

INTERNATIONAL STANDARD

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**Luminaires –
Part 1: General requirements and tests**

**Luminaires –
Partie 1: Exigences générales et essais**

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**Luminaires –
Part 1: General requirements and tests**

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Partie 1: Exigences générales et essais**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

XH

ICS 29.140.40

ISBN 978-2-8322-1553-1

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC 60598-1
Edition 8.0 2014-05

LUMINAIRES –

Part 1: General requirements and tests

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 34D, Luminaires, of IEC technical committee 34: Lamps and related equipment.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
34D/1197/ISH	34D/1207/RVD

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

INTRODUCTION (not part of the proposal)

Changes introduced in IEC 60598-1 Ed.8.0 were made urgently to address completely new designs of LED luminaire that are entering the market. Some further alignment with the already existing previous requirements of the standard are still needed and this will be addressed for Amendment 1 to Edition 8 that is now in preparation.

PROPOSAL

To publish Interpretation Sheet on Clause 4.31; Clause 10; Clause 11; Annex M and Annex X of IEC 60598-1:2014 (Ed. 8.0), *Luminaires – Part 1: General requirements and tests*, as follows:

INTERPRETATION SHEET

Clause 4.31; Clause 10; Clause 11; Annex M and Annex X of
IEC 60598-1:2014 (Ed. 8.0), *Luminaires – Part 1: General requirements and tests*

For insulation requirements between active (current carrying/live) parts and accessible parts, Table X.1 of Annex X is to be taken as the definitive reference of the required insulation that is to be provided. Furthermore, the details prescribed by Table X.1 are to be used as the basis for establishing the 'working voltage' that is to be considered for application of the electric strength tests of Clause 10 and Creepage and Clearance requirements of Clause 11.

Withdrawn

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LUMINAIRES –

Part 1: General requirements and tests

FOREWORD

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International Standard IEC 60598-1 has been prepared by subcommittee 34D: Luminaires, of IEC technical committee 34: Lamps and related equipment.

This eighth edition cancels and replaces the seventh edition published in 2008. This edition constitutes a technical revision and includes the following significant technical changes with respect to the previous edition:

- a) requirements to support the construction methods for new LED luminaires entering the market;
- b) photobiological requirements extended;
- c) more precise requirements for insulation between different types of electrical circuit;
- d) other general updates and improvements.

The major changes which may affect certification are given in Annex R.

Annex R shows where a new text has been included which contains more serious/critical requirements requiring products to be re-tested.

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

FDIS	Report on voting
34D/1110/FDIS	34D/1121/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.

NOTE In this standard, the following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

A list of all parts of the IEC 60598 series, under the general title: *Luminaires*, can be found on the IEC website.

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

The contents of the corrigenda 1 (October 2015), 2 (December 2015) and 3 (May 2017), and the interpretation sheet 1 (May 2016) have been included in this copy.

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.

LUMINAIRES –

Part 1: General requirements and tests

SECTION 0: GENERAL INTRODUCTION

0.1 Scope

This Part 1 of IEC 60598 specifies general requirements for luminaires, incorporating electric light sources for operation from supply voltages up to 1 000 V. The requirements and related tests of this standard cover: classification, marking, mechanical construction, electrical construction and photobiological safety.

Each section of this Part 1 is read in conjunction with this Section 0 and with other relevant sections to which reference is made.

Each part of IEC 60598-2 details requirements for a particular type of luminaire or group of luminaires on supply voltages not exceeding 1 000 V. These parts are published separately for ease of revision and additional sections will be added as and when a need for them is recognized.

The presentation of photometric data for luminaires is under consideration by the International Commission on Illumination (CIE) and is not, therefore, included in this Part 1.

Requirements are included in this Part 1 for luminaires incorporating ignitors with nominal peak values of the voltage pulse not exceeding those of Table 11.2. The requirements apply to luminaires with ignitors built into ballasts and to luminaires with ignitors separate from ballasts. For luminaires with ignitors built into lamps, the requirements are under consideration.

Requirements for semi-luminaires are included in this Part 1.

In general, this Part 1 covers safety requirements for luminaires. The object of this Part 1 is to provide a set of requirements and tests which are considered to be generally applicable to most types of luminaires and which can be called up as required by the detail specifications of IEC 60598-2. This Part 1 is thus not regarded as a specification in itself for any type of luminaire, and its provisions apply only to particular types of luminaires to the extent determined by the appropriate part of IEC 60598-2.

The parts of IEC 60598-2, in making reference to any of the sections of Part 1, specify the extent to which that section is applicable and the order in which the tests are to be performed; they also include additional requirements as necessary.

The order in which the sections of Part 1 are numbered has no particular significance as the order in which their provisions apply is determined for each type of luminaire or group of luminaires by the appropriate part of IEC 60598-2. All parts of IEC 60598-2 are self-contained and therefore do not contain references to other parts of IEC 60598-2.

Where the requirements of any of the sections of Part 1 are referred to in the parts of IEC 60598-2 by the phrase "The requirements of section... of IEC 60598-1 apply", this phrase is to be interpreted as meaning that all the requirements of that section of Part 1 apply except those which are clearly inapplicable to the particular type of luminaire covered by that part of IEC 60598-2.

For explosion proof luminaires, as covered by IEC 60079, the requirements of IEC 60598 (selecting the appropriate parts 2) are applied in addition to the requirements of IEC 60079. In the event of any conflict between IEC 60598 and IEC 60079, the requirements of IEC 60079 take priority.

Attention is drawn to lamp performance standards which contain "information for luminaire design"; this should be followed for proper lamp operation; however, this standard does not require the testing of lamp performance as part of the type test approval for luminaires.

