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INTERNATIONAL STANDARD

colour inside

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HEATING CABLES WITH A RATED VOLTAGE ~~OF~~ 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 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.
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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. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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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.

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

1 Scope ~~and object~~

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 ~~may~~ can comprise either factory ~~fabricated~~ 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.

~~NOTE Terminations and gland fittings are outside the scope of this standard.~~

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.

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

Applications in which the ~~operating~~ 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.

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1 Numbers in square brackets refer to the bibliography.

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

IEC 60228, *Conductors of insulated cables*

IEC 60332-1-1, *Tests on electric and optical fibre cables under fire conditions – Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus*

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IEC 60364-7-701, *Low-voltage electrical installations – Part 7-701: Requirements for special installations or locations – Locations containing a bath or shower*

IEC 60364-7-753, *Low-voltage electrical installations – Part 7-753: Requirements for special installations or locations – Heating cables and embedded heating systems*

IEC 62230, *Electric cables – Spark test method*

~~IEC 60811-1-1, *Common test methods for insulating and sheathing materials of electric cables and optical cables – Part 1-1: Methods for general application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*~~

~~IEC 60811-1-2:1985, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 1-2: Methods for general application – Thermal ageing methods*~~
~~Amendment 1 (1989)~~
~~Amendment 2 (2000)~~

~~IEC 60811-1-3, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 1-3: General application – Methods for determining the density – Water absorption tests – Shrinkage test*~~

~~IEC 60811-1-4, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 1-4: Methods for general application – Tests at low temperature*~~

~~IEC 60811-2-1, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 2-1: Methods specific to elastomeric compounds – Ozone resistance, hot set and mineral oil immersion tests*~~

~~IEC 60811-3-1, *Common test methods for insulating and sheathing materials of electric and optical cables – Part 3-1: Methods specific to PVC compounds – Pressure test at high temperature – Tests for resistance to cracking*~~

IEC 60811-201, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-401, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in air oven*

IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 60811-502, *Electric and optical fibre cables – Test methods for non-metallic materials- Part 502: Mechanical tests – Shrinkage test for insulations*

IEC 60811-503, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 503: Mechanical tests – Shrinkage test for sheaths*

IEC 60811-506, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for insulations and sheaths*

IEC 60811-507, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 507: Mechanical tests – Hot set test for cross-linked materials*

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IEC 62395-1:~~2006~~2013, *Electrical resistance trace heating systems for industrial and commercial applications – Part 1: General and testing requirements*

ISO 4892-3:~~2006~~2016, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

IEC 60800

Edition 4.0 2021-11

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 jusques et y compris 300 V/500 V pour le chauffage des locaux et la protection contre la formation de glace

IEC 60800:2021-11(en-fr)

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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CÂBLES CHAUFFANTS DE TENSION ASSIGNÉE JUSQUES ET Y COMPRIS 300 V/500 V POUR LE CHAUFFAGE DES LOCAUX ET LA PROTECTION CONTRE LA FORMATION DE GLACE

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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La Norme internationale IEC 60800 a été établie par le comité d'études 20 de l'IEC: Câbles électriques. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition, parue en 2009. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) modification du titre: introduction de "jusques et y compris";
b) mise à jour des références à la série IEC 60811;
c) introduction d'un essai relatif aux propriétés mécaniques des gaines après l'immersion dans l'eau et l'essai de cycle thermique;

d) introduction d'un essai de vieillissement et de résistance aux UV conformément à l'Annexe A de l'ISO 4892-2:2013.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
20/1972/FDIS	20/1991/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

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- amendé.

INTRODUCTION

Le présent document est destiné à fournir un aperçu complet des exigences essentielles et des essais appropriés pour les câbles chauffants à résistance électrique utilisés pour le chauffage des locaux et la protection contre la formation de glace. Dans la mesure où une partie de ce travail existe déjà dans des normes nationales ou internationales, le présent document rassemble une grande partie de ces travaux déjà existants.

Le présent document fournit un moyen de vérifier la tenue électrique, thermique et mécanique des câbles chauffants résistifs, de telle sorte que leurs performances en utilisation normale ne présentent pas de danger pour l'utilisateur ou l'environnement. La vérification est effectuée par la réalisation de tous les essais spécifiés dans le présent document.

