



BSI Standards Publication

Switches for household and similar fixed-electrical installations

Part 1: General requirements

National foreword

This British Standard is the UK implementation of EN 60669-1:2018, incorporating corrigendum November 2018. It is derived from IEC 60669-1:2017, incorporating corrigendum January 2020. It supersedes BS EN 60669-1:1999+A2:2008, which will be withdrawn on 13 February 2021.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **[C]** **[C]**.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum January 2020 is indicated in the text by **[AC1]** **[AC1]**.

The UK participation in its preparation was entrusted to Technical Committee PEL/23, Electrical accessories.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Amendments/corrigenda issued since publication

Date	Text affected
30 November 2018	Implementation of CENELEC corrigendum November 2018: dow corrected
31 December 2018	UK Technical Committee details corrected in the national foreword
29 February 2020	Implementation of IEC corrigendum January 2020

English Version

**Switches for household and similar fixed electrical installations -
Part 1: General requirements
(IEC 60669-1:2017 , modified)**

Interrupteurs pour installations électriques fixes
domestiques et analogues - Partie 1: Exigences générales
(IEC 60669-1:2017 , modifiée)

Schalter für Haushalt und ähnliche ortsfeste elektrische
Installationen - Teil 1: Allgemeine Anforderungen
(IEC 60669-1:2017 , modifiziert)

This European Standard was approved by CENELEC on 2017-02-13. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 23B/1235/FDIS, future edition 4 of IEC 60669-1, prepared by IEC/SC 23B "Plugs, socket-outlets and switches" of IEC/TC 23 "Electrical accessories" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60669-1:2018.

A draft amendment, which covers common modifications to IEC 60669-1 (23B/1235/FDIS), was prepared by CLC/TC 23BX "Switches, boxes and enclosures for household and similar purposes, plugs and socket outlets for d.c. and for the charging of electrical vehicles including their connectors" and approved by CENELEC.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-08-16
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2021-02-13

EN 60669-1:2018 supersedes EN 60669-1:1999.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60669-1:2017 are prefixed "Z".

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

For the relationship with EU Directive see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 60669-1:2017 was approved by CENELEC as a European Standard with agreed common modifications.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038 (mod)	2009	IEC standard voltages	EN 60038	2011
IEC 60068-2-75	2014	Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests	EN 60068-2-75	2014
IEC 60112	2003	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	2003
+A1	2009		+A1	2009
IEC 60212	2010	Standard conditions for use prior to and during the testing of solid electrical insulating materials	EN 60212	2011
IEC 60227-5	2011	Polyvinyl chloride insulated cables of rated - voltages up to and including 450/750 V - Part 5: Flexible cables (cords)	-	-
IEC 60228	2004	Conductors of insulated cables	EN 60228 + corr. May	2005 2005
IEC 60245-4	2011	Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables	-	-
IEC 60417-DB	-	Graphical symbols for use on equipment	-	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
+A1	1999		+A1	2000
+A2	2013		+A2	2013
IEC 60669-2-1 (mod)	2002	Switches for household and similar fixed electrical installations - Part 2-1: Particular requirements - Electronic switches	EN 60669-2-1 + corr. December	2004 2007
			+A12	2010
+A1 (mod)	2008		+A1	2009
+A2	2015		+A2	201X ¹⁾

¹⁾ To be published.

EN 60669-1:2018 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60695-2-10	2000	Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure	EN 60695-2-10	2001 ²⁾
IEC 60695-2-11	2014	Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products (GWEPT)	EN 60695-2-11	2014
IEC 60998-1 (mod)	2002	Connecting devices for low-voltage circuits for household and similar purposes - Part 1: General requirements	EN 60998-1	2004
IEC 60998-2-1 (mod)	-	Connecting devices for low-voltage circuits for household and similar purposes - Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units	EN 60998-2-1	-
IEC 60998-2-2	-	Connecting devices for low-voltage circuits for household and similar purposes - Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units	EN 60998-2-2	-
IEC 60998-2-3	-	Connecting devices for low-voltage circuits for household and similar purposes - Part 2-3: Particular requirements for connecting devices as separate entities with insulation-piercing clamping units	EN 60998-2-3	-
IEC 60998-2-4	-	Connecting devices for low voltage circuits for household and similar purposes - Part 2-4: Particular requirements for twist- on connecting devices	EN 60998-2-4	-
IEC 61032	1997	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	1998
ISO 1456	2009	Metallic and other inorganic coatings - Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium	EN ISO 1456	2009
ISO 2081	2008	Metallic and other inorganic coatings - Electroplated coatings of zinc with supplementary treatments on iron or steel	EN ISO 2081	2008
ISO 2093	1986	Electroplated coatings of tin; Specification and test methods	-	-

²⁾ Superseded by EN 60695-2-10:2013 (IEC 60695-2-10:2013).

Annex ZB (normative)

Special national conditions

Special national condition: National characteristic or practice that cannot be changed over a long period, e.g. climatic conditions, electrical earthing conditions. If it affects harmonization, it forms part of the European Standard.

For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

<u>Clause</u>	<u>Special national condition</u>
---------------	-----------------------------------

7.7	Belgium, Finland, Germany, Netherlands, Norway and Sweden
-----	--

Design B is not used due to installation practice.

8.1	United Kingdom
-----	-----------------------

Add after the first paragraph:

The marking of the type reference is not used.

Germany

Add at the index n:

n) the symbol that electrotechnical expertise is required (see IEC 60417-6182) is to be placed on the packaging.

8.3	United Kingdom
-----	-----------------------

Add at the end:

The marking of the type reference is not used.

10.2	Norway
------	---------------

Add after the first paragraph:

Due to the lack of an earthing conductor in many existing old buildings, accessories requiring earth connection cannot normally be used.

Annex ZC
(informative)

A-Deviations

A-Deviation: National deviations due to regulation, the alteration of which is for the time being outside the competence of CENELEC member.

This European Standard falls under Directive 2014/35/EU.

NOTE (from CEN/CENELEC IR Part 2, 3.1.9): Where standards fall under EC Directives, it is the view of the Commission of the European Communities (OJ No C 59; 1982-03-09) that the effect of the decision of the Court of Justice in case 815/79 Cremonini/Vrankovich (European Court Reports 1980, p.3583) is that compliance with A-deviations is no longer mandatory and that the free movement of the products complying with such a standard should not be restricted except under the safeguard procedure provided for the relevant Directive.

A-deviations in an EFTA-country are valid instead of the relevant provisions of the European Standard in that country until they have been removed.

<u>Clause</u>	<u>Special national condition</u>
---------------	-----------------------------------

11.2	Belgium (Reglement General sur les Installations Electriques, R.G.I.E. § 73.02).
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Replace the second paragraph by:

They shall have a capacity not less than that of the corresponding terminals for the supply conductors except that any additional external earthing terminal shall be of a size suitable for conductors of at least 4 mm².

