

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Thermal-links – Requirements and application guide

Protecteurs thermiques – Exigences et guide d'application





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables 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 It also gives information on projects, replaced and withdrawn publications.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 online and once a month by email.

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

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

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) 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 IEC

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

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC 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.

IEC Just Published - webstore.iec.ch/justpublished

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

Service Clients - webstore.iec.ch/csc

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

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.



IEC 60691

Edition 5.0 2023-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Thermal-links – Requirements and application guide

Protecteurs thermiques – Exigences et guide d'application

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.50

ISBN 978-2-8322-6469-0

**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.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 General requirements	11
5 General notes on tests	12
6 Classification.....	14
6.1 Electrical conditions.....	14
6.2 Thermal conditions.....	14
6.3 Resistance to tracking.....	14
7 Marking	14
8 Documentation	15
9 Constructional requirements	16
9.1 General.....	16
9.2 Lead secureness tests	17
9.2.1 General	17
9.2.2 Tensile test.....	17
9.2.3 Thrust test	17
9.2.4 Bending/twist test	17
9.3 Contacts used for the current path	18
9.4 Accessible mounting brackets or metal parts	19
9.5 Insulating materials.....	19
9.6 Resistance to tracking.....	19
9.7 Creepage distances and clearances.....	19
9.8 Temperature and humidity cycle conditioning.....	20
9.9 Terminals and terminations	20
10 Electrical requirements	21
10.1 Dielectric strength.....	21
10.2 Insulation resistance	21
10.3 Interrupting current	22
10.3.1 General	22
10.3.2 Specific conditions.....	22
10.4 Transient overload current	23
10.5 Limited short-circuit test.....	24
10.5.1 General	24
10.5.2 Test method	24
10.5.3 Fuse size (rating).....	25
10.5.4 Compliance	25
11 Temperature tests	25
11.1 General.....	25
11.2 Holding temperature, T_h	26
11.3 Rated functioning temperature, T_f	26
11.4 Maximum temperature limit, T_m	26
11.5 Ageing	27

12	Resistance to rusting	27
13	Manufacturer's validation programme	28
	Annex A (normative) Application guide.....	29
	Annex B (normative) Alternative ageing test for thermal-links with T_h greater than 250 °C for use in electric irons	30
	Annex C (normative) Conductive heat ageing test.....	31
	C.1 Conductive heat ageing test.....	31
	C.2 Method	31
	C.2.1 General	31
	C.2.2 Typical test fixture assembly.....	31
	C.2.3 Temperature setting.....	31
	C.2.4 Temperature behaviour.....	31
	C.2.5 Temperature monitoring.....	32
	C.3 Ageing	32
	C.3.1 General	32
	C.3.2 Cooling operation	32
	C.3.3 Premature operation	32
	C.4 Results	33
	C.5 Dielectric strength test	33
	C.6 Test oven.....	33
	Annex D (informative) Extended holding temperature evaluation.....	35
	D.1 Extended holding temperature conditioning test	35
	D.2 Load current interrupt test.....	35
	Annex E (normative) Seal ageing test	37
	Annex F (normative) Identification requirements	39
	Annex G (normative) Indelibility of markings	40
	Annex H (normative) Requirements for thermal-link packaged assemblies	41
	Annex I (informative) Holding temperature	45
	Bibliography.....	46
	Figure 1 – Bending/twist test.....	18
	Figure C.1 – Typical test fixture assembly.....	33
	Figure C.2 – Typical thermal-link test oven	34
	Figure D.1 – Typical terminal block support test fixture	36
	Figure E.1 – Conditioning time versus oven temperature for proposed temperature index	38
	Figure G.1 – Apparatus for testing durability of markings	40
	Table 1 – Test schedule.....	13
	Table 2 – Strength of leads and terminal parts – Minimum required tensile and thrust test forces.....	18
	Table 3 – Creepage distances and clearances (absolute minimum values)	20
	Table 4 – Test voltages for dielectric strength.....	21
	Table 5 – Test current for interrupting test	22
	Table 6 – Limited short-circuit test capacity	24
	Table H.1 – Push and pull force	43

Table H.2 – Minimum nominal cross-sectional area of conductor43
Table H.3 – Allowed values for the materials used in the thermal-link package44

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**THERMAL-LINKS –
REQUIREMENTS AND APPLICATION GUIDE****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.

IEC 60691 has been prepared by subcommittee 32C: Miniature fuses, of IEC technical committee 32: Fuses. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2015 and Amendment 1:2019. This edition constitutes a technical revision.

This fifth edition includes the following significant technical changes with respect to the previous edition:

- a) requirements for thermal-link packaged assemblies;
- b) renew the requirements and definitions for T_h -test;

The harmonization of the USA national standard, UL 1020, fifth edition (withdrawn 2003), and IEC 60691:1993, together with its Amendment 1:1995 and Amendment 2:2000 have served as a basis for the elaboration of this standard.

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

Draft	Report on voting
32C/604/FDIS	32C/605/RVD

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

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

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The following differing practices of a less permanent nature exist in the country indicated below:

- Annex C is required to be declared in the USA;
- Annex E is required in the USA, if applicable;
- Annex F is required to be declared in the USA.

In this standard, the following type is used:

- *compliance statements: in italic type.*

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

INTRODUCTION

Thermal-links, defined as non-resettable devices functioning once only without refunctioning, are widely applied for the thermal protection of equipment in which, under fault (abnormal) conditions, one or more parts may reach hazardous temperatures.

As these devices have several aspects in common with miniature fuse-links and are used for obtaining a comparable degree of protection, this standard has endeavoured to lay down a number of basic requirements for such devices.