Improvements in safety to take into account the state of the art technology are incorporated in the standards with revisions and amendments on an ongoing basis. Regional standardisation bodies may include statements in their derived standards to cover products which have complied with the previous document as shown by the manufacturer or standardization body. The statements may require that for such products, the previous standard may continue to apply to production until a defined date after which the new standard shall apply.

0.2 Normative references

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.

IEC 60061, *Lamp caps and holders together with gauges for the control of interchangeability and safety*

IEC 60061-2, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 2: Lampholders*

IEC 60061-3, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 3: Gauges*

IEC 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements*
Amendment 1:2005

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

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

IEC/TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60155, *Glow-starters for fluorescent lamps*

IEC 60227(all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60238, *Edison screw lampholders*

IEC 60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750 V*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

IEC 60357, *Tungsten halogen lamps (non-vehicle) – Performance specifications*

IEC 60360, *Standard method of measurement of lamp cap temperature rise*

IEC 60384-14, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60400, *Lampholders for tubular fluorescent lamps and starterholders*

IEC 60417, *Graphical symbols for use on equipment* Available at: <http://www.graphical-symbols.info/equipment>

IEC 60432-1, *Incandescent lamps – Safety specifications – Part 1: Tungsten filament lamps for domestic and similar general lighting purposes*

IEC 60432-2, *Incandescent lamps – Safety specifications – Part 2: Tungsten halogen lamps for domestic and similar general lighting purposes*

IEC 60432-3, *Incandescent lamps – Safety specifications – Part 3: Tungsten-halogen lamps (non-vehicle)*

IEC 60449:1973, *Voltage bands for electrical installations of buildings*
Amendment 1:1979

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60570:2003, *Electrical supply track systems for luminaires*

IEC 60598-2 (all parts), *Luminaires – Part 2: Particular requirements*

IEC 60598-2-4, *Luminaires – Part 2: Particular requirements – Section 4: Portable general purpose luminaires*

IEC 60662, *High-pressure sodium vapour lamps – Performance specifications*

IEC 60682, *Standard method of measuring the pinch temperature of quartz-tungsten-halogen lamps*

IEC 60684 (all parts), *Flexible insulating sleeving*

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

IEC 60695-11-5, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60838 (all parts), *Miscellaneous lampholders*

IEC 60989, *Separating transformers, autotransformers, variable transformers and reactors*

IEC 60990:1999, *Methods of measurement of touch current and protective conductor current*

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

IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*

IEC 61167, *Metal halide lamps – Performance specification*

IEC 61184, *Bayonet lampholders*

IEC 61199, *Single-capped fluorescent lamps – Safety specifications*

IEC 61249 (all parts), *Materials for printed boards and other interconnecting structures*

IEC 61347 (all parts), *Lamp controlgear*

IEC 61347-1, *Lamp controlgear – Part 1: General and safety requirements*

IEC 61347-2-9, *Lamp controlgear – Part 2-9: Particular requirements for electromagnetic controlgear for discharge lamps (excluding fluorescent lamps)*

IEC 61558 (all parts), *Safety of power transformers, power supplies, reactors and similar products*

IEC 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 61558-2 (all parts), *Safety of power transformers, power supplies, reactors and similar products – Part 2: Particular requirements and tests*

IEC 61558-2-5, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-5: Particular requirements and test for transformer for shavers, power supply units for shavers and shaver supply units*

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*

IEC 61643-11, *Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – requirements and tests*

IEC 62031, *LED modules for general lighting – Safety specifications*

IEC 62035, *Discharge lamps (excluding fluorescent lamps) – Safety specifications*

IEC/TR 62778, *Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires*

IEC 80416-1, *Basic principles for graphical symbols for use on equipment* –
Part 1: Creation of symbol originals

0.3 General requirements

0.3.1 Luminaires shall be so designed and constructed that in normal use they function safely and cause no danger to persons or surroundings. In general, compliance is checked by carrying out all the tests specified.

0.3.2 A luminaire shall comply with a part of IEC 60598-2. If, however, an appropriate part of IEC 60598-2 does not exist for a particular luminaire or group of luminaires, the nearest applicable part of IEC 60598-2 may be used as a guide to the requirements and tests.

Where the design of a luminaire is such that two or more parts of IEC 60598-2 are applicable, the luminaire shall comply with both or all of the appropriate sections.

0.3.3 Semi-luminaires should be regarded as luminaires for test purposes.

0.4 General test requirements and verification

0.4.1 Tests according to this standard are type tests. For the definition of a "type test", see Section 1 of this Part 1.

The requirements and tolerances permitted by this standard are related to testing of a type test sample submitted for that purpose. Compliance of the type test sample does not ensure compliance of the whole production of a manufacturer. Compliance for production is the responsibility of the manufacturer and may include routine tests and quality assurance in addition to type testing.

0.4.2 Except where otherwise specified in the sections of Part 1 or Part 2, luminaires shall be tested as delivered, and installed as for normal use, in an ambient temperature of between 10 °C and 30 °C, having regard to the manufacturer's installation instructions. The lamp (or lamps) is (are) not included except where essential for the test.

Luminaires cannot be regarded as meeting the requirements of this Part 1 unless all internal wiring is complete.

In general, the tests are made on a single sample luminaire or, where a range of similar luminaires is involved, on a single luminaire of each rated wattage in the range or on a representative selection from the range as agreed with the manufacturer (see Annex S). This selection shall include the luminaire, together with any attachments, which represents the most unfavourable combination from a testing point of view.

In accordance with IEC guidelines, new IEC standards are divided into those covering either safety or performance. In the lamp safety standards, "information for luminaire design" is given for the safe operation of lamps; this shall be regarded as normative when testing luminaires to this standard.

Each sample luminaire shall comply with all the relevant tests. In order to reduce the time of testing and to allow for any tests which may be destructive, the manufacturer may submit additional luminaires or parts of luminaires provided that these are of the same materials and design as the original luminaire and that the results of the test are the same as if carried out on an identical luminaire. Where the test for compliance is shown as being "by inspection", this shall include any necessary handling.

