

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Heating cables with a rated voltage up to and including 300/500 V for comfort heating and prevention of ice formation**

**Câbles chauffants de tension assignée jusqu'à et y compris 300 V/500 V pour le chauffage des locaux et la protection contre la formation de glace**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 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 Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://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](mailto:sales@iec.ch).

#### IEC online collection - [oc.iec.ch](http://oc.iec.ch)

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

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 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](http://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](http://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](http://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](mailto:sales@iec.ch).

#### IEC online collection - [oc.iec.ch](http://oc.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](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

---

**Heating cables with a rated voltage up to and including 300/500 V for comfort heating and prevention of ice formation**

**Câbles chauffants de tension assignée jusqu'à et y compris 300 V/500 V pour le chauffage des locaux et la protection contre la formation de glace**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 29.060.20

ISBN 978-2-8322-1042-3

**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.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	9
4 Mechanical classification .....	11
5 Requirements for marking.....	11
6 Requirements for installation instructions .....	12
7 General requirements for construction of heating cables.....	13
7.1 General.....	13
7.2 Conductors .....	13
7.3 Insulation .....	14
7.4 Electrically conducting screen.....	14
7.5 Armouring .....	14
7.6 Sheath.....	14
7.7 Moisture resistance.....	14
8 Testing .....	15
8.1 Type tests – General requirements .....	15
8.2 Type tests – Detailed test requirements .....	15
8.2.1 Electrical resistance of heating conductor and screen.....	15
8.2.2 Water immersion and temperature cycling test.....	16
8.2.3 Verification of rated output for parallel heating cables.....	17
8.2.4 Verification of start-up current for parallel heating cables .....	17
8.2.5 Penetration test for electrically conductive screen .....	17
8.2.6 Flammability test .....	18
8.2.7 Deformation test for installation classification .....	19
8.2.8 Cold impact test.....	20
8.2.9 Cold bend test.....	21
8.2.10 Ageing test for insulation .....	22
8.2.11 Ageing test for non-metallic sheath.....	22
8.2.12 Compatibility test.....	22
8.2.13 Weathering and UV resistance test.....	22
8.2.14 Tensile test.....	23
8.2.15 Reverse winding test .....	24
8.2.16 Heat shock test.....	24
8.2.17 Shrinkage test for insulation and sheath .....	25
8.2.18 Hot set test.....	25
8.2.19 Cyclic ageing test for the heating cable .....	25
8.2.20 Cyclic ageing test for splices and end seals.....	26
8.2.21 Checking of the durability of markings .....	26
8.2.22 Pressure test at high temperature for insulation and sheath.....	26
8.3 Routine and sample tests.....	27
8.3.1 General remarks.....	27
8.3.2 Voltage test .....	27
8.3.3 Heating cable resistance and output verification .....	27

8.3.4	Insulation thickness .....	27
8.3.5	Sheath thickness .....	27
8.3.6	Hot set test .....	28
Annex A (normative) Weathering and UV resistance test .....		29
Bibliography .....		30
Figure 1 – Typical arrangement for splice testing .....		18
Figure 2 – Typical arrangement for end seal testing .....		19
Figure 3 – Cold bend test .....		21
Figure 4 – Jaws for tensile machine .....		24

Currently in preview, click buy full version.

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HEATING CABLES WITH A RATED VOLTAGE UP TO  
AND INCLUDING 300/500 V FOR COMFORT HEATING AND  
PREVENTION OF ICE FORMATION**

## 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 Publications"). 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 60800 has been prepared by IEC technical committee 20: Electric cables. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2009. This edition constitutes a technical revision.

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

- a) modification of the title: "up to and including", has been introduced;
- b) update of IEC 60811 references;
- c) introduction of a test for mechanical properties of sheaths after the water immersion and temperature cycling test;
- d) introduction of a weathering and UV resistance test according to ISO 4892-2:2013, Annex A.

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

Draft	Report on voting
20/1972/FDIS	20/1991/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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](http://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

This document is intended to provide a comprehensive overview of the essential requirements and testing appropriate to electrical resistance heating cables used for comfort heating and prevention of ice formation. While some of this work already exists in national standards or international standards, this document has collated much of this existing work.

This document provides a means to verify the electrical, thermal and mechanical durability of resistive heating cables, so that in normal use their performance is without danger to the user or surroundings. Compliance is checked by carrying out all the tests specified in this document.

Currently in preview, click buy full version

# HEATING CABLES WITH A RATED VOLTAGE UP TO AND INCLUDING 300/500 V FOR COMFORT HEATING AND PREVENTION OF ICE FORMATION

## 1 Scope

This document is applicable to, and specifies requirements for resistive heating cables for low temperature applications such as comfort heating and the prevention of ice formation. These heating cables and heating cable sets can comprise either factory assembled or field (work-site) assembled units, and are heating cables assembled in accordance with manufacturer's instructions.

Bare conductors and protected conductors to be supplied at voltages equal to, or less than, 50 V are excluded from the scope of this document.

Typical applications include, but are not limited to:

- surface heating installed in or under surfaces;
- direct and storage heating;
- snow melting and frost protection of roofs, gutters, pipes, etc.

Electrical resistance trace heating systems for industrial and commercial applications are specified in the IEC 62395 series [1]<sup>1</sup> and for explosive atmospheres applications in the IEC/IEEE 60079-30 series [2], as are mineral insulated heating cables.

Applications in which the sheath temperature exceeds 100 °C are outside the scope of this document.

The object of this document is to ensure that electrical resistance heating cables operate safely under their normal defined conditions of use. This is achieved by:

- employing heating cables of the appropriate construction that meet the test criteria detailed in this document;
- including, for heating cables with an electrical protective component, a metallic braid, concentric wires or sheath, or other suitable electrically conductive material for protective purposes in case of fault;
- ensuring that the heating cables operate at safe temperatures with respect to the materials used in the construction of the cables and their installations according to national regulations.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-461, *International Electrotechnical Vocabulary (IEV) – Part 461: Electric cables* (available at <http://www.electropedia.org>)

<sup>1</sup> Numbers in square brackets refer to the bibliography.