Annex ZD
Routine test

(Under consideration)

Annex ZZ

(informative)

Relationship between this European standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

Table ZZ.1 – Correspondence between this European standard and Annex I of Directive 2014/35/EU [2014 OJ L96]

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1(a) the <u>essential characteristics</u> , the recognition and observance of which will ensure that electrical equipment will be used safely and in applications for which it was made, <u>shall be marked on the electrical equipment, or, if this is not possible, on an accompanying document</u>	Clause 1 to 7 8 - Marking Annex D Annex E (See SNC)	
1.(b) <u>ensure that it can be safely and properly assembled and connected;</u>	Clause 1 to 7 8 - Marking 9 - Dimensions 10 - Protection against electrical shock 11 - Provision for earthing 12 - Terminals 13 - Constructional requirements 14 – Mechanism 22 – Screws, current-carrying parts and connections Annex A Annex D Annex E (See SNC)	

1(c) protection against the hazards set out in points 2 and 3 is assured, providing that <u>the equipment is used in applications for which it was made and is adequately maintained</u>	Clause 1 to 7 10 - Protection against electrical shock 11 - Provision for earthing 12 - Terminals 13 - Constructional requirements 14 - Mechanism 16 - Insulation resistance and electrical strength 17 - Temperature rise 18 - Making and breaking capacity 19 - Normal operation 23 - Creepage and clearance distances Annex A Annex D Annex E (See SNC)	
2(a) persons and domestic animals are adequately protected against the <u>danger of physical injury or other harm which might be caused by direct or indirect contact</u>	Clause 1 to 7 10 - Protection against electrical shock 16 - Insulation resistance and electrical strength 17 - Temperature rise 20 - Mechanical strength 23 - Creepage and clearance distances 24 - Resistance of insulating material to abnormal heat, to fire and to tracking Annex A Annex E (See SNC)	
2(b) <u>temperatures, arcs or radiation</u> which would cause a danger, <u>are not produced</u>	Clause 1 to 7 14 - Mechanism 16 - Insulation resistance and electrical strength 17 - Temperature rise 18 - Making and breaking capacity 19 - Normal operation 21 - Resistance to heat 24 - Resistance of insulating material to abnormal heat, to fire and to tracking 25 - Resistance to rusting 27 - EMF requirement Annex E (See SNC)	

2(c) persons, domestic animals and property are adequately <u>protected against non-electrical dangers</u> caused by the electrical equipment which are revealed by experience;	Clause 1 to 7 13 - Constructional requirements 17 - Temperature rise 20 - Mechanical strength Annex A Annex E (See SNC)	
2(d) <u>the insulation is suitable for foreseeable conditions</u>	Clause 1 to 7 16 - Insulation resistance and electrical strength 17 - Temperature rise 19 - Normal operation 20 - Mechanical strength 23 - Creepage and clearance distances 24 - Resistance of insulating material to abnormal heat, to fire and to tracking 25 - Resistance to rusting Annex E (See SNC)	
3(a) meets the <u>expected mechanical requirements</u> in such a way that persons, domestic animals and property <u>are not endangered</u>	Clause 1 to 7 13 - Constructional requirements 15 - Resistance to ageing, protection provided by enclosures of switches, and resistance to humidity 16 - Insulation resistance and electrical strength 20 - Mechanical strength Annex A Annex E (See SNC)	
3(b) resistant to non-mechanical <u>influences in expected environmental conditions</u> , in such a way that persons, domestic animals and property are not endangered	Clause 1 to 7 15 - Resistance to ageing, protection provided by enclosures of switches, and resistance to humidity 16 - Insulation resistance and electrical strength 17 - Temperature rise	
3(c) not endanger persons, domestic animals and property in <u>foreseeable conditions of overload</u>	Clause 1 to 7 17 - Temperature rise 18 - Making and breaking capacity	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SWITCHES FOR HOUSEHOLD AND SIMILAR
FIXED ELECTRICAL INSTALLATIONS –****Part 1: General requirements****FOREWORD**

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- 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 60669-1 has been prepared by subcommittee 23B: Plugs, socket-outlets and switches, of IEC technical committee 23:

This fourth edition cancels and replaces the third edition published in 1998, Amendment 1:1999 and Amendment 2:2006. This edition constitutes a technical revision.

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

- a) change of the scope for motor load switches;
- b) deletion of some dated normative references;
- c) changes to the definitions;
- d) in Clause 5 the number of specimens to be used for the tests are clearly given in Table 1 (Corresponding Annex A of IEC 60669-1:1998 was therefore deleted);

- e) in Clause 5 it was clarified on which switches the tests of Clause 19 shall be carried out;
- f) requirements concerning 13 A switches have been included;
- g) mandatory indication that a terminal is suitable for rigid conductor only;
- h) requirements and test conditions for flexible conductors have been included in Clause 12;
- i) requirements for pilot light units have been included;
- j) new test for self-ballasted lamp loads in 19.3;
- k)  Table 20 has been completely redrawn to cover normal, mini and micro-gap switches and renumbered Table 23; 
- l) new informative Annex B including changes planned for the future in order to align IEC 60669-1 with the requirements of IEC 60998 (all parts), IEC 60999 (all parts) and IEC 60228;
- m) new informative Annex C about the circuit development for 19.3;
- n) new informative Annex D including additional requirements for insulation-piercing terminals;
- o) new informative Annex E including additional requirements and tests for switches intended to be used at a temperature lower than –5 °C.

The text of this standard is based on the following documents:

FDIS	Report on voting
23B/1235/FDIS	23B/1241/RVD

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

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

In this standard, the following print types are used:

- *compliance statements: in italic type*

A list of all parts in the IEC 60669 series, published under the general title *Switches for household and similar fixed electrical installations*, can be found on the IEC website.

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SWITCHES FOR HOUSEHOLD AND SIMILAR FIXED ELECTRICAL INSTALLATIONS –

Part 1: General requirements

1 Scope

This part of IEC 60669 applies to manually operated general purpose functional switches, for alternating current (AC) only with a rated voltage not exceeding 440 V with a rated current not exceeding 63 A, intended for household and similar fixed electrical installations, either indoors or outdoors.

For switches provided with screwless terminals, the rated current is limited to 16 A.

NOTE 1 The rated current is limited to 16 A for switches provided with insulation piercing terminals (IPT's) according to Annex D.

Switches covered by this document are, where applicable, intended for the control in normal use of all of the following loads:

- a circuit for a tungsten filament lamp load;
- a circuit for an externally ballasted lamp load (for example LED, CFL, fluorescent lamp load);
- a circuit for a self ballasted lamp load (for example LEDi or CFLi);
- a circuit for a substantially resistive load with a power factor not less than 0,95;
- a single phase circuit for motor load with a rated current not exceeding 3 A at 250 V (750 VA) and 4,5 A at 120 V (540 VA) and a power factor not less than 0,6. This applies to both switches rated not less than 10 A that have not undergone additional tests and to momentary switches rated not less than 6 A that have not undergone additional tests.

NOTE 2  Void 

This document also applies to boxes for switches, with the exception of mounting boxes for flush-type switches.

NOTE 3 General requirements for boxes for flush-type switches are given in IEC 60670-1.

It also applies to switches such as

- switches incorporating pilot lights;
- electromagnetic remote control switches (particular requirements are given in IEC 60669-2-2);
- switches incorporating a time-delay device (particular requirements are given in IEC 60669-2-3);
- combinations of switches and other functions (with the exception of switches combined with fuses);
- electronic switches (particular requirements are given in IEC 60669-2-1);
- switches having facilities for the outlet and retention of flexible cables (see Annex A);
- isolating switches (particular requirements are given in IEC 60669-2-4);
- switches and related accessories for use in home and building electronic systems (particular requirements are given in IEC 60669-2-5);
- firemen's switches (particular requirements are given in IEC 60669-2-6).

Switches complying with this document are suitable for use at ambient temperatures not normally exceeding +40 °C, but their average over a period of 24 h does not exceed +35 °C, with a lower limit of the ambient air temperature of –5 °C.

NOTE 4 For lower temperatures see Annex E.

Switches complying with this document are suitable only for incorporation in equipment in such a way and in such a place that it is unlikely that the surrounding ambient temperature exceeds +35 °C.

In locations where special conditions prevail, such as in ships, vehicles and the like and in hazardous locations, for example where explosions are liable to occur, special construction and/or additional requirements may be required.

2 Normative references

NOTE Normative references to international publications are listed in Annex ZA (normative).

IEC 60038:2009, *IEC standard voltages*

IEC 60068-2-75:2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60112:2009, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60212:2010, *Standard conditions for use prior to and during the testing of solid electrical insulation materials*

IEC 60227-5:2011, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60245-4:2011, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60417, *Graphical symbols for use on equipment* (available from: <http://www.graphical-symbols.info/equipment>)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60669-2-1:2002, *Switches for household and similar fixed electrical installations – Part 2-1: Particular requirements – Electronic switches*
IEC 60669-2-1:2002/AMD1:2008
IEC 60669-2-1:2002/AMD2:2015

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60998-1:2002, *Connecting devices for low-voltage circuits for household and similar purposes – Part 1: General requirements*

IEC 60998-2-1, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units*

IEC 60998-2-2, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units*

IEC 60998-2-3, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-3: Particular requirements for connecting devices as separate entities with insulation-piercing clamping units*

IEC 60998-2-4, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-4: Particular requirements for twist-on connecting devices*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

ISO 1456:2009, *Metallic and other inorganic coatings – Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium*

ISO 2081:2008, *Metallic and other inorganic coatings – Electroplated coatings of zinc with supplementary treatments on iron or steel*

ISO 2093:1986, *Electroplated coatings of tin – Specification and test methods*

3 Terms and definitions

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

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>

NOTE Where the terms "voltage" and "current" are used, they are rms values unless otherwise specified.