For track-mounted luminaires the manufacturer shall provide, together with the luminaire, a sample of the appropriate track, connector and adaptors for the luminaire to be connected.

Combination luminaires are tested for safety requirements with that assemblage of parts which gives the most unfavourable result.

Certain parts of luminaires, such as joints, raising and lowering devices, may be tested separately provided that the design of these parts is such that their performance is not dependent upon the other parts of the luminaires.

Luminaires intended to be used with supply cords are tested with the flexible supply cord connected to the luminaire.

For luminaires intended to be used with a shade, but not normally supplied with a shade, the manufacturer shall provide a shade, typical of the type that might be used with the luminaire.

0.4.3 Verification and tests

Luminaires for testing to the requirements of this standard may have earlier test reports updated in accordance with this standard by submitting a new sample for test together with the previous test reports.

Full type testing need not generally be necessary and the product and the previous test results shall be reviewed only against any amended clauses marked "R" and scheduled in Annex R.

NOTE Clauses marked "R" and scheduled in Annex R will be included in future amendments/editions.

0.5 Components of luminaires

0.5.1 Components, other than integral components, shall comply with the requirements of the relevant IEC standards, if any.

Components which comply with the requirements of the relevant IEC standard and marked with individual ratings are checked to establish that they suit the conditions which may occur in use. Aspects of use not covered by the respective standard shall require them to satisfy the additional relevant requirements of this standard.

Compliance is checked by inspection and the relevant tests.

Integral components shall comply as far as is reasonable with the IEC component standards, as part of the luminaire.

NOTE 1 This does not imply that components need to be separately tested before approval of the luminaire.

NOTE 2 Guidance for selection of components in different kinds of luminaires can be found in Annex L.

Internal wiring of a luminaire shall comply with the requirements in 5.3.

NOTE 3 This does not exclude the use of standardized cables.

0.5.2 Components complying with the requirements of their own standard and used in accordance with their intended use, shall only be tested to the requirements of this standard where there are no requirements in the component standard (covering the requirement heading of this standard).

A valid test report is considered adequate to show compliance.

Lampholders and starterholders shall additionally comply with the gauging and interchangeability requirements of the appropriate IEC component standard where applicable after building into the luminaire.

For terminal blocks with an integrated screwless earthing contact for direct connection to the luminaire or to parts of the body, special requirements apply according to Annex V.

0.5.3 Components for which no appropriate IEC standard exists shall satisfy the relevant requirements of this luminaire standard as part of the luminaire. Lampholders and starterholders shall additionally comply with the gauging and interchangeability requirements of the appropriate IEC component standard where applicable.

NOTE Examples of components are lampholders, switches, transformers, ballasts, flexible cables and cords and plugs.

0.5.4 Compliance with this standard can only be assured if protective shields of identical specification are used.

0.6 List of parts of IEC 60598-2

- Part 2-1 Fixed general purpose luminaires
- Part 2-2 Recessed luminaires
- Part 2-3 Luminaires for road and street lighting
- Part 2-4 Portable general purpose luminaires
- Part 2-5 Floodlights
- Part 2-6 Luminaires with built-in transformers for tungsten filament lamps (See Note.)
- Part 2-7 Portable luminaires for garden use
- Part 2-8 Handlamps
- Part 2-9 Photo and film luminaires (non-professional)
- Part 2-10 Portable luminaires for children
- Part 2-11 Aquarium luminaires
- Part 2-12 Mains socket-outlet mounted nightlights
- Part 2-13 Ground recessed luminaires
- Part 2-14 Luminaires for cold cathode tubular discharge lamps (neon tubes) and similar equipment
- Part 2-15 Not used at present
- Part 2-16 Not used at present
- Part 2-17 Luminaires for stage lighting, television and film studios (outdoor and indoor)
- Part 2-18 Luminaires for swimming-pools and similar applications
- Part 2-19 Air-handling luminaires (safety requirements)
- Part 2-20 Lighting chains
- Part 2-21 Sealed lighting chains¹
- Part 2-22 Luminaires for emergency lighting
- Part 2-23 Extra low voltage lighting systems for filament lamps
- Part 2-24 Luminaires with limited surface temperatures
- Part 2-25 Luminaires for use in clinical areas of hospitals and health care buildings

NOTE In this edition of IEC 60598-1 all requirements listed in IEC 60598-2-6 have been incorporated. As a consequence, IEC 60598-2-6 will be withdrawn after publication of this standard. For this reason, compliance to IEC 60598-2-6 for luminaire with built-in transformer or controlgear, is not required when tested according to this edition of IEC 60598-1.

¹ To be published.

SECTION 1: TERMS AND DEFINITIONS

1.1 General

This section gives general definitions applicable to luminaires.

1.2 Terms and definitions

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

NOTE 1 Other definitions related to lamps are to be found in the relevant lamp standards.

NOTE 2 Where the terms "voltage" and "current" are used, they imply the r.m.s. values unless otherwise stated.

1.2.1

luminaire

apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes all the parts necessary for supporting, fixing and protecting the lamps, but not the lamps themselves, and where necessary, circuit auxiliaries together with the means for connecting them to the supply

Note 1 to entry: A luminaire with integral non-replaceable lamps is regarded as a luminaire, except that the tests are not applied to the integral lamp or integral self ballasted lamp.

1.2.2

main part of luminaire

that which is fixed to the mounting surface or is directly suspended from it or standing on it (it may or may not carry the lamps, lampholders and auxiliary gear)

Note 1 to entry: In luminaires for tungsten filament lamps, the part carrying the lampholder is normally the main part.