CÂBLES CHAUFFANTS DE TENSION ASSIGNÉE JUSQUES ET Y COMPRIS 300 V/500 V POUR LE CHAUFFAGE DES LOCAUX ET LA PROTECTION CONTRE LA FORMATION DE GLACE

1 Domaine d'application

Le présent document s'applique aux câbles chauffants résistifs utilisés dans des applications basse température telles que le chauffage des locaux et la protection contre la formation de glace, et spécifie les exigences qui s'y appliquent. Ces câbles chauffants et câbles chauffants équipés peuvent comprendre soit des unités fabriquées en usine, soit des unités assemblées sur site (chantier), et sont des câbles chauffants assemblés conformément aux instructions du fabricant.

Les conducteurs nus et les conducteurs protégés destinés à être alimentés à des tensions inférieures ou égales à 50 V sont exclus du domaine d'application du présent document.

Les applications typiques comprennent entre autres:

- le chauffage superficiel interne aux surfaces ou situé sous les surfaces;
- le chauffage direct et à accumulation;
- la fonte de neige et le dégivrage des toits, gouttières, chéneaux, etc.

Les systèmes de traçage par résistance électrique pour applications industrielles et commerciales sont spécifiés dans la série IEC 62395 [1][1] et ceux pour applications en atmosphères explosives dans la série IEC/IEEE 60079-30 [1], tout comme les câbles chauffants à isolation minérale.

Les applications pour lesquelles la température de la gaine dépasse 100 °C ne relèvent pas du domaine d'application du présent document.

Le présent document a pour objet d'assurer que les câbles chauffants résistants électriques fonctionnent en toute sécurité dans leurs conditions normales d'utilisation définies. Ce but est atteint par les moyens suivants:

- utilisation de câbles chauffants de construction appropriée qui satisfont aux critères d'essai décrits dans le présent document;
- intégration, pour les câbles chauffants qui comportent un élément de protection électrique, d'une tresse métallique, de fils concentriques ou d'une gaine, ou de tout autre matériau électriquement conducteur adapté à des fins de protection en cas de défaut;
- vérification du fonctionnement des câbles chauffants à des températures de sécurité par rapport aux matériaux utilisés dans la construction des câbles et leurs installations selon les règlements nationaux.

2 Références normatives

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1 Les chiffres entre crochets renvoient à la bibliographie.

IEC 60050-461, *Vocabulaire électrotechnique international (IEV) – Partie 461: Câbles électriques* (disponible à l'adresse http://www.electropedia.org)

IEC 60228: *Âmes des câbles isolés*

IEC 60332-1-1, *Essais des câbles électriques et à fibres optiques soumis au feu – Partie 1-1: Essai de propagation verticale de la flamme sur conducteur ou câble isolé – Appareillage d'essai*

IEC 60332-1-2, *Essais des câbles électriques et à fibres optiques soumis au feu – Partie 1-2: Essai de propagation verticale de la flamme sur conducteur ou câble isolé – Procédure pour flamme à prémélange de 1 kW*

IEC 60364-7-701, *Installations électriques à basse tension – Partie 7-701: Exigences pour les installations et emplacements spéciaux – Emplacements contenant une baignoire ou une douche*

IEC 60364-7-753, *Installations électriques à basse tension – Partie 7-753: Exigences pour les installations ou emplacements spéciaux – Câbles chauffants et systèmes de chauffage intégrés*

IEC 62230, *Câbles électriques – Méthode d'essai au défilement à sec (sparker)*

IEC 60811-201, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques - Partie 201: Essais généraux – Mesure de l'épaisseur des enveloppes isolantes*

IEC 60811-202, *Câbles électriques et à fibres optiques - Méthodes d'essai pour les matériaux non-métalliques – Partie 202: Essais généraux – Mesure de l'épaisseur des gaines non métalliques*

IEC 60811-401, *Câbles électriques et à fibres optiques - Méthodes d'essai pour les matériaux non-métalliques – Partie 401: Essais divers – Méthodes de vieillissement thermique – Vieillissement en étuve à air*

IEC 60811-501, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 501: Essais mécaniques – Détermination des propriétés mécaniques des mélanges pour les enveloppes isolantes et les gaines*

IEC 60811-502, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 502: Essais mécaniques – Essai de rétraction des enveloppes isolantes*

IEC 60811-503, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 503: Essais mécaniques – Essai de rétraction des gaines*

IEC 60811-506, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 506: Essais mécaniques – Essai de choc à basse température pour les enveloppes isolantes et les gaines*

IEC 60811-507, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 507: Essais mécaniques – Essai d'allongement à chaud pour les matériaux réticulés*

IEC 60811-508, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 508: Essais mécaniques – Essai de pression à température élevée pour les enveloppes isolantes et les gaines*

IEC 60811-509, *Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques – Partie 509: Essais mécaniques – Essai de résistance à la fissuration des enveloppes isolantes et des gaines (essai de choc thermique)*

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