3.1

switch

device designed to make or break the current in one or more electric circuits

3.1.1

on/off switch

switch for alternatively closing and opening one or more electric circuits.

[SOURCE: IEC 60050-151:2001, 151-12-23]

3.1.2

momentary contact switch

switch which returns its contacts automatically to the initial state after operation.

Note 1 to entry: Momentary contact switches are intended to operate, for example, bells, electromagnetic remote control switches, time-delay switches and electronic switches.

3.1.3**push-button switch**

switch having a single actuator which moves with a single motion when operated by an external, manual force usually applied by the finger or palm of the hand and having stored energy return

3.1.4**cord-operated switch**

switch the operating means of which is a cord which has to be pulled in order to change its contact state

3.1.5**switch of normal-gap construction**

switch construction having a clearance between the contacts in the open position of not less than 3 mm

3.1.6**switch of mini-gap construction**

switch construction having a clearance between the contacts which is less than 3 mm but is not less than 1,2 mm

3.1.7**switch of micro-gap construction**

switch construction having a clearance between the contacts in the open position of less than 1,2 mm

3.2**one operation**

transfer of the moving contacts from one operating position to another

3.3**terminal**

conductive part of one pole, composed of one or more clamping unit(s) and insulation if necessary

3.4**clamping unit**

part or parts of a terminal necessary for the mechanical clamping and the electrical connection of the conductor(s)

3.5**screw-type terminal**

terminal intended for the connection, by clamping only, of (an) external rigid or flexible conductor(s)

3.5.1**pillar terminal**

screw-type terminal in which the conductor(s) is (are) inserted into a hole or cavity, where it is clamped under the shank of the screw or screws

Note 1 to entry: The clamping pressure can be applied directly by the shank of the screw or through an intermediate clamping part to which pressure is applied by the shank of the screw.

Note 2 to entry: Examples of pillar terminals are shown in Figure 1.

[SOURCE: IEC 60050-442:1998, 442-06-22, modified — “or screws” has been added because in some constructions there is more than one screw.]

3.5.2

screw head terminal

screw-type terminal in which the conductor is clamped under the head of the screw

Note 1 to entry: The clamping pressure can be applied directly by the head of the screw or through an intermediate part, such as a washer, clamping plate or anti-spread device.

Note 2 to entry: Examples of screw head terminals are shown in Figure 2.

3.5.3

stud terminal

screw-type terminal in which the conductor is clamped under a nut

Note 1 to entry: The clamping pressure can be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, a clamping plate or an anti-spread device.

Note 2 to entry: Examples of stud terminals are shown in Figure 2.

[SOURCE: IEC 60050-442:1998, 442-06-23]

3.5.4

saddle terminal

screw-type terminal in which the conductor is clamped under a saddle by means of two or more screws or nuts

Note 1 to entry: Examples of saddle terminals are shown in Figure 3.

[SOURCE: IEC 60050-442:1998, 442-06-09, modified — "screw-type" has been added.]

3.5.5

lug terminal

screw head terminal or stud terminal, designed for clamping a cable lug or bar by means of a screw or nut

Note 1 to entry: Examples of lug terminals are shown in Figure 4.

[SOURCE: IEC 60050-442:1998, 442-06-16, modified — "screw-type terminal" is replaced with "screw head terminal or stud terminal" and "directly and indirectly" has been deleted.]

3.5.6

mantle terminal

screw-type terminal in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut

Note 1 to entry: The conductor is clamped against the base of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut, or by equally effective means for transmitting the pressure from the nut to the conductor within the slot.

Note 2 to entry: Examples of mantle terminals are shown in Figure 5.

[SOURCE: IEC 60050-442:1998, 442-06-14, modified — "screw-type" has been added and the last part of the definition is included in a note.]

3.6

screwless-type terminal

terminal for the connection and subsequent disconnection of a rigid (solid or stranded) or flexible conductor or the interconnection of two conductors capable of being dismantled, the connection being made, directly or indirectly, by means of springs, parts of angled, eccentric or conical form, etc., without special preparation of the conductor concerned, other than removal of insulation

[SOURCE: IEC 60050-442:1998, 442-06-11, modified]

3.7**thread-forming screw**

screw having an uninterrupted thread which, by screwing in, forms a thread by displacing material in the cavity

Note 1 to entry: An example of a thread-forming screw is shown in Figure 6.

[SOURCE: IEC 60050-442:1998, 442-06-04]

3.8**thread-cutting screw**

screw having an interrupted thread which, by screwing in, makes a thread by removing material from the cavity

Note 1 to entry: An example of a thread-cutting screw is shown in Figure 7.

[SOURCE: IEC 60050-442:1998, 442-06-03]

3.9**mechanical time-delay device**

device which, through a mechanical auxiliary, operates some time after the instant at which the conditions which cause it to operate are established

3.10**base**

part of the switch retaining current-carrying parts and which normally retains the mechanism in position

3.11**rated voltage**

voltage assigned by the manufacturer for a specific operating condition of the switch

[SOURCE: IEC 60050-442:1998, 442-01-03, modified — "accessory" has been replaced with "switch".]

3.12**rated current**

current assigned by the manufacturer for a specific operating condition of the switch

[SOURCE: IEC 60050-442:1998, 442-01-02, modified — "accessory" has been replaced with "switch".]

3.13**operating member**

part of a cord-operated switch which connects the internal mechanism with a pull cord and is usually attached to the actuating member of the switch

3.14**pole of a switching device**

portion of a switching device associated exclusively with one electrically separated conducting path of its main circuit and excluding those portions which provide a means for mounting and operating all poles together

Note 1 to entry: A switching device is called single-pole if it has only one pole. If it has more than one pole, it may be called multipole (two-pole, three-pole, etc.) provided the poles are or can be coupled in such a manner as to operate together.

[SOURCE: IEC 60050-441:2000, 441-15-01]

3.15

actuating member

part which is pulled, pushed, turned or otherwise moved to cause an operation of the switch

[SOURCE: IEC 60050-442:1998, 442-04-14]

3.16

pilot light

device incorporating a light source either integral or designed to be installed with the switch and intended to give for example an indication of the switch state or to indicate the switch location

3.17

main part

assembly consisting of the base and other parts which is not intended to be dismantled at any time after manufacture

3.18

grommet

component used to support and protect the wires or cable or conduit at the point of entry

Note 1 to entry: A grommet may also prevent the ingress of moisture or contaminants.

Note 2 to entry: Examples are shown in Figure 23.

[SOURCE: IEC 60050-581:2008, 581-27-19, modified — "part of a component or an accessory" has been replaced with "component", "or conduit" has been added and part of the definition is included in a note.]

3.19

entry membrane

component or integral part of the switch used to protect the wires or cable which may be used to support the cable or conduit at the point of entry

Note 1 to entry: An entry membrane may also prevent the ingress of moisture or contaminants and may be part of a grommet.

Note 2 to entry: Examples are shown in Figure 23.

3.20

protecting membrane

component or integral part of the switch that is not intended to be penetrated in normal use and is intended to provide protection against ingress of water or solid objects and/or to allow the operation of an accessory

Note 1 to entry: Examples are shown in Figure 23

3.21

self ballasted lamp

SBL

unit which cannot be dismantled without being permanently damaged, which is provided with a lamp cap or caps and which incorporates a light source and any additional elements necessary for starting and stable operation of the light source

Note 1 to entry: In the text, a self ballasted lamp is also called CFLi or LEDi, where:

- CFL stands for Compact Fluorescent Lamp;
- LED stands for Light Emitting Diode;
- "i" means that the control gear is incorporated in the lamp.