1.2.3

ordinary luminaire

luminaire providing protection against accidental contact with live parts but without any other special protection against dust, solid objects or moisture

1.2.4

general purpose luminaire

luminaire which is not designed for a special purpose

Note 1 to entry: Examples of general purpose luminaires include pendants, some spotlights and certain fixed luminaires for surface or recessed mounting. Examples of special purpose luminaires are those for rough usage, photo and film applications and swimming-pools.

1.2.5

adjustable luminaire

luminaire, the main part of which can be turned or moved by means of joints, raising and lowering devices, telescopic tubes or similar devices

Note 1 to entry: An adjustable luminaire may be fixed or portable.

1.2.6

basic luminaire

smallest number of assembled parts that can satisfy the requirements of any of the parts of IEC 60598-2

1.2.7**combination luminaire**

luminaire consisting of a basic luminaire in combination with one or more parts which may be replaced by other parts, or used in a different combination with other parts and changed either by hand or with the use of tools

1.2.8**fixed luminaire**

luminaire which cannot easily be moved from one place to another, either because the fixing is such that the luminaire can only be removed with the aid of a tool, or because it is intended for use out of arms reach

Note 1 to entry: In general, fixed luminaires are designed for permanent connection to the supply, but connection may also be made by means of a plug or similar device.

1.2.9**portable luminaire**

luminaire which, in normal use, can be moved from one place to another while connected to the supply

Note 1 to entry: Luminaires for wall mounting provided with a supply cord for connection to a plug and luminaires which may be fixed to their support by means of a wing screw, a clip or a hook so that they can easily be removed from their support by hand, are considered to be portable luminaires.

1.2.10**recessed luminaire**

luminaire intended by the manufacturer to be fully or partly recessed into a mounting surface

Note 1 to entry: The term applies both to luminaires for operation in enclosed cavities and to luminaires for mounting through a surface such as a suspended ceiling.

1.2.11**rated voltage**

supply voltage or voltages assigned to the luminaire by the manufacturer

1.2.12**supply current**

current at the supply terminals when the luminaire has stabilized in normal use at the rated voltage and frequency

1.2.13**rated wattage**

number and rated wattage of the lamps for which the luminaire is designed

1.2.14**supply cord**

external flexible cable or cord, for supply purposes, that is fixed to the luminaire

Note 1 to entry: Luminaires may be provided with the supply cord or designed for attachment of a supply cord e.g. type X or Y attachment.

Note 2 to entry: It is the intention to amend each Part 2 of the standard to align with this modification; however, this will be done when each Part 2 is amended for other reasons. In the meantime, therefore, wherever a Part 2 makes reference to a "non-detachable flexible cable or cord" read "supply cord".

1.2.15**live part**

conductive part which may cause an electric shock in normal use. The neutral conductor is, however, regarded as a live part.

Note 1 to entry: The test to determine whether or not a conductive part is a live part which may cause an electric shock is given in Annex A.

1.2.16

basic insulation

insulation applied to live parts to provide basic protection against electric shock

Note 1 to entry: Basic insulation does not necessarily include insulation used exclusively for functional purposes.

1.2.17

supplementary insulation

independent insulation applied in addition to basic insulation in order to provide protection against electric shock in the event of a failure of basic insulation

1.2.18

double insulation

insulation comprising both basic insulation and supplementary insulation

1.2.19

reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation

Note 1 to entry: The term "insulation system" does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

1.2.20

protective impedance device

component or assembly of components used to bridge double or reinforced insulation and the impedance and construction of which are such as to ensure that steady state touch current and charge are limited to a non-hazardous level

1.2.21

class 0 luminaire (applicable to ordinary luminaires only)

luminaire in which protection against electric shock relies upon basic insulation

This implies that there are no means for the connection of accessible conductive parts, if any, to the protective conductor in the fixed wiring of the installation, reliance in the event of a failure of the basic insulation being placed on the environment. For the application of Class 0, see Annex T for reference to test requirements.

Note 1 to entry: Class 0 luminaires may have either an enclosure of insulating material which forms a part or the whole of the basic insulation or a metal enclosure which is separated from live parts by at least basic insulation.

Note 2 to entry: If a luminaire with an enclosure of insulating material has provision for earthing internal parts, it is class I.

Note 3 to entry: Class 0 luminaires may have parts with double insulation or reinforced insulation.

Note 4 to entry: In Japan, Class 0 is applicable only to ordinary luminaires for use with a supply voltage from 100 V to 127 V.

1.2.22

class I luminaire

luminaire in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation

Note 1 to entry: For a luminaire intended for use with a flexible cord or cable, this provision includes a protective conductor as part of the flexible cord or cable.

Note 2 to entry: Class I luminaires may have parts with double insulation or reinforced insulation.

Note 3 to entry: Class I luminaires may have parts in which protection against electric shock relies on operation at safety extra-low voltage (SELV).

1.2.23

class II luminaire

luminaire in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions such as double insulation or reinforced insulation are provided, there being no provision for protective earthing or reliance upon installation conditions

Note 1 to entry: Such a luminaire may be of one of the following types:

- a) A luminaire having a durable and substantially continuous enclosure of insulating material which envelopes all metal parts with the exception of small parts such as nameplates, screws and rivets which are isolated from live parts by insulation at least equivalent to reinforced insulation. Such a luminaire is called an insulation encased class II luminaire.
- b) A luminaire having a substantially continuous enclosure of metal, insulated from live parts by insulation at least equivalent to double or reinforced insulation. Such a luminaire is called a metal-encased class II luminaire.
- c) A luminaire which is a combination of types a) and b) above.

Note 2 to entry: The enclosure of an insulation-encased class II luminaire may form a part or the whole of the supplementary insulation or the reinforced insulation.

Note 3 to entry: If earthing is provided to assist starting or for EMC reasons, but is not connected to an accessible metal part, the luminaire may still be deemed to be of class II. Accessible metal parts in compliance with the appropriate IEC lamp specification and other metal parts not normally earthed and not normally accessible during normal use are not regarded to be conductive parts which may cause an electric shock unless the tests of Annex A show them to be live parts.

