



DPC: 22/30454209 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 01 April 2022

Origin: International

Latest date for receipt of comments: 04 May 2022

Project No. 2018/02575

Responsible committee: JPEL/64 Electrical Installations of Buildings - Joint Committee

Interested committees:

Title: Draft BS EN 60364-1 Low-voltage electrical installations. Part 1: Fundamental principles, assessment of general characteristics, definitions.

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 04 May 2022

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



64/2451/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 60364-1 ED6

DATE OF CIRCULATION:

2020-06-05

CLOSING DATE FOR COMMENTS:

2020-08-28

SUPERSEDES DOCUMENTS:

64/2349/CD, 64/2372A/CC

IEC TC 64 : ELECTRICAL INSTALLATIONS AND PROTECTION AGAINST ELECTRIC SHOCK

SECRETARIAT:

Germany

SECRETARY:

Mr Wolfgang Niedenzu

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 99

PROPOSED HORIZONTAL STANDARD:

☐

Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☒ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions

NOTE FROM TC/SC OFFICERS:

Copyright © 2020 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

1	FOREWORD.....	5
2	1 Scope.....	7
3	2 Normative references	10
4	3 Terms and definitions	11
5	4 Fundamental principles.....	12
6	4.1 Protection for safety.....	12
7	4.1.1 General	12
8	4.1.2 Protection against electric shock	12
9	4.1.3 Protection against thermal effects.....	13
10	4.1.4 Protection against overcurrent.....	13
11	4.1.5 Protection against fault currents	13
12	4.1.6 Protection against voltage disturbances and measures against electromagnetic influences	13
13	4.1.7 Protection against power supply interruption.....	14
14	4.2 Design	14
15	4.2.1 General	14
16	4.2.2 Supplies	14
17	4.2.3 Nature of demand	16
18	4.2.4 Environmental conditions.....	16
19	4.2.5 Cross-sectional area of conductors.....	16
20	4.2.6 Type of wiring and methods of installation	17
21	4.2.7 Protective equipment.....	17
22	4.2.8 Emergency switching.....	17
23	4.2.9 Disconnecting and switching devices	17
24	4.2.10 Prevention of mutual detrimental influence	18
25	4.2.11 Accessibility of electrical equipment	18
26	4.2.12 Additions and alterations to an installation.....	18
27	4.2.13 Energy efficiency	18
28	4.2.14 Local production and storage of energy (prosuming).....	18
29	4.2.15 Documentation for the electrical installation.....	18
30	4.2.16 Division of installation.....	18
31	4.3 Selection of electrical equipment	19
32	4.3.1 General	19
33	4.3.2 Characteristics	19
34	4.3.3 Conditions of installation.....	19
35	4.3.4 Prevention of harmful effects	20
36	4.3.5 New materials and inventions	20
37	4.4 Erection and verification of electrical installations	20
38	4.4.1 Erection.....	20
39	4.4.2 Initial verification	21
40	4.4.3 Periodic verification	21
41	5 Assessment of general characteristics.....	21
42	6 Purposes, supplies and structure.....	21
43	6.1 Maximum demand and diversity	21
44	6.2 Conductor arrangement and system earthing	21

