IEC 60364-4-42

Edition 4.0 2024-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

HORIZONTAL PUBLICATION
PUBLICATION HORIZONTALE

Low-voltage electrical installations –
Part 4-42: Protection for safety – Protection against thermal effects

Installations électriques à basse tension –
Partie 4-42: Protection pour assurer la sécurité – Protection contre les effets thermiques

IEC 60364-4-42:2024-11 (en-fr)

IEC Secretariat
3, rue de Varembé
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 It also gives information on projects, replaced and withdrawn publications.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, graphical symbols and the glossary. 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 22 500 terminological entries in English and French, with equivalent terms in 25 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, symboles graphiques et le glossaire. 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 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 60364-4-42

Edition 4.0 2024-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Low-voltage electrical installations –
Part 4-42: Protection for safety – Protection against thermal effects

Installations électriques à basse tension –
Partie 4-42: Protection pour assurer la sécurité – Protection contre les effets thermiques

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.50, 91.140.50

ISBN 978-2-8322-9909-8

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 4-42: Protection for safety – Protection against thermal effects

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60364-4-42 has been prepared by IEC technical committee 64: Electrical installations and protection against electrical shock. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2010 and Amendment 1:2014. This edition constitutes a technical revision.

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

a) the Scope now includes a new paragraph stating that IEC 60364-4-42 has become a group safety publication (GSP) following the Advisory Committee on Safety (ACOS) recommendation for approval of the group safety function "protection against thermal effects for any kind of low-voltage electrical installations" to TC 64; this GSP is primarily intended to be used as a product safety standard for the installations mentioned in the scope, but also to be used by TCs in the preparation of publications for installations similar to those mentioned in the scope of this GSP;

b) new terms and definitions have been added, for:
   - arcing;
   - arc fault;
   - assembly internal arc fault;
   - burn;
   - combustion;
   - escape route;
   - final circuit arc fault;
   - flame;
   - flammable;
   - flaming combustion;
   - low-voltage switchgear and controlgear assembly;

c) a new Subclause 421.6 regarding measures for preventing fires originating from the use of an electrical stove or cooker or hob has been added;

d) the previous Subclause 421.7 was expanded and moved to a new Clause 426: Additional protective measures against thermal effect for locations where consequences of fire are severe;

e) requirements for escape routes have been expanded and modified;

f) requirements for final circuits in BE2 locations have been expanded and modified;

g) requirements for locations with irreplaceable goods or with business critical facilities have been expanded and modified;

h) a new Clause 425 for protection against fire due to fault currents has been added;

i) a new Clause 427 for protection against assembly internal arc faults has been added.

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

Draft	Report on voting
64/2686/FDIS	64/2697/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 has the status of a group safety publication in accordance with IEC Guide 104.

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.

A list of all parts in the IEC 60364 series, published under the general title *Low-voltage electrical installations*, can be found on the IEC website.

The reader's attention is drawn to the fact that Annex A lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

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, or
- revised.

INTRODUCTION

IEC 60364-1 gives the rules for the design, erection, and verification of electrical installations. The rules are intended to provide for the safety of persons, livestock and property against dangers and damage which can arise in the reasonable use of electrical installations and to provide for the proper functioning of those installations.

According to IEC 60364-1:2005, 11.5, electrical equipment is dealt with only so far as its selection and application in the electrical installation are concerned.

According to IEC 60364-1:2005, 131.3 (Protection against thermal effects), "the electrical installation shall be so arranged to minimize the risk of damage or the risk of ignition of flammable materials due to high temperature or electric arc. In addition, during normal operation of the electrical equipment, there shall be no risk of persons or livestock suffering burns." These general requirements are specified in this document.

However, there are several types of electrical installations which are not covered by the IEC 60364 series, such as those indicated in IEC 60364-1:2005, 11.3.

The safety aspects specified in this document are also applicable to installations not covered by the IEC 60364 series.

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 4-42: Protection for safety – Protection against thermal effects

420 Protection against thermal effects

420.1 Scope

This part of IEC 60364 applies to electrical installations with regard to measures for the protection of persons, livestock and property against:

- thermal effects, risk of combustion or degradation of materials, and risk of burns caused by electrical equipment,
- flames in case of a fire hazard being propagated from electrical installations to other fire compartments segregated by barriers which are in the vicinity, and
- the impairment of the safe functioning of electrical equipment, including safety services due to thermal effects.

NOTE For explosion risks, see IEC 60079-14.

This group safety publication (GSP) focusing on safety essential requirements is primarily intended to be used as a product safety standard for the installations mentioned in the scope, but is also intended to be used by TCs in the preparation of publications for installations similar to those mentioned in the scope of this GSP, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

One of the responsibilities of a TC is, wherever applicable, to make use of basic safety publications and/or group safety publications in the preparation of its publications.