Note 4 to entry: If a luminaire with double insulation and/or reinforced insulation throughout has a protective earthing terminal or a protective earthing contact, it is class I construction. However, a fixed class II luminaire may have an internal terminal or contact for maintaining the electrical continuity (e.g. for looping in or through wiring) of an earthing conductor, provided that the terminal is insulated from accessible metal parts by class II insulation.

Note 5 to entry: Class II luminaires may have parts in which protection against electric shock relies on operation at safety extra-low voltage (SELV).

1.2.24

class III luminaire

luminaire in which protection against electric shock relies on supply at safety extra-low voltage (SELV) and in which voltages higher than those of SELV are not generated

1.2.25

rated maximum ambient temperature

t_a

temperature assigned to a luminaire by the manufacturer to indicate the highest sustained temperature in which the luminaire may be operated under normal conditions

Note 1 to entry: This does not preclude temporary operation at a temperature not exceeding $(t_a + 10) ^\circ\text{C}$.

1.2.26

rated maximum operating temperature of the case of a controlgear or capacitor

t_c

highest permissible temperature which may occur on the outer surface (at the indicated place if marked) of the component under normal operating conditions at the rated voltage or maximum of the rated voltage range

1.2.27

rated maximum operating temperature of a lamp controlgear winding

t_w

winding temperature assigned by the manufacturer as the highest temperature at which 50/60 Hz lamp controlgear may be expected to have a service life of at least 10 years continuous operation

1.2.28

ballast

unit inserted between the supply and one or more discharge lamps which by means of inductance, capacitance or resistance, single or in combination, serves mainly to limit the current of the lamp(s) to the required value

It may also include means for transforming from the supply voltage and arrangements which help to provide starting voltage and preheating current, prevent cold starting, reduce stroboscopic effect, correct the power factor and suppress radio interference.

1.2.29

independent lamp controlgear

lamp control gear consisting of one or more separate elements so designed that it, or they, can be mounted separately outside a luminaire with protection according to the marking on the lamp control gear and without any additional enclosure

1.2.30

built-in lamp controlgear

lamp controlgear designed to be built into a luminaire and not intended to be mounted outside a luminaire without special precautions

1.2.31

integral lampholder

part of a luminaire which supports the lamp and provides electrical contact with it and which is designed as part of the luminaire

1.2.32

(Not used at present)

1.2.33

translucent cover

light-transmitting parts of the luminaire which may also protect the lamps and other component parts including diffusers, lens panels and similar light-control elements

1.2.34

fixed wiring

cable which is part of the fixed installation to which the luminaire is connected

Note 1 to entry: Fixed wiring may be brought into the luminaire and connected to terminals, including terminals of lampholders, switches and the like.

1.2.35

appliance coupler

means enabling a flexible cable to be connected at will to the luminaire consisting of two parts: a connector provided with contact tubes which is the part integral with or designed to be attached to the flexible cable connected to the supply and an appliance inlet, provided with contact pins, which is the part incorporated in or fixed to the luminaire

1.2.36

external wiring

wiring generally outside the luminaire but delivered with it

Note 1 to entry: External wiring may be used for connecting the luminaire to the supply, to other luminaires, or to any external ballast.

Note 2 to entry: External wiring is not necessarily outside the luminaire for its full length.

1.2.37**internal wiring**

wiring generally inside the luminaire and delivered with it, which forms the connection between terminations for external wiring or supply cords and terminations of lampholders, switches and similar components

Note 1 to entry: Internal wiring is not necessarily inside the luminaire for its full length.

1.2.38**normally flammable material**

material having an ignition temperature of at least 200 °C and which will not deform or weaken at this temperature

EXAMPLE: Wood and materials based on wood of more than 2 mm thickness.

Note 1 to entry: The ignition temperature and the resistance of normally flammable materials to deformation or weakening are based on widely accepted values determined during a test period of 15 min.

1.2.39**readily flammable material**

material which cannot be classified as either normally flammable or non-combustible

EXAMPLE: Wood fibre and materials based on wood of up to 2 mm thickness

1.2.40**non-combustible material**

material incapable of supporting combustion

Note 1 to entry: For the purpose of this standard, materials such as metal, plaster and concrete are regarded as non-combustible materials.

1.2.41**flammable material**

material which does not comply with the glow-wire test requirements of 13.3.2.

1.2.42**ELV****extra low voltage**

voltage which does not exceed 50 V a.c. r.m.s. or 120 V ripple free d.c. between conductors, or between any conductor and earth (voltage band I of IEC 60449)

Note 1 to entry: "Ripple free" is conventionally defined for sinusoidal ripple voltage as a ripple content of not more than 10 % r.m.s.: the maximum peak value does not exceed 140 V for a nominal 120 V ripple-free d.c. system, respectively 70 V for a nominal 60 V ripple-free d.c. system, and 35 V for a nominal 30 V ripple-free system.

1.2.42.1**FELV****functional extra low voltage**

ELV in a circuit having ELV voltage for functional reason and not fulfilling the requirements for SELV (or PELV)

1.2.42.2**SELV****safety extra low voltage**

ELV in a circuit which is insulated from the mains supply by an insulation not less than that between the primary and secondary circuits of a safety isolating transformer according to IEC 61558-2-6 or equivalent

Note 1 to entry: Maximum voltage lower than 50 V a.c. r.m.s. or 120 V ripple free d.c. may be specified in particular requirements, especially when direct contact with current-carrying parts is allowed.