48	6.2.1	General	21
49	6.2.2	Live conductors depending on kind of current	22
50	6.2.3	Types of system earthing	24
51	7	Compatibility	42
52	7.1	Compatibility of characteristics	42
53	7.2	Electromagnetic compatibility	42
54	8	Maintainability	42
55	9	Safety services	43
56	10	Continuity of service	43
57	Annex A (informative)	Plan of IEC 60364 series	44
58	A.1	Table A.1 – Numbering system of IEC 60364 series	44
59	A.2	Table A.2 – Plan of IEC 60364 series: Low-voltage electrical installations	44
60	Bibliography		46
61			
62	Figure 1	– Single-phase 2-wire	22
63	Figure 2	– Single-phase 3-wire	22
64	Figure 3	– Two-phase 3-wire	22
65	Figure 4	– Three-phase 3-wire	23
66	Figure 5	– Three-phase 4-wire	23
67	Figure 6	– 2-wire	23
68	Figure 7	– 3-wire	24
69	Figure 6A1	– Example of a TN-S system with separate neutral conductor and protective conductor throughout the system	27
70			
71	Figure 6B1	– Example of a TN-C-S system 3-phase, 4-wire where the PEN is separated into a protective earthing conductor and a neutral conductor	28
72			
73	Figure 6B2	– Example of a TN-C-S system – single-phase, 2-wire where the PEN conductor is separated into a protective earthing conductor and a mid-point conductor	29
74			
75	Figure 6D1	– Example of a TN-S multiple source system with two local sources	31
76	Figure 6D2	– Example of a TN-C-S multiple source system with one local source and one external source (e.g. public supply network)	31
77			
78	Figure 6F	– Example of a TT system with separate neutral conductor and protective conductor throughout the installation	32
79			
80	Figure 6G	– Example of an IT system with all exposed-conductive-parts interconnected by a protective conductor which is collectively earthed	33
81			
82	Figure 6H1	– Example of a DC supplied TN-S system without mid-point	35
83	Figure 6H2	– Example of a DC supplied TN-S system with mid-point	35
84	Figure 6J1	– Example of a DC supplied TN-C system without mid-point	36
85	Figure 6J2	– Example of a DC supplied TN-C system with mid-point	36
86	Figure 6K1	– Example of a DC supplied TN-C-S system without mid-point	37
87	Figure 6K2	– Example of a DC supplied TN-C-S system with mid-point	37
88	Figure 6L1	– Example of a DC supplied TT system without mid-point	38
89	Figure 6L2	– Example of a DC supplied TT system with mid-point	39
90	Figure 6M1	– Example of a DC supplied IT system without mid-point	40
91	Figure 6M2	– Example of a DC supplied IT system with mid-point	41
92	Figure 6N	– Example of a TM system	41
93	Figure 6O	– Example of a MM system	41

94	
95	Table 6A1: Type of earthing systems in AC installations 24
96	Table 6A2: Type of earthing systems in DC installations 24
97	Table 6A3 Symbols indicating the conductor function..... 26
98	

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –**Part 1: Fundamental principles, assessment of
general characteristics, definitions****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 60364-1 has been prepared by IEC technical committee TC64: Electrical installations and protection against electric shock..

This sixth edition cancels and replaces the fifth edition published in 2005- This edition constitutes a technical revision.

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

- a) The entire Part 1 has been restructured and numbered with reference to current editions of various parts of the IEC 60364 standard.
- b) The scope has been expanded to include new areas of application and has been restructured
- c) With section 4.2.2.2, the topic of safety services and standby electric supply systems has been added
- d) With section 4.2.13, the topic of energy efficiency has been included
- e) With section 4.2.14, the topic of prosumer electrical installations has been included
- f) An equivalent safety level is required for the use of new materials and innovations for which no product standards exist yet. This must be verified by a risk assessment.
- g) With section 4.4.3 it is required that effectiveness of protective measures for people and livestock safety shall be maintained during the entire lifetime of the installation. This should be done by periodic verification.
- h) Table GA3 defines the newly introduced "system-referencing-conductor"
- i) The number of pictures showing the type of earth connection in AC and DC systems is limited to the most important ones. Since the applications for DC installations have increased significantly, some figures for DC Installations have been added.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<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.

The National Committees are requested to note that for this document the stability date is **2021**.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 1: Fundamental principles, assessment of general characteristics, definitions

1 Scope

The International Standards of the IEC 60364 series give the rules for the design, erection, and verification of electrical installations. The rules are intended to provide for the safety of human beings, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations and to provide for the proper functioning of those installations.