Note 2 to entry: This note applies to the French language only.

3.22**externally ballasted lamp**

lamp other than an incandescent lamp which cannot be dismantled without being permanently damaged, which is provided with a lamp cap and which incorporates a light source to be controlled by a separate lamp control gear

Note 1 to entry: For lamp control gear, see definitions in IEC 61347-1.

**3.Z1****surface-type switch**

switch, which when mounted, projects wholly above the surface on which it is mounted

3.Z2**flush-type switch**

switch mainly intended to be mounted in a flush-type box

3.Z3**semi flush-type switch**

switch mainly intended to be mounted in a semi flush-type box

3.Z4**panel-type switch**

switch mainly intended for mounting to a panel having an aperture through which the intended accessible surface of the switch protrudes

3.Z5**architrave-type switch**

switch having a cover plate of such proportions that it may be accommodated within an architrave

3.Z6**live part**

[IEV 442-01-40] conductor or conductive part intended to be energized in normal use, including a neutral conductor, but, by convention, not the combined protective and neutral conductor (PEN)

Note 1 to entry: This concept does not necessarily imply a risk of electric shock.

3.Z7**type test**

test of one or more switches made to a certain design to show that the design meets certain specifications

3.Z8**routine test**

test to which each individual switch is subjected during and/or after manufacture to ascertain whether it complies with certain criteria

3.Z9**switch without gap construction**

switch having a semiconductor switching device which has no contact gap

4 General requirements

Switches and boxes of surface mounting accessories shall be so designed and constructed that, in normal use, their performance is reliable and safety is achieved by reducing risk to a tolerable level as defined in ISO/IEC Guide 51:2014.

Compliance is checked by meeting all the relevant requirements and tests specified.

4 General requirements

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Compliance is checked by meeting all the relevant requirements and tests specified.

5 General remarks on tests

Tests according to this document are type tests.

Unless otherwise specified, the specimens are tested as delivered and under normal conditions of use.

Switches having provision for pilot lights shall be tested with pilot lights fitted, unless otherwise stated. The results of the tests shall be considered to apply to switches of the same type which do not have provision for pilot lights.

Flush and semi-flush type switches shall be tested when installed in a box complying with the applicable standard sheet(s), if any. In case the switch is manufactured for a specific box, the tests shall be conducted when the switch is installed in the corresponding box as specified by the manufacturer.

Unless otherwise specified, the tests are carried out in the order of the clauses, at an ambient temperature between +15 °C and +35 °C.

In case of doubt, the tests are made at an ambient temperature of $(+20 \pm 5)$ °C.

For each of the two combinations of rated voltages and rated currents marked on the switch, three specimens are subjected to all the relevant tests except the test of 19.2 and 19.3, where two further sets of three specimens are used.

For switches with a rated current up to and including 16 A the tests of 19.1, 19.2 and 19.3 shall be carried out.

For switches with a rated current above 16 A and up to and including 20 A the tests of 19.1 and 19.3 shall be carried out.

For switches with a rated current above 16 A and up to 20 A inclusive the test of 19.2 shall be carried out only if the manufacturer has assigned the switch with an externally ballasted lamp current rating.

For switches with a rated current above 20 A, only the tests of 19.1 shall be carried out.

A switch marked 250 V/400 V is tested as a 400 V switch.

Momentary contact switches are not to be submitted to the tests of 18.3, 19.2 and 19.3.

Switches of pattern 3 and 03 are submitted to the tests of 18.3 if they have a rated voltage over 250 V, but are not to be submitted to the tests of 19.2 and 19.3.

The number of specimens required for the tests shall be as specified in Table 1.

Table 1 – Number of specimens needed for the tests

Clauses and subclauses		Number of specimens	Number of additional specimens for dual current rating
6	Ratings	A	JKL
7	Classification	A	
8	Marking	A	
9	Checking of dimensions	ABC	
10	Protection against electric shock	ABC	
11	Provision for earthing	ABC	
12	Terminals ^{a, f, l}	ABC	
13	Constructional requirements ^{b, m}	ABC	
14	Mechanism	ABC	
15	Resistance to ageing, protection provided by enclosures of switches, and resistance to humidity	ABC	
16	Insulation resistance and electric strength ^c	ABC	
17	Temperature rise	ABC	JKL
18	Making and breaking capacity	ABC ⁱ	JKL
19	Normal operation	ABC ⁱ	JKL
20	Mechanical strength ^{d, g}	ABC	JKL
21	Resistance to heat ^h	ABC	
22	Screws, current-carrying parts and connections	ABC	
23	Creepage distances, clearances and distances through sealing compound	ABC	
19.2	Test for switches intended for externally ballasted lamp loads	DEF ^j	MNO
19.3	Test for switches intended for self ballasted lamp loads	UVW ^k	XYZ
24.1	Resistance to abnormal heat and to fire	GHI	
24.2	Resistance to tracking ^e	GHI	
25	Resistance to rusting	GHI	
TOTAL		12	9
^a Five extra screwless terminals are used for the test of 12.3.11 and one extra set of specimens is used for the test of 12.3.12. ^b An extra set of membranes are needed for each of the tests of 13.15.1 and 13.15.2. ^c One extra set of specimens of switches fitted with pilot light may be used for the tests of Clause 16. ^d One extra set of specimens of cord-operated switches is needed for the test of 20.10. ^e One extra set of specimens may be used. ^f Two extra set of specimens of terminals suitable for rigid and flexible conductors are required for 12.2.5, 12.2.6 and 12.2.7. ^g One extra set of specimens is needed for the tests of 20.5.1 and 20.5.2. ^h One extra set of specimens may be used for the tests of 21.2 and 21.3. In this case the specimens shall be subjected first to the tests of 15.1. ⁱ One extra set of specimens of switches of pattern number 7 are necessary for 18 and 19.1. ^j One extra set of specimens of switches of pattern number 7 are necessary for 19.2. ^k One extra set of specimens of switches of pattern number 7 are necessary for 19.3. ^l Number of specimens required for insulation-piercing terminals (IPTs) are shown in Table D.1 ^m For switches with pilot light units if the electronic circuitry is so enclosed that the short-circuiting or disconnecting of components is impossible or difficult, the manufacturer shall provide additional prepared test specimens.			

The specimens are submitted to all the relevant tests and comply with this document if all the requirements of all the relevant tests are met.

If one specimen does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated and also the tests which follow shall be made in the required sequence on another full set of specimens, all of which shall comply with the requirements.

The applicant may submit, together with a number of specimens specified in Table 1, the additional set of specimens which may be required, should one specimen fail. The test laboratory should then, without further request, test additional specimens and will reject them only if a further failure occurs. If the additional set of specimens is not submitted at the same time, the failure of one specimen will result in non compliance.

6 Ratings

6.1 Rated voltage

☐ Preferred values of rated voltage are 230 V, 250 V, 400 V, or 440 V. ☐

6.2 Rated current

Preferred values of rated current are 6 A, 10 A, 13 A, 16 A, 20 A, 25 A, 32 A, 40 A, 45 A, 50 A or 63 A.

The rated current of switches shall not be less than 6 A, except for momentary contact switches where a rated current of 1 A, 2 A or 4 A is allowed.

Switches with a rated current not exceeding 16 A shall have an externally ballasted lamp current rating equal to the rated current. This requirement does not apply to switches of pattern numbers 3 and 03 or to momentary contact switches.

Switches with a rated current not exceeding 20 A shall be tested with self ballasted lamp (SBL) circuits as given in 19.3.

Switches which are tested according to 19.3 are capable of switching the rated power of SBL circuits according to Table 2.

NOTE Higher values of rated power of SBL circuits can be declared by the manufacturer according to Table 19.