1.2.43

working voltage

highest r.m.s. voltage which may occur across any insulation at rated supply volts, transients being neglected, in open-circuit conditions or during normal operation

1.2.44

type test

test or series of tests made on a type test sample, for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard

1.2.45

type test sample

sample consisting of one or more similar units submitted by the manufacturer or the responsible vendor for the purpose of a type test

1.2.46

by hand

not requiring the use of a tool

1.2.47

terminal

that part of a luminaire or component which is necessary to make electrical connection to a conductor

Note 1 to entry: See Sections 14 and 15.

1.2.48

looping-in

system of mains supply connection to two or more luminaires where each supply conductor is taken into and out of the same terminal

Note 1 to entry: A supply conductor may be cut to facilitate connections to a terminal (see Figure 20).

1.2.49

through wiring

wiring which passes through the luminaire intended for interconnection of a row of luminaires

Note 1 to entry: Some countries do not permit joints in through wiring.

Note 2 to entry: The luminaire may or may not be electrically connected to the through wiring (see Figure 20).

1.2.50

starting device

apparatus that, by itself or in combination with other components in the circuit, provides the appropriate electrical conditions to start a discharge type of lamp

1.2.51

starter

starting device, usually for fluorescent lamps, that provides for the necessary preheating of the electrodes and in combination with the series impedance of the ballast, causes a surge in the voltage applied to the lamp

1.2.52

ignitor

starting device that generates voltage pulses to start a discharge lamp and that does not provide for preheating of electrodes

1.2.53**terminal block**

assembly of one or more terminals in or on a housing or body of insulating material to facilitate interconnection between conductors

1.2.54**rough service luminaire**

luminaire designed to withstand severe mechanical handling

Note 1 to entry: The luminaire may:

- be permanently fixed, or
- be temporarily fixed on a construction or stand, or
- incorporate an integral stand or handle.

Note 2 to entry: Such luminaires are for use where normally rough circumstances occur, or where temporary lighting is required, for example on building sites, engineering workshops and similar applications.

1.2.55**electro-mechanical contact system**

connection system within a luminaire by which the main part carrying the lampholder is electrically and mechanically connected to the base plate or suspension device

SEE: Figure 31 describes an electro-mechanical contact system as defined in 1.2.55. As such the requirements of 4.11.6 and 7.2.1 apply. Because, in the situation described, the base and gear tray are unique and non-interchangeable, the base plate does not require marking with the rated current of the electrical connection, as specified in 3.2.

Note 1 to entry: The system can incorporate an adjusting device.

Note 2 to entry: The system can be dedicated to a specific luminaire design or can provide for connection of a variety of luminaire types.

1.2.56

(Not used at present)

1.2.57**mounting surface**

part of any building, furniture or other structure which a luminaire may in any way be attached to, suspended from, stood on or placed upon in normal use and which will or is intended to support the luminaire

1.2.58**integral component**

component which forms a non-replaceable part of a luminaire and which cannot be tested separately from the luminaire

1.2.59**self-ballasted lamps**

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

Note 1 to entry: The light source component of a self-ballasted lamp is not replaceable.

Note 2 to entry: The ballast component is part of the self-ballasted lamp; it is not part of the luminaire. It is discarded at the end of the life of the unit.

Note 3 to entry: For test purposes, self-ballasted lamp units should be regarded as conventional lamps.

Note 4 to entry: For examples and further information, see IEC 60972.

1.2.60
semi-luminaire

unit similar to a self-ballasted lamp but designed to utilize a replaceable light source and/or starting device

Note 1 to entry: The light source component and/or starting device of a semi luminaire is readily replaceable.

Note 2 to entry: The ballast component is not replaceable and is not disposed of each time a light source is replaced.

Note 3 to entry: A lampholder is required for a supply connection.

Note 4 to entry: For examples and further information, see IEC 60972.

1.2.61
plug-ballast/transformer

ballast or transformer incorporated in an enclosure provided with an integral plug as the means of connection to the electrical supply

1.2.62
mains socket-outlet-mounted luminaire

luminaire provided with an integral plug as the means of both mounting and connection to the electrical supply

1.2.63
clip-mounted luminaire

integral assembly of a luminaire and resilient spring clip, securing the luminaire in position on its mounting surface by a single hand action

1.2.64
lamp connectors

set of contacts specially designed to provide a means of electrical contact but not to support the lamp

1.2.65
mains socket-outlet

accessory having socket-contacts designed to engage with the pins or blades of a mains plug and having terminals for the connection of cables or cords

1.2.66
(Not used at present)

1.2.67
(Not used at present)

1.2.68
lamp controlgear

devices employed for the control of lamps, for example ballasts, transformers and step-down convertors

Note 1 to entry: The definition does not include devices for the switching of lamps or the control of brightness such as dimmers and daylight sensors.

1.2.69
(Not used at present)

1.2.70
dummy lamp

device incorporating a cap which is in compliance with the requirements of IEC 60061 where applicable

1.2.71**self-shielded lamp**

tungsten halogen lamp or metal halide lamp for which the luminaire needs no protective shield for protection against UV emission or lamp shattering

1.2.72**external flexible cable or cord**

flexible cable or cord for external connection to the input or output circuit, fixed to or assembled with, the luminaire according to one of the following methods of attachment:

1.2.72.1**type X attachment**

method of attachment of the cable or cord such that it can be easily replaced

Note 1 to entry: The flexible cable or cord may be specially prepared and only available from the manufacturer or his service agent.

Note 2 to entry: A specially prepared cable or cord may also include a part of the luminaire.

1.2.72.2**type Y attachment**

method of attachment of the cable or cord such that any replacement can only be made by the manufacturer, his service agent or similarly qualified person

Note 1 to entry: Type Y attachment may be used either with an ordinary or a special flexible cable or cord.