420.2 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 60332 (all parts), *Tests on electric and optical fibre cables under fire conditions*

IEC 60364-4-43:2023, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 60364-5-53:2019, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Devices for protection for safety, isolation, switching, control and monitoring*

IEC 61084 (all parts), *Cable trunking systems and cable ducting systems for electrical installations*

IEC 61386 (all parts), *Conduit systems for cable management*

IEC 61439-6, *Low-voltage switchgear and controlgear assemblies – Part 6: Busbar trunking systems (busways)*

IEC 61534 (all parts), *Powertrack systems*

IEC 61537, *Cable management – Cable tray systems and cable ladder systems*

IEC 60598-2-24, *Luminaires – Part 2-24: Particular requirements – Luminaires with limited surface temperatures*

IEC 62606, *General requirements for arc fault detection devices*

IEC TS 63107:2020, *Integration of internal arc-fault mitigation systems in power switchgear and controlgear assemblies (PSC-assemblies) according to IEC 61439-2*

IEC TR 61641, *Enclosed low-voltage switchgear and controlgear assemblies – Guide for testing under conditions of arcing due to internal fault*

420.3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

420.3.1
combustible
capable of being ignited and burned

[SOURCE: ISO 13943:2023, 3.59]

420.3.2
fire
<general> process of combustion characterized by the emission of heat and fire effluent and usually accompanied by smoke, flame or glowing or a combination thereof

[SOURCE: ISO 13943:2023, 3.138, modified – Note 1 to entry has been deleted.]

420.3.3
fire
<uncontrolled> self-supporting combustion that has not been deliberately arranged to provide useful effects and is not limited in its extent in time and space

[SOURCE: ISO 13943:2023, 3.140]

420.3.4
ignition
initiation of combustion

Note 1 to entry: For more information see IEC 60695-4.

[SOURCE: ISO 13943:2023, 3.242, modified – The domain and deprecated term have been deleted and Note 1 to entry has been added.]

420.3.5
non-flame propagating
liable to ignite, as a result of an applied flame, but in which the flame does not propagate, and which extinguishes itself within a limited time after the flame is removed

[SOURCE: IEC 60050-442:1998, 442-01-12, modified – "component" has been deleted from the term and "a component which is" has been deleted from the start of the definition.]

420.3.6
arcing
luminous discharge of electricity across an insulating medium, usually accompanied by the partial volatilization of the electrodes

Note 1 to entry: A complete sinusoidal current half-cycle is not considered to be an arcing half-cycle.

[SOURCE: IEC 60050-442:2019, 442-05-65]

420.3.7
arc fault
arcing fault
dangerous unintentional arc

[SOURCE: IEC 60050-442:2019, 442-05-66]

420.3.8
final circuit arc fault
arc fault occurring in a final circuit causing a fault current not exceeding the design current of the final circuit

Note 1 to entry: The main risk of final circuit arc faults are thermal effects which can cause fire.

Note 2 to entry: Arc fault detection and protective devices (AFDD) are intended to provide protection against arc faults in final circuits.

420.3.9
low-voltage switchgear and controlgear assembly
assembly
combination of one or more low-voltage switching devices together with associated control, measuring, signalling, protective, regulating equipment, with all the internal electrical and mechanical interconnections and structural parts

[SOURCE: IEC 61439-1:2020, 3.1.1, modified – The last part of the definition and the Notes to entry have been deleted.]

420.3.10
assembly internal arc fault
free burning arc fault causing a current through air higher than the rated current of an assembly, arising from a fault between conductive parts having different potentials within the assembly

Note 1 to entry: The initiation of a high current arc inside an assembly generates various physical phenomena, causes potentially (very high) overheating and especially high overpressure inside the enclosure, which can endanger people in the close proximity of the assembly (e.g. burns, but also doors sudden opening, projection of hot materials or gases outside the enclosure) and damages the equipment.

Note 2 to entry: Protection against assembly internal arc faults is for example provided by an "internal arc-fault mitigation system".

420.3.11
escape route
route to follow for access to a safe area in the event of an emergency

420.3.12
flame
rapid, self-sustaining, sub-sonic propagation of combustion in a gaseous medium, usually with emission of light

[SOURCE: ISO 13943:2023, 3.184]

420.3.13
combustion
exothermic reaction of a substance with an oxidizing agent

Note 1 to entry: Combustion generally emits fire effluent accompanied by flames and/or glowing.

[SOURCE: ISO 13943:2023, 3.62]

420.3.14
burn
undergo combustion

[SOURCE: ISO 13943:2023, 3.38]

420.3.15
flammable
capable of flaming combustion under specified conditions

[SOURCE: ISO 13943:2023, 3.202, modified – The deprecated term has been deleted.]

420.3.16
flaming combustion
combustion in the gaseous phase, usually with emission of light

[SOURCE: ISO 13943:2023, 3.197]

421 Protection against fire caused by electrical equipment

421.1 Persons, livestock and property shall be protected against damage and injury caused by heat, fire or electric arcing which can be generated by electrical equipment and the propagation of the heat, fire and electric arcing in the electrical installation by taking into account the requirements of this document and the instructions of equipment manufacturers.

The heat generated by electrical equipment shall not cause danger or harmful effects to adjacent fixed material or to material which can foreseeably be in proximity to such equipment. Electrical equipment shall not present a fire hazard to adjacent materials.