Table 2 - Relationship between rated current of the switch and rated power of the SBL circuit

Rated current of the switch [A]	Rated power of the SBL circuit [W]
Up to and including 10	100
Above 10 up to and including 13	150
Above 13 up to and including 16	200
Above 16 up to and including 20	250



Compliance with the requirements of 6.1 and 6.2 is checked by inspection of the marking.

6.3 Preferred combinations of number of poles and ratings

Preferred combinations of number of poles and ratings are shown in Table 3.

Table 3 – Preferred combinations of numbers of poles and ratings

Rated current A	Number of poles	
	Rated voltage from 120 V to 250 V inclusive	Rated voltage over 250 V
1, 2 and 4	1	–
6	1	1
	2	2
10 and 13	1 2	1
		2
		3
		4
16, 20, 25, 32, 40, 45, 50 and 63	1	1
	2	2
	3	3
	4	4

7 Classification

Switches are classified

7.1 according to the possible connections (see Figure 8):

	Pattern number
– single-pole switches	1
– double-pole switches	2
– three-pole switches	3
– three-pole plus switched neutral switches	03
– two-way switches	6
– two-circuit switches with a common incoming line	5
– two-way switches with one off-position	4
– two-way double-pole switches	6/2
– two-way reversing switches (or intermediate switches)	7

NOTE 1 Two or more switches having the same or different pattern numbers can be mounted on a common base.

NOTE 2 For the pattern number for which an off-position is considered, the above classification refers also to push-button switches and momentary contact switches.

7.2 according to the contact opening:

- switches of normal-gap construction;
- switches of mini-gap construction;
- switches of micro-gap construction;
- switches without contact gap (semiconductor switching devices).

7.3 according to the degree of protection against access to hazardous parts and against harmful effects due to the ingress of solid foreign objects as described in IEC 60529.

7.4 according to the degree of protection against harmful effects due to the ingress of water as described in IEC 60529.

7.5 according to the method of actuating the switch:

- rotary;
- tumbler;
- rocker;
- push-button;
- cord-operated.

7.6 according to the method of mounting the switch:

- surface-type;
- flush-type;
- semi flush-type;
- panel-type;
- architrave-type.

7.7 according to the method of installation, as a consequence of the design of the switch:

- switches where the cover or cover plate can be removed without displacement of the conductors (design A);
- switches where the cover or cover plate cannot be removed without displacement of the conductors (design B).

NOTE 1 If a switch has a base which cannot be separated from the cover or cover plate, and requires a supplementary plate to meet the standard, which can be removed for redecorating the wall without displacement of the conductors, it is considered to be of design A, provided the supplementary plate meets the requirements specified for covers and cover plates.

☐ NOTE Z1 See Annex ZB for special national conditions. ☐

7.8 according to the type of terminal:

- switches with screw-type terminals;
- switches with screwless-type terminals.

7.9 according to the suitability to accept conductors:

- switches with terminals for rigid conductors only;
- switches with terminals for rigid and flexible conductors.

NOTE 1 In the following country, switches with terminals for rigid conductors only are not allowed: ES, IN and IT.

NOTE 2 In the following countries, switches with screw terminals for rigid conductors only are not allowed: DE, DK, IN and ZA.

8 Marking

8.1 General

Switches shall be marked with

- a) rated current(s)
 - in amperes (A) if the switch is tested according to 19.1 only
 - in amperes (A) if the switch is tested according to 19.1 and 19.3 only or
 - in amperes (AX) if the switch is tested according to 19.1, 19.2 and 19.3 when the rated currents in amperes (A) and (AX) are equal or
 - in amperes (A and AX) if the switch is tested according to 19.1, 19.2 and 19.3 when the rated currents in amperes (A) and (AX) are not equal;
- b) rated voltage(s) in volts;
- c) symbol for nature of supply;
- d) manufacturer's or responsible vendor's name, trade mark or identification mark;
- e) type reference, which may be a catalogue number;
- f) symbol for switches of mini-gap construction, if applicable;
- g) symbol for switches of micro-gap construction, if applicable;
- h) symbol for switches without contact gap (semiconductor switching device), if applicable;
- i) first characteristic numeral for the degree of protection against access to hazardous parts and against harmful effects due to ingress of solid foreign objects, if declared to be higher than 4 in which case the second characteristic numeral shall also be marked;
- j) second characteristic numeral for the degree of protection against harmful effects due to ingress of water, if declared to be higher than 2 in which case the first characteristic numeral shall also be marked;
- k) length of insulation to be removed before the insertion of the conductor into the screwless type terminal;

l) symbol for the suitability to accept rigid conductors only.

In addition the following information shall be given in the manufacturer's documentation:

m) for SBL loads: the rated power in watts and the type of load if the switch is tested according to 19.3.

NOTE 1 Marking of the pattern number given in 7.1 can be made if the connections are not clear from an inspection of the switch; this pattern number may be part of the type reference.

NOTE 2 If a base carries two or more switches with separate operating devices, marking with the pattern numbers can be made, for example 1+6 or 1+1+1.

NOTE 3 If there is no marking on the terminals, they are suitable to accept both rigid and flexible conductors.

NOTE 4 See Annex ZB for special national conditions.

Convenor note: The relevant national committees should propose the exact text for Annex ZB, SNC related to the notes in this paragraph.

Text deleted

8.2 Symbols

When symbols are used, they shall be as follows:

Amperes (Rated current for externally ballasted loads).....	AX
(other currents).....	A
Volts	V
Alternating current	~
Watt	W
Neutral	N
Line	L
Protective earth (IEC 60417-5019:2006-08)	
"open" position (off)	O
"closed" position (on)	I
Mini-gap construction.....	m
Micro-gap construction.....	μ
Without contact gap (semiconductor switching device).....	ε
Degree of protection, when relevant.....	IPXX
Degree of protection for fixed accessories to be installed on rough surfaces (test wall of Figure 21)	
Suitability to accept rigid conductors only.....	r

NOTE 1 Details of construction of certain symbols are given in IEC 60417.

NOTE 2 See Annex ZB for special national conditions.

NOTE 3 Lines formed by the construction of the tool are not considered as part of the marking.

The symbol "AX" may be replaced by the symbol "X". For the marking with rated current and rated voltage the figures may be used alone.

The marking for the nature of supply shall be placed next to the marking for rated current and rated voltage.

NOTE 4 The marking for current, voltage and nature of supply can be, for example, as follows:

10 AX 250 V ~	or	10 X/250 ~	or	$\frac{10 X}{250} \sim$
20 A – 16 AX 250 V ~	or	20 -16 X/250 ~	or	$\frac{20 - 16 X}{250} \sim$
10 AX 400 V ~	or	10 X/400 ~	or	$\frac{10 X}{400} \sim$
25 AX 400 V ~	or	25 X/400 ~	or	$\frac{25 X}{400} \sim$
25 A 250 V ~	or	25/250 ~	or	$\frac{25}{250} \sim$
25 AX 440 V ~	or	25 X/440 ~	or	$\frac{25 X}{440} \sim$

8.3 Visibility of markings

Markings shall be clearly visible with normal or corrected vision, without additional magnification.

Markings as given in 8.1 a), b), c), d), e) and, if applicable, f), g), h), k), and l) shall be placed on the main part of the switch.

NOTE 1 Marking e) can be the series reference only.

NOTE 2 In the following country, the marking of the type reference is not used: UK.

Parts such as cover plates, which are necessary for safety purposes and are intended to be sold separately, shall be marked with the manufacturer's or responsible vendor's name, trade mark or identification mark and type reference.

Markings i) and j), when applicable, shall be marked so as to be easily discernible when the switch is mounted and wired as in normal use. These markings shall be placed on parts which cannot be removed without the use of a tool.

NOTE 3 Additional type references can be marked on the main part, or on the outside or the inside of the associated enclosure.

8.4 Marking on terminals for phase conductors

Terminals intended for the connection of phase conductors (supply conductors) shall be identified unless the method of connection is of no importance, is self-evident or is indicated on a wiring diagram. Such identification may take the form of a letter L or, in the case of more than one of such terminals, the letters L1, L2, L3, etc. The letters L1, L2, L3 may be accompanied by an arrow or arrows pointing to the relevant terminal or terminals.