1.2.72.3**type Z attachment**

method of attachment of the cable or cord such that it cannot be replaced without breaking or destroying the luminaire

1.2.73**functional earthing**

earthing of a point in a system or in an installation or in equipment, which is necessary for the proper function, but does not form part of the protection against electric shock

1.2.74**inter-connecting cable**

wiring or wiring assembly between two main parts of a luminaire as supplied by the luminaire manufacturer and which can be regarded as being part of the luminaire

Note 1 to entry: A wiring assembly may contain a combination of different wiring, e.g. to feed through the supply voltage, to provide earthing, to supply starting and working voltages and wiring providing functional connection. Examples of applications are: between a luminaire and a control gear box, a mounting box or a connector fitting to a track system.

1.2.75**ferrule**

mechanical fixture, generally a rigid tube, used to confine the stripped end of a cable

1.2.76**impulse withstand category****overvoltage category**

numeral defining a transient overvoltage condition

Note 1 to entry: Impulse withstand categories I, II, III and IV are used.

Note 2 to entry: The following explanation is taken from IEC 60364-4-443 (withdrawn).

a) Purpose of classification of impulse withstand categories

Impulse withstand categories are to distinguish different degrees of availability of equipment with regard to required expectations on continuity of service and on an acceptable risk of failure.

By selection of impulse withstand levels of equipment insulation, coordination can be achieved in the whole installation reducing the risk of failure to an acceptable level providing a basis for overvoltage control.

A higher characteristic numeral of an impulse withstand category indicates a higher specific impulse withstand of the equipment and offers a wider choice of methods for overvoltage control.

The concept of impulse withstand categories is used for equipment energized directly from the mains.

b) Description of impulse withstand categories

Equipment of impulse withstand category I is equipment which is intended to be connected to the fixed electrical installations of buildings. Protective means are taken outside the equipment – either in the fixed installation or between the fixed installation and the equipment – to limit transient overvoltages to the specific level.

Equipment of impulse withstand category II is equipment to be connected to the fixed electrical installations of buildings.

Equipment of impulse withstand category III is equipment which is part of the fixed electrical installations and other equipment where a higher degree of availability is expected.

Equipment of impulse withstand category IV is for use at or in the proximity of the origin of the electrical installations of buildings upstream of the main distribution board.

1.2.77 circuits and circuit characteristics

1.2.77.1 primary circuit

circuit which is directly connected to the a.c. mains supply

Note 1 to entry: It includes, for example, the means for connection to the a.c. mains supply, the primary windings of transformers, motors and other loading devices

[SOURCE: IEC 60950-1:2005, 1.2.8.4, modified — Additional information has been transferred to a note to entry and the existing note has been deleted]

1.2.77.2 secondary circuit

circuit which has no direct connection to a primary circuit and derives its power from a transformer, converter or equivalent device, or from a battery

Note 1 to entry: In autotransformers, although having direct connection to a primary circuit, the tapped part of the transformer is also deemed to be a secondary circuit in the above sense.

Note 2 to entry: Mains transients in such a circuit are attenuated by the corresponding primary windings. Inductive ballasts also reduce the mains transient voltage height. Therefore, components located after a primary circuit or after an inductive ballast can be suited for an impulse withstand category of one step lower, see Annex U.

[SOURCE: IEC 60950-1:2005, 1.2.8.5, modified — Two new notes to entry have been added replacing the existing note]

1.2.78 touch current

electric current passing through a human body or through an animal body when it touches one or more accessible parts of an installation or equipment

Note 1 to entry: In this standard, the human body is represented by the networks in Figures G.2 or G.3.

[SOURCE: IEC 60050-826:2004, 826.05.21, modified — The word "electrical" has been deleted from "electrical installation or electrical equipment" and a note to entry has been added.]

1.2.79**protective conductor current**

current which flows in a protective conductor

Note 1 to entry: This current may have an influence on the operation of RCD's (residual current protection devices) connected in the same circuit.

1.2.80**electric burn**

burning of the skin or of an organ, caused by passing an electric current across or through the surface

[SOURCE: IEC 60050-604:1987, 604.04.18]

1.2.81**means of adjustment**

part of a luminaire, which may be the lamp compartment, obviously intended to be manipulated by the user during use of the luminaire, e.g. to redirect the light beam

1.2.82**arms reach**

zone of accessibility to touch extending from any point on a surface where persons usually stand or move about to the limits which a person can reach with the hand, in any direction, without assistance

Note 1 to entry: IEC 60364-4-41 incorporates a drawing representing the zone of accessibility. In general terms, the height being 2,5 m from the floor, and the width being 1,25 m in all horizontal directions from the locations a person may be.

[SOURCE: IEC 60050-195:1998, 195.06.12]

1.2.83**terminal block with integrated screwless earthing contact**

terminal with earthing connection performed by means of an integrated contact or by means of an auxiliary contact without additional assembly actions (e.g. screwing) when fitted

1.2.84**detachable cord**

flexible cable or cord, for supply or interconnection, intended to be connected to the luminaire by means of a suitable appliance connector

Note 1 to entry: A detachable cord is considered to be easily replaceable.

1.2.85**tool**

screwdriver, coin or other object that may be used to operate a screw or similar fixing means

1.2.86**specially prepared cord**

flexible cable or cord the replacement of which with another non-special cable or cord would create a hazard or diminish safety

1.2.87**settable luminaire**

fixed luminaire, the main part of which can be turned or moved by means of joints, raising and lowering devices, telescopic tubes or similar devices, but which has a locking device (or devices) operated by a tool and is not intended to be adjusted during use

1.2.88

light source

lamp, provided with a lamp-cap, or module (LED) or other light source made in order to produce an optical visible radiation to be used or incorporated into the luminaire

1.2.88.1

replaceable light source

lamp, provided with a lamp-cap according to IEC 60061, or light source designed to be connected by terminals, connector or similar devices and designed to be replaced during normal use or during maintenance of the luminaire

EXAMPLE: All kinds of lamps provided with lamp caps.

Note 1 to entry: Built-in LED module according to the IEC 62031 are normally considered as replaceable light source unless the requirements for non replaceable or non-user replaceable light sources are fulfilled.