NOTE Damage, injury or ignition can be caused by effects such as:

- heat accumulation, heat radiation, hot elements (faulty or loose terminal connections),
- reduction of the safe function of electrical equipment, for example protective devices such as protective switchgear, thermostats, temperature limiters, seals of cable penetrations and wiring systems,
- overcurrents,
- insulation faults,
- parallel or series arcs between conductors and arcing faults to earth (e.g. final circuit arc faults),
- arcs together with light, gas pressure, current (e.g. assembly internal arc faults),
- harmonic currents,
- inappropriate selection or erection of equipment.

421.2 Where fixed equipment can provide temperatures on adjacent materials that can cause a fire hazard, the equipment shall either:

- be mounted on or within materials that shall withstand such temperatures and are of low thermal conductance, or
- be screened from the adjacent material by a barrier of a material which shall withstand such temperatures and is of low thermal conductance, or
- be mounted so as to allow safe dissipation of heat at a sufficient distance from any material on which such temperatures can have deleterious thermal effects, any means of support being of low thermal conductance.

421.3 Where arcs or sparks can be emitted by permanently connected equipment in normal service, the equipment shall either:

- be totally enclosed in arc-resistant material, or
- be screened by arc-resistant material from materials on which the emission can have harmful effects, or
- be mounted so as to allow safe extinction of the emissions at a sufficient distance from material upon which the emissions can have harmful effects.

421.4 Where a location contains electrical equipment with flammable liquids:

- provision should be made to disconnect (switch-off) all electrical equipment in the location at the onset of a fire, except those installed for safety services, and
- provisions shall be made to prevent the spread of liquid, and
- where electrical equipment contains a significant quantity of flammable liquids (e.g. more than 25 litres) provision shall be made to prevent the spread of flames and the products of combustion.

EXAMPLE Spreading preventions include:

- a retention pit to collect any leakage of liquid and ensure extinction in the event of fire;
- installation of the equipment in a chamber of adequate fire resistance and the provision of sills or other means of preventing liquid spreading to other parts of the building, such a chamber being ventilated solely to the external atmosphere.

NOTE Products of combustion of liquid are: flame, smoke and gas.

421.5 The materials of enclosures erected around electrical equipment shall withstand foreseeable temperatures likely to be generated by the electrical equipment.

421.6 In domestic and similar installations, considerations should be given to provide measures for preventing fires originating from the use of an electrical stove or cooker or hob to be propagated to its environment.

422 Requirements where external influences present particular risks during a fire

422.1 General

422.1.1 The requirements of Clause 422 apply to installations in areas where the external influences are as described in 422.2 to 422.6.

A location may be associated with more than one class of external influence. Accordingly, for such a location, the requirements of 422.2 to 422.6 apply.

NOTE Explanation of codes for external influences are given in IEC 60364-5-51.

422.1.2 Electrical equipment shall be restricted to that necessary for the use of these locations, except wiring systems in accordance with 422.3.4.

422.1.3 Thermal cut-out devices shall not have automatic re-closure. This text is aligned with the text in IEC 60364-5-53:2019, 532.2.1.

422.2 Locations with external influences classified as BD2, BD3 or BD4 for conditions of evacuations in emergency

422.2.1 General

422.2.1.1 Wiring systems of electric circuits for safety services shall have a resistance to fire rating of at least 60 min.

422.2.1.2 Switchgear and controlgear, except certain devices to facilitate evacuation, shall be accessible only to authorized persons.

If switchgear and controlgear are placed in passages, they shall be enclosed in cabinets or boxes constructed of non-combustible or not readily combustible material.

NOTE 1 Some enclosures made of plastic, metallic or composite material are non-combustible or not readily combustible.

NOTE 2 Information on whether a material is considered combustible or non-combustible can be found in ISO 1182 or ISO 1716.

422.2.1.3 Except for BD2 locations, electrical equipment containing flammable liquids shall not be installed.

Electrical equipment where the flammable liquids are contained in capacitors are not subject to this requirement.

NOTE This exception principally concerns discharge luminaires and motor starters with capacitors.

422.2.2 Escape routes

422.2.2.1 Wiring systems shall be provided with sheaths or enclosures, provided by the cable management system itself or by other means.

422.2.2.2 Wiring systems shall not be within arm's reach unless they are provided with protection against mechanical damage likely to occur during an evacuation.

422.2.2.3 Wiring systems in escape routes shall not present an obstruction to evacuation under any circumstances.

422.2.2.4 Wiring systems shall be as short as practicable.

422.2.2.5 Compliance with this requirement may be achieved by using the following products:

- cables fulfilling the tests under fire conditions of IEC 60332-1-2, and appropriate fire conditions as follows: IEC 60332-3-21, IEC 60332-3-22, IEC 60332-3-23, IEC 60332-3-24 and IEC 60332-3-25;
- conduit systems classified as non-flame propagating in accordance with the IEC 61386 series;
- cable trunking systems or cable ducting systems classified as non-flame propagating in accordance with the IEC 61084 series;
- cable tray systems and cable ladder systems classified as non-flame propagating in accordance with IEC 61537;