These indications shall not be placed on screws or any other easily removable part.

Alternatively, the surface of such terminals shall be bare brass or copper, other terminals being covered with a metallic layer of another colour.

For switches of pattern numbers 2, 3, 03 and 6/2, terminals associated with any one pole shall have similar identification, if applicable, differing from that of the terminals associated with the other poles, unless the relationship is self-evident.

NOTE 1 The wiring diagram can be an instruction sheet which accompanies the switch.

NOTE 2 "Easily removable parts" are those parts which can be removed during the normal installation of the switch.

8.5 Marking on terminals for neutral and earth conductors

Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

Earthing terminal for the connection of the protective conductor shall be indicated by the symbol  (IEC 60417-5019:2006-08).

These markings shall not be placed on screws or any other easily removable part.

NOTE "Easily removable parts" are those parts which can be removed during the normal installation of the switch.

Terminals provided for the connection of conductors not forming part of the main function of the switch shall be clearly identified unless their purpose is self-evident, or indicated in a wiring diagram which shall be fixed to the accessory.

The identification of switch terminals may be achieved by

- their marking with graphical symbols according to IEC 60417 or colours and/or alpha-numeric system;
- their physical dimension or relative location.

Leads of pilot lights are not considered to be conductors for the purpose of 8.5.

8.6 Marking of the switch position

If switches are marked to indicate the switch position, they shall be so marked that the direction of movement of the actuating member to its different positions or the actual position is clearly indicated. For switches having more than one actuating member, this marking shall indicate, for each of the actuating members, the effect achieved by its operation.

The marking shall be clearly visible on the front of the switch when fitted with its cover or cover plate.

If this marking is placed on the cover, cover plate, or removable actuating members, it shall not be possible to fix them in a position such that the marking is incorrect.

The symbols for "on" and "off" shall not be used for the indication of the switch positions unless, at the same time, they clearly indicate the direction of the movement of the actuating members.

NOTE 1 Other suitable means for the indication of the switch position can be used, for example pilot lights.

The short straight line indicating the "on" position shall be radial for rotary switches, perpendicular to the axis of rotation of the dolly for tumbler switches and rocker switches and vertical for push-button switches when mounted vertically.

These requirements do not apply to cord-operated switches and to switches of pattern numbers 6, 6/2 and 7.

NOTE 2 This indication can be avoided for push-button switches.

Compliance with the requirements of 8.1 to 8.6 is checked by inspection.

8.7 Additional requirements for marking

If it is necessary to take special precautions when installing the switch, details of these shall be given in an instruction sheet which accompanies the switch.

Instruction sheets shall be written in the official language(s) of the country in which the switch is to be sold.

Compliance is checked by inspection.

NOTE 1 Special precautions can, for example, be necessary for unenclosed switches and for switches for panel mounting.

NOTE 2 After installation, the conditions necessary to meet the requirements of this document are achieved when the instruction sheet includes clear information with regard to the following:

- dimensions of the space to be provided for each switch;
- dimensions and position of the means for supporting and fixing the switch within this space;
- minimum clearance between the various parts of the switch and the surrounding parts where fitted;
- minimum dimensions of ventilating openings, if needed, and their correct arrangement.

NOTE 3 If necessary, information concerning the connection between the earthing terminal and accessible metal parts can be given.

8.8 Durability

Marking shall be durable and easily legible.

Compliance is checked by inspection and by the following test.

The marking is rubbed by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with 95 % n-hexane.

NOTE 1 Marking made by impression, moulding, pressing, laser marking or engraving is not subjected to this test.

NOTE 2 95 % n-hexane (Chemical Abstracts Service Registry Number CAS RN 110-54-3) is available from a variety of chemical suppliers as a high pressure liquid chromatography (HPLC) solvent.

9 Checking of dimensions

Switches and boxes shall comply with the appropriate standard sheets, if any.

Compliance is checked by measurement.

10 Protection against electric shock

10.1 Prevention of access to live parts

Switches shall be so designed that when they are mounted and wired as in normal use, live parts are not accessible even after removal of parts which can be removed without the use of a tool.

Switches which are designed to be fitted with pilot lights supplied at voltages other than ELV shall have means to prevent direct contact with the lamp.

Compliance is checked by inspection and, if necessary, by the following test:

The specimen is mounted as in normal use and fitted with conductors of the smallest cross-sectional area specified in Clause 12; the test is repeated using conductors of the largest cross-sectional area specified in Clause 12.

Test probe B of IEC 61032 is applied in every possible position, an electrical indicator with a voltage between 40 V and 50 V being used to show contact with the relevant part.

Switches having enclosures or covers in thermoplastic or elastomeric material are subjected to the following additional test, which is carried out at an ambient temperature of $(35 \pm 2)^\circ\text{C}$, the switches being at this temperature.

During the additional test, the switches are subjected for 1 min to a force of 75 N, applied through the tip of test probe 11 of IEC 61032.

This finger, with an electrical indicator as described above, is applied to all places where yielding of insulating material could impair the safety of the switch, but is not applied to membranes or the like and is applied to thin-walled knock-outs with a force of only 10 N.

During this test, switches with their associated mounting means shall not deform to such an extent that live parts can be touched with the test probe 11 of IEC 61032.

NOTE Membranes or the like are tested according to 13.15.1 only.

10.2 Requirements for operating parts

Knobs, operating levers, push-buttons, rockers and the like shall be of insulating material, unless their accessible metal parts are separated from the metal parts of the mechanism by double insulation or reinforced insulation, or, as an alternative, they are reliably connected to earth.

NOTE See Annex ZB for special national conditions.

Compliance is checked by inspection and by the tests of Clauses 16 and 23.

This requirement does not apply to removable keys or intermediate parts, such as chains or rods.

10.3 Requirements for accessible metal parts

10.3.1 Accessible parts of switches when in normal use shall be made of insulating material with the exception of the following:

- small screws and the like which are isolated from live parts and which are used for the fixing of the base and of covers, cover plates and other parts of the enclosure;
- actuating members complying with 10.2;
- the covers, cover plates and other parts of the enclosure made of metal which comply with the requirements of 10.3.2 or 10.3.3.

10.3.2 Covers, cover-plates and other parts of the enclosure shall be protected by additional insulation made by insulating linings or insulating barriers. The insulating linings or insulating barriers shall either

- be fixed to covers, cover-plates and other parts of the enclosure or the body of the switches in such a way that they cannot be removed without being permanently damaged, or
- be so designed that
 - they cannot be replaced in an incorrect position;
 - if they are omitted, the accessories are rendered inoperable or manifestly incomplete;

- there is no risk of accidental contact between live parts and metal [C] covers, cover-plates and other parts of the enclosure [C], for example through their fixing screws, even if a conductor should come away from its terminal;
- precautions are taken in order to prevent creepage distances or clearances becoming less than the values specified in Clause 23.

Compliance is checked by inspection.

The above linings or barrier shall comply with the tests of Clauses 16 and 23.

NOTE Insulating coating sprayed on the inside or on the outside of the metal [C] covers, cover-plates and other parts of the enclosure [C] is not deemed to be an insulating lining or barrier for the purpose of 10.3.2.

10.3.3 The earthing of metal [C] covers, cover-plates and other parts of the enclosure [C] can be made with fixing screws or other integral means, the resulting connection shall be of low resistance.

[C] NOTE See Annex ZB for special national conditions. [C]

Compliance is checked by inspection and by the tests of 11.4.

10.4 Requirements for insulation of the mechanism

Metal parts of the mechanism, such as the spindle or the pivot of the dolly or rocker, that are not insulated from live parts, shall not protrude from the enclosure.

However, for switches operated by means of a removable key or similar device, such metal parts of the mechanism shall be insulated from live parts.

Compliance is checked by inspection and, if necessary, after the actuating member has been removed or broken.

If the actuating member has to be broken, compliance is checked by the test of Clause 23.