1.2.88.2

non replaceable light source

light source which is a non replaceable part of the luminaire either because it cannot be replaced without breaking or destroying the luminaire or because it is enclosed under a cover fixed by screw or similar fixing means designed to be used only once and which is not possible to be opened

1.2.88.3

non-user replaceable light source

light source which can only be replaced by the manufacturer, his service agent, or similar qualified person

1.2.89

controllable luminaire

luminaire having a control terminal for the purpose of controlgear information exchange and/or setting of controlgear functions

1.2.90

control terminal

control terminal connections, other than power supply terminals to the electronic controlgear, which are used to exchange information with the controlgear

Note 1 to entry: The power supply terminals can also be used to exchange information with the controlgear.

1.2.91

LV supply

circuits, wiring or part of them connected to the Low Voltage (LV) public distribution network; the voltage of these circuits correspond to the voltage band II of IEC 60449

EXAMPLE: 230 V distribution network

Note 1 to entry: SELV and FELV are not included in the definition given here for a LV supply

Note 2 to entry: High Voltage (HV) supply corresponding to band III of IEC 60449 is not included in the definition given here for an LV supply.

SECTION 2: CLASSIFICATION OF LUMINAIRES

2.1 General

This section describes the classification of luminaires.

Luminaires are classified according to the type of protection against electric shock, the degree of protection against ingress of dust, solid objects and moisture, the material of the supporting surface and the circumstances of use.

2.2 Classification according to type of protection against electric shock

Luminaires shall be classified according to the type of protection against electric shock provided, as class I, class II or class III (see definitions in Section 1).

Luminaires shall have only a single classification. For example, for a luminaire with a built-in extra-low voltage transformer with provision for earthing, the luminaire shall be classified as class I and no part of the luminaire shall be classified as class III even though the lamp compartment is separated by a barrier from the transformer compartment.

Semi-luminaires shall comply with all relevant requirements for class II luminaires without being provided with the class II symbol.

Unless a luminaire has been specifically designed for use with semi-luminaires, the luminaire manufacturer is not responsible for continued IEC 60598 conformity in the situation where the user has replaced specified lamp types with semi-luminaires. The semi-luminaire manufacturer has a responsibility to provide information with respect to limitations of use.

NOTE The class II symbol is omitted in order to avoid the symbol being applied to the complete luminaire in which the semi-luminaire is used.

2.3 Classification according to degree of protection against ingress of dust, solid objects and moisture

Luminaires shall be classified in accordance with the "IP number" system of classification described in IEC 60529.

Tests for the degrees of protection are given in Section 9.

NOTE Luminaires classified as watertight are not necessarily suitable for operation under water. Pressure watertight luminaires can be used for such applications.

2.4 Classification according to material of supporting surface for which the luminaire is designed

Luminaires shall be classified according to whether they are suitable for direct mounting on normally flammable surfaces or are only suitable for mounting on non-combustible surfaces as follows:

Classification

- Luminaires suitable for direct mounting on normally flammable surfaces
- Luminaires not suitable for direct mounting on normally flammable surfaces

Symbol

No symbol required

The relevant symbol –
see Figure 1

NOTE Readily flammable surfaces are not suitable for the direct mounting of luminaires. Requirements for luminaires classified as primarily intended for direct mounting on normally flammable surfaces are given in Section 4 and related tests in Section 12.

2.5 Classification according to the circumstances of use

Luminaires shall be classified according to whether they are intended for normal use or for rough service.

Classification	Symbol
– Luminaires for normal use	No symbol
– Luminaires for rough service	Symbol – see Figure 1

SECTION 3: MARKING

3.1 General

This section specifies the information to be marked on luminaires or given by instruction.

Any written instructions related to safety shall be in a language which is acceptable in the country in which the equipment is to be installed.

3.2 Marking on luminaires

The following information shall be distinctly and durably marked on the luminaire (see Table 3.1).

- Marking to be observed when replacing lamps or other replaceable components, shall be visible on the outside of the luminaire (except the mounting side) or behind a cover which is removed during lamp or other component replacement and with the lamp removed.
- Marking to be observed during installation shall be visible during installation on the outside of the luminaire or behind a cover or part which is removed during installation.
- Marking to be observed after installation shall be visible with the luminaire assembled and installed as for normal use and with the lamp in place.

Marking may be on ballasts provided the conditions under a) or b) above, as appropriate, are fulfilled. See Table 3.1 for details.

Table 3.1 – Marking

Markings belonging to item a)	Markings belonging to item b)	Markings belonging to item c)
3.2.8 ^a Rated wattage	3.2.1 – 3.2.2 ^b	3.2.13 Lighted objects ^d
3.2.10 Special lamps	3.2.3 Ambient temperature	3.2.14 Rough service
3.2.11 Cool beam	3.2.4 – 3.2.5	3.2.20 Means of adjustment
	3.2.6 IP number	3.2.23 Do not stare at light source ^e
3.2.15 Bowl mirror	3.2.7 Type reference	
3.2.16 Protective shield	3.2.9 Symbols	
3.2.18 Ignition warning	The relevant symbol for luminaires not suitable for direct mounting on normally flammable surfaces	
3.2.19 Self-shielded lamp	3.2.12 Termination	
3.2.22 Internal replaceable fuse(s)	3.2.17 ^c Interconnected luminaires	
3.2.23 Do not stare at light source ^e	3.2.21 The relevant symbol for luminaires not suitable for covering with thermally insulating material	
3.2.24 Symbol for electric shock risk		
^a 3.2.8 Rated wattage. For luminaires for discharge lamps with remote control gear, the marking may be replaced by the instruction: "For lamp designation, see control gear". ^b 3.2.2 Rated voltage. For luminaires for discharge lamps, if the ballast is not built into the