EXAMPLES: A non-comprehensive list of electrical installations or systems includes:

- residential premises;
- commercial premises;
- public premises;
- industrial premises;
- agricultural and horticultural premises;
- prefabricated buildings;
- caravans, caravan sites and similar sites;
- construction sites, exhibitions, fairs and other installations for temporary purposes;
- marinas;
- external lighting and similar installations;
- medical locations;
- mobile or transportable units;
- photovoltaic systems;
- low-voltage generating sets.

The IEC 60364 series applies to any kind of low-voltage electrical installation or system, except:

- a) electric traction equipment, including rolling stock and signalling equipment;
- b) electrical circuits and equipment for automotive purposes within motor vehicle;
- c) electrical installations of ships and of mobile and fixed offshore units;

- 218 d) electrical installations in aircraft;
- 219 e) public street-lighting installations which are part of the public power grid;
- 220 f) installations in mines and quarries;
- 221 g) radio interference suppression equipment, except where it affects the safety of the
222 installation;
- 223 h) electric fences;
- 224 i) external lightning protection systems for buildings (LPS);
- 225 NOTE 1 Atmospheric phenomena are covered in IEC 60364-1 but only insofar as effects on the electrical
226 installations are concerned (for example, with respect to selection of surge protective devices).
- 227 j) certain aspects of lift installations;
- 228 k) electrical equipment of machines.

229 The IEC 60364 series is not intended to apply to

- 230 – systems for distribution of energy to the public, or
- 231 – power generation and transmission for such systems.

232 NOTE 2 Countries wishing to do so may, however, use this standard in whole or in part for that purpose.

233 NOTE 3 According to IEC 61936 which provides common rules for the design and the erection of electrical power
234 installations in systems with nominal voltages above 1kV AC and nominal frequency up to and including 60 Hz,
235 low-voltage AC and DC protection and monitoring systems should be in accordance with IEC 60364 series.

236 Electrical equipment is dealt with only so far as its selection and application in the installation
237 are concerned.

238 This applies also to assemblies of electrical equipment complying with the relevant standards.

239 NOTE 4 "Premises" covers the land and all facilities including buildings belonging to it.

240

241 The IEC 60364 series covers

- 242 a) circuits supplied at nominal voltages up to and including 1.000 V AC or 1 500 V DC;
243 For AC, the preferred frequencies which are taken into account in this standard are
244 50 Hz and 60 Hz. The use of other frequencies is not excluded.
- 245 b) circuits, other than the internal wiring of apparatus, operating at voltages exceeding
246 1.000 V AC or 1.500 V DC and derived from an installation having a voltage not
247 exceeding 1.000 V AC or 1.500 V DC, for example, discharge lighting, electrostatic
248 precipitators;
- 249 c) wiring systems and cables not specifically covered by the standards for appliances;
- 250 d) all consumer installations external to buildings;
- 251 e) fixed wiring for information and communication technology including power supply,
252 signalling, control and the like (excluding internal wiring of apparatus).

- 253 f) alterations and/or extensions of the installation;
- 254 g) parts of the existing installation affected by modifications, extensions or alterations;
- 255 h) the design of functional aspects, such as energy efficiency, local production and storage
256 of energy (prosuming).

257 NOTE 5 The rules of IEC 60364-1 are intended to apply to electrical installations generally but, in certain cases,
258 they may need to be supplemented by the requirements or recommendations of other IEC standards (for example,
259 for installations in explosive gas atmospheres).

260

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 60038, IEC standard voltages

IEC 60050(691), International Electrotechnical Vocabulary (IEV) – Chapter 691: Tariffs for electricity

IEC 60050-826, International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations

IEC 60364-4-41:2005, Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock

IEC 60364-4-42, Electrical installations of buildings – Part 4-42: Protection for safety – Protection against thermal effects

IEC 60364-4-43, Electrical installations of buildings – Part 4-43: Protection for safety – Protection against overcurrent

IEC 60364-4-44, Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances

IEC 60364-5-51, Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules

IEC 60364-5-52, Electrical installations of buildings – Part 5-52: Selection and erection of electrical equipment – Wiring systems