10.5 Requirements for insulation of the mechanism with respect to the surrounding environment

Metal parts of the mechanism shall not be accessible and shall be insulated from accessible metal parts when the switch is fixed as in normal use.

These requirements do not apply if the metal parts of the mechanism are separated from live parts in such a way that the creepage distances and clearances have at least twice the values specified in Clause 23, or, as an alternative, if they are reliably connected to earth.

Compliance is checked by inspection and, if necessary, by measurement and by the tests of Clauses 10 and 16.

NOTE 1 When checking the inaccessibility of metal parts of the mechanism of unenclosed switches or architrave-type switches, the protection provided by the normal way of mounting the switch is taken into account.

[C] NOTE Z1 See Annex ZB for special national conditions. [C]

For unenclosed stack-type switches having a metal spindle pivoting in a metal base plate, the additional requirement means that the creepage distances and clearances between live parts and the spindle, and between metal parts of the mechanism and base plate, shall have at least twice the values specified in Clause 23.

10.6 Requirements for switches operated indirectly

Switches operated by means of a removable key or by means of an intermediate part, such as a cord, a chain or a rod, shall be so designed that the key or intermediate part can only touch parts which are insulated from live parts.

The key or intermediate part shall be insulated from metal parts of the mechanism, unless the creepage distances and clearances between live parts and metal parts of the mechanism have at least twice the values specified in Clause 23.

Compliance is checked by inspection, by the test of 16.3 and, if necessary, by measurement.

NOTE Lacquer or enamel is not considered to be insulating material for the purposes of 10.1 to 10.6.

10.7 Requirements for switches with replaceable pull cord

Where cord-operated switches are provided with a pull cord which can be fitted or replaced by the user, they shall be so designed that it is impossible to touch live parts when fitting or replacing the pull cord in the normal way.

Compliance is checked by inspection.

11 Provision for earthing

11.1 General

Accessible metal parts, which can become live in the event of an insulation fault, shall be provided with, or permanently and reliably connected to, an earthing terminal.

This requirement does not apply to the metal cover plates mentioned in 10.3.2.

For the purpose of this requirement, small screws and the like, isolated from live parts, are not considered as accessible parts which can become live in the event of an insulation fault.

11.2 Earthing terminals

Earthing terminals shall be terminals with screw clamping or screwless terminals and shall comply with the appropriate requirements of Clause 12.

NOTE See Annex ZC for A-deviations.

11.3 Requirements for surface-type switches

Surface-type switches with an enclosure of insulating material, having an IP code higher than IPX0 and more than one cable inlet, shall be provided with either an internal fixed earthing terminal or adequate space for a floating terminal allowing the connection of an incoming and outgoing conductor for the continuity of the earthing circuit.

Clause 12 does not apply to floating terminals which shall comply with IEC 60998-1 and the relevant sub-part of IEC 60998-2.

Compliance with 11.1 to 11.3 is checked by inspection and by the tests of Clause 12.

Compliance for adequate space for floating terminals is checked by performing a test connection using the type of terminal specified by the manufacturer.

11.4 Test for earthing connection

The connection between the earthing terminal and accessible metal parts to be connected thereto shall be of low resistance.

Compliance is checked by the following test:

A current derived from an AC source having a no-load voltage not exceeding 12 V and equal to 1,5 times the rated current or 25 A, whichever is the greater, is passed between the earthing terminal and each of the accessible metal parts in turn.

The voltage drop between the earthing terminal and the accessible metal part is measured, and the resistance calculated from the current and this voltage drop.

In no case shall the resistance exceed 0,05 Ω .

NOTE Care is taken that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test results.

12 Terminals

12.1 General

Switches shall be provided with terminals having screw clamping or with screwless terminals.

The means for clamping the conductors in the terminals shall not serve to fix any other component, although they may hold the terminals in place or prevent them from turning.

All the tests on terminals, with the exception of 12.3.11, shall be carried out after the test of 15.1. Rigid solid conductors shall be of Class 1, rigid stranded conductors shall be of Class 2 and flexible conductors shall be of Class 5 according to IEC 60228.

Compliance is checked by inspection and by the tests of 12.2 or 12.3, as applicable.

12.2 Terminals with screw clamping for external copper conductors

12.2.1 Terminals with screw clamping may be of the type suitable for rigid copper conductors only or of the type suitable for both rigid and flexible copper conductors having cross-sectional areas as shown in Table 4.

Table 4 – Relationship between rated currents and connectable cross-sectional areas of copper conductors

Ranges of rated currents	Rigid conductors (solid or stranded) ^c	
	Nominal cross-sectional areas	Diameter of largest conductor
A	mm ²	mm
up to and including 4 ^a	–	–
above 4 up to and including 6	From 0,75 up to 1,5 inclusive	1,45
above 6 up to and including 13 ^b	From 1 up to 2,5 inclusive	2,13
above 13 up to and including 16 ^b	From 1,5 up to 4 inclusive	2,72
above 16 up to and including 25	From 2,5 up to 6 inclusive	3,34
above 25 up to and including 32	From 4 up to 10 inclusive	4,34
above 32 up to and including 50	From 6 up to 16 inclusive	5,46
above 50 up to and including 63	From 10 up to 25 inclusive	6,85
^a For special purposes such as ELV applications, where flexible conductors are used (from 0,5 mm ² up to 1 mm ² inclusive). ^b Each supply terminal of switches, other than those of pattern numbers 3, 03 and 7, shall allow the connection of two 2,5 mm ² conductors. For switches having a rated voltage not exceeding 250 V a round hole is sufficient for the connection of two 2,5 mm ² conductors. ^c The use of flexible conductors is permitted.		

The conductor space shall be at least that specified in Figures 1, 2, 3, 4 and 5.

Compliance is checked by inspection and by fitting conductors of the smallest and largest cross-sectional areas specified.

12.2.2 Terminals with screw clamping shall allow the conductor to be connected without special preparation.

Compliance is checked by inspection.

NOTE The term "special preparation" covers soldering of the wires of the conductor, use of cable lugs, formation of eyelets, etc., but not the reshaping of the conductor before its introduction into the terminal or the twisting of a flexible conductor to consolidate the end.

12.2.3 Terminals with screw clamping shall have adequate mechanical strength.

Screws and nuts for clamping the conductors shall have a metric ISO thread or a thread comparable in pitch and mechanical strength.

Screws shall not be of metal which is soft or liable to creep, such as zinc or aluminium.

Compliance is checked by inspection and by the tests of 12.2.6 and 12.2.8.

NOTE Provisionally SI, BA, and UN threads are considered to be comparable in pitch and mechanical strength to metric ISO thread.

12.2.4 Terminals with screw clamping shall be resistant to corrosion.

Terminals, the body of which is made of copper or copper alloy as specified in 22.5 are considered as complying with this requirement.

12.2.5 Terminals with screw clamping shall be so designed and constructed that they clamp the conductor(s) without undue damage to the conductor(s).

Compliance is checked by the following test:

Terminals suitable for rigid conductors only are checked with rigid solid conductors and on a new set of specimens with rigid stranded conductors, if existing.

NOTE 1 “if existing” means that the conductor is available in the market where the product is sold and installed.

*Terminals suitable for rigid and flexible conductors are checked with rigid conductors as above and on a new set of **[AC1]** specimens **[AC1]** with flexible conductors.*

The terminal is placed in the test apparatus according to Figure 9. The terminal is fitted first with a conductor of the smallest and then with a conductor of the largest cross-sectional area according to Table 4, the clamping screw(s) or nut(s) being tightened with the torque according to Table 5.

Where a screw has a hexagonal head with a slot for tightening with a screwdriver and the values of columns 3 and 5 are different, the test is made twice, first applying to the hexagonal head the torque specified in column 5 and then applying the torque specified in column 3 by means of a screwdriver. If the values of columns 3 and 5 are the same, only the test with the screwdriver is made.

For mantle terminals, the specified nominal diameter is that of the slotted stud.

The shape of the blade of the test screwdriver shall suit the head of the screw to be tested.

