with U.

9.2 Time/current characteristic

9.2.1 Time/current characteristic at normal ambient temperature

Addition:

Limit values t_1 to t_8 given in standard sheet 1 shall be defined by the manufacturer.

Limit values t_2 (maximum value at $2,1 I_N$ or $2,0 I_N$) and t_8 (maximum value at $10 I_N$) are required to be specified. Limit values t_1 , t_3 , t_4 , t_5 , t_6 and t_7 are optional.

The value t_2 shall be not more than 1 h.

The value t_8 shall be not more than 1 s.

9.2.2 Test at elevated temperature

Replacement:

If declared by the manufacturer, this test shall be carried out according to IEC 60127-1:2006, 9.2.2, using the test current (I_{70}) specified by the manufacturer.

9.3 Breaking capacity

9.3.1 Operating conditions

Method A of IEC 60127-1:2006, 9.3.1, applies.

Addition:

In the case of fuse-links in which any component is organic (such as with a moulded body), the recovery voltage shall be maintained for 5 min after the fuse has operated.

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