IEC 60364-5-53:2001, Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control

IEC 60364-5-54, Electrical installations of buildings – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements, protective conductors and protective bonding conductors

IEC 60364-5-55:2001, Electrical installations of buildings – Part 5-55: Selection and erection of electrical equipment – Other equipment

IEC 60445, Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system

IEC 60446, Basic and safety principles for man-machine interface, marking and identification – Identification of conductors by colours or numerals

IEC 60617-DB:2001, Graphical symbols for diagrams

IEC 60721 (all parts), Classification of environmental conditions

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

4 Fundamental principles

NOTE This clause contains basic requirements. In other parts of this standard (see Table A.2), more detailed requirements may be given.

4.1 Protection for safety

4.1.1 General

The requirements stated in 4.1.2 to 4.1.7 are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations under all operating conditions. The requirements to provide for the safety of livestock are applicable in locations intended for them.

NOTE In electrical installations, the following hazards may arise:

- shock currents;
- excessive temperatures likely to cause burns, fires and other injurious effects;
- ignition of a potentially explosive atmosphere;
- undervoltages, overvoltages and electromagnetic influences likely to cause or result in injury or damage;
- power supply interruptions and/or interruption of safety services;
- arcing, likely to cause fire, burns or blinding effects, excessive pressure, and/or toxic gases;
- mechanical movement of electrically activated equipment.

4.1.2 Protection against electric shock

4.1.2.1 Basic protection

Protection shall be provided against dangers that may arise from contact with live parts of the installation by persons or livestock.

This protection can be achieved by one of the following methods:

- preventing a current from passing through the body of any person or any livestock;
- limiting the current which can pass through a body to a non-hazardous value.

4.1.2.2 Fault protection

Protection shall be provided against dangers that may arise from contact with exposed-conductive-parts of the installation by persons or livestock.

This protection can be achieved by one of the following methods:

- preventing a current resulting from a fault from passing through the body of any person or any livestock;
- limiting the magnitude of a current resulting from a fault, which can pass through a body, to a non-hazardous value;
- limiting the duration of a current resulting from a fault, which can pass through a body, to a non-hazardous time period.

4.1.2.3 Additional Protection

Additional protection shall be provided in certain cases to supplement basic protection and/or the provision for fault protection.

4.1.3 Protection against thermal effects

The electrical installation shall be arranged so that human beings, livestock and the environment adjacent to the electrical equipment are protected against the harmful thermal effects caused by the electrical equipment.

EXAMPLES: Thermal effects can be the following:

- combustion,
- degradation of materials
- electric arcing
- burns resulting from high temperatures

4.1.4 Protection against overcurrent

Human beings and livestock shall be protected against injury and property shall be protected against damage due to excessive temperatures or electromechanical stresses caused by any overcurrents likely to arise in conductors.

Protection can be achieved by limiting the overcurrent to a safe value or duration.

4.1.5 Protection against fault currents

Fault currents flowing in conductors or other parts shall not cause excessive temperatures in those conductors or parts.

Human beings and livestock shall be protected against injury and property shall be protected against damage due to electromechanical stresses caused by any fault currents flowing in conductors or any other parts, for example electrical equipment.

NOTE Particular attention should be given to PE conductor and earthing conductor currents.

4.1.6 Protection against voltage disturbances and measures against electromagnetic influences

Persons and livestock shall be protected against injury and property shall be protected against any harmful effects as a consequence of a fault between live parts of circuits supplied at different voltages.

Persons and livestock shall be protected against injury and property shall be protected against damage as a consequence of overvoltages such as those originating from atmospheric events or from switching.

NOTE For protection against direct lightning strikes, see IEC 62305 series.

Persons and livestock shall be protected against injury and property shall be protected against damage as a consequence of undervoltage and any subsequent voltage recovery.

The installation shall have an adequate level of immunity against electromagnetic disturbances so as to function correctly in the specified environment. The installation design shall take into consideration the anticipated electromagnetic emissions generated by the