The screws and nuts shall be tightened in one smooth and continuous motion.

**Table 5 – Tightening torque for the verification
of the mechanical strength of screw-type terminals**

Nominal diameter of thread mm	Torque Nm					
	1	2	3	4	5	6
Up to and including 2,8	0,2	–	0,4	–	0,4	–
Over 2,8 up to and including 3,0	0,25	–	0,5	–	0,5	–
Over 3,0 up to and including 3,2	0,3	–	0,6	–	0,6	–
Over 3,2 up to and including 3,6	0,4	–	0,8	–	0,8	–
Over 3,6 up to and including 4,1	0,7	1,2	1,2	1,2	1,2	–
Over 4,1 up to and including 4,7	0,8	1,2	1,8	1,8	1,8	–
Over 4,7 up to and including 5,3	0,8	1,4	2,0	2,0	2,0	–
Over 5,3 up to and including 6,0	–	1,8	2,5	3,0	3,0	–
Over 6	–	–	–	–	–	0,8
Column 1 applies to screws without heads if the screw when tightened does not protrude from the hole, and to other screws which cannot be tightened by means of a screwdriver with a blade wider than the diameter of the screw. Column 2 applies to nuts of mantle terminals which are tightened by means of a screwdriver. Column 3 applies to other screws which are tightened by means of a screwdriver. Column 4 applies to nuts of mantle terminals in which the nut is tightened by means other than a screwdriver. Column 5 applies to screws or nuts, other than nuts of mantle terminals, which are tightened by means other than a screwdriver. Column 6 applies to nuts of switches with central hole fixing.						

The length of the test conductor shall be 75 mm longer than the height (H) specified in Table 6.

The end of the conductor is passed through an appropriate sized bushing in a platen positioned at a height (H) below the equipment as given in Table 6. The bushing shall be positioned in a horizontal plane such that its centre line describes a circle of 75 mm diameter, concentric with the centre of the clamping unit in the horizontal plane. The platen is then rotated at a rate of (10 ± 2) r/min.

The distance between the mouth of the clamping unit and the upper surface of the bushing shall be within ± 15 mm of the height of Table 6. The bushing may be lubricated to prevent binding, twisting, or rotation of the insulated conductor.

A mass as specified in Table 6 is to be suspended from the end of the conductor. The duration of the test shall be 15 min.

During the test, the rigid conductor, or any wire of rigid stranded or flexible conductor, shall neither slip out of the clamping unit nor break near the clamping unit, nor shall the conductor be damaged in such a way as to render it unfit for further use.

In the case of the flexible conductor, the breakage of a few wires shall not be taken into account provided it does not exceed 15 % of the original number of wires.

NOTE Z1 See Annex ZB for special national conditions.

Table 6 – Test values for flexion and pull out for copper conductors

Conductor cross-sectional area ^a mm ²	Diameter of bushing hole ^b mm	Height H ^c mm	Mass for conductor kg
0,5	6,5	260	0,3
0,75	6,5	260	0,4
1,0	6,5	260	0,4
1,5	6,5	260	0,4
2,5	9,5	280	0,7
4,0	9,5	280	0,9
6,0	9,5	280	1,4
10,0	9,5	280	2,0
16,0	13,0	300	2,9
25,0	13,0	300	4,5

^a Void

^b If the bushing hole diameter is not large enough to accommodate the conductor without binding, a bushing having the next larger hole size may be used.

^c Tolerance for height $H = \pm 15$ mm.

12.2.6 Terminals with screw clamping shall be so designed that they clamp the conductor reliably between metal surfaces.

Compliance is checked by inspection and by the following test:

Terminals suitable for rigid conductors only are checked with rigid solid conductors and on a new set of specimens with rigid stranded conductors, if existing.

NOTE 1 “if existing” means that the conductor is available in the market where the product is sold and installed.

Terminals suitable for rigid and flexible conductors are checked with rigid conductors as above and on a new set of specimens with flexible conductors.

The terminals are fitted first with conductors of the smallest and then with conductors of the largest cross-sectional area specified in Table 4, the terminal screws being tightened with a torque equal to two-thirds of the torque shown in the appropriate column of Table 5.

If the screw has a hexagonal head with a slot, the torque applied is equal to two-thirds of the torque shown in column 3 of Table 5.

The conductor is then subjected to a pull as specified in Table 7, applied without jerks, for 1 min, in the direction of the axis of the conductor space.

If the clamp is intended for two conductors, the appropriate pull is applied consecutively to each conductor.

Table 7 – Test values for pulling out test

Cross-section of conductors connected to the terminal mm ²	0,75	1	1,5	2,5	4	6	10	16	25
Pull N	30	35	40	50	50	60	80	90	100

During the test, the conductor shall not move noticeably in the terminal.

If the clamp is intended for connection of more than two conductors, reference is made for the testing to the requirements given in the appropriate part of IEC 60998.

NOTE 2 See Annex ZB for special national conditions.

12.2.7 Terminals with screw clamping shall be so designed or placed that neither a rigid solid conductor nor a wire of a stranded conductor can slip out while the clamping screws or nuts are tightened.

This requirement does not apply to lug terminals.

Compliance is checked by the following test:

Terminals suitable for rigid conductors only are checked with rigid solid conductors and on a new set of specimens with rigid stranded conductors, if existing.

NOTE “if existing” means that the conductor is available in the market where the product is sold and installed.

Terminals suitable for rigid and flexible conductors are checked with rigid conductors as above and on a new set of specimens with flexible conductors.

The terminals are fitted with conductors having the largest cross-sectional area specified in Table 4.

Terminals intended for the looping-in of two or three conductors are checked, fitted with the permissible number of conductors.

The terminals are fitted with conductors having the composition given in IEC 60228.

Before insertion into the clamping means of the terminal, wires of rigid (solid or stranded) conductors are straightened; rigid stranded conductors may, in addition, be twisted to restore them approximately to their original shape and flexible conductors are twisted in one direction so that there is a uniform twist of one complete turn in a length of approximately 20 mm.

The conductor is inserted into the clamping means of the terminal for the minimum distance prescribed or, where no distance is prescribed, until it just projects from the far side of the terminal and in the position most likely to allow the wire to escape.

The clamping screw(s) or nut(s) is (are) then tightened with a torque equal to two-thirds of the torque shown in the appropriate column of Table 5.

After the test, no wire of the conductors shall have escaped outside the clamping unit thus reducing creepage distances and clearances to values lower than those indicated in Table 23.

12.2.8 Terminals with screw clamping shall be so fixed or located within the switch that, when the clamping screws or nuts are tightened or loosened, the terminals shall not work loose from their fixing to the switch.

Movement of the terminal is allowed as long as it is sufficiently limited so as to prevent non-compliance with this document.

The use of sealing compound or resin is considered to be sufficient for preventing a terminal from working loose, provided that

- the sealing compound or resin is not subject to stress during normal use, and
- the effectiveness of the sealing compound or resin is not impaired by temperatures attained by the terminal under the most unfavourable conditions specified in this document.

Compliance is checked by inspection, by measurement and by the following test:

A solid rigid copper conductor of the largest cross-sectional area specified in Table 4 is placed in the terminal.

Screws and nuts are tightened and loosened five times by means of a suitable test screwdriver or spanner, the torque applied when tightening being equal to the torque shown in the appropriate column of Table 5 or in the table of the appropriate Figures 1 to 4, whichever is the highest.

The conductor is moved each time the screw or nut is loosened.

During the test, terminals shall not work loose and there shall be no damage, such as breakage of screws or damage to the heads, slots, threads, washers or stirrups that will impair the further use of the terminals.

12.2.9 Clamping screws or nuts of earthing terminals with screw clamping shall be adequately locked against accidental loosening and it shall not be possible to loosen them without the aid of a tool.

Compliance is checked by manual test.

In general, the designs of terminals shown in Figures 1, 2, 3, 4 and 5 provide sufficient resiliency to comply with this requirement; for other designs, special provisions, such as the use of an adequately resilient part which is not likely to be removed inadvertently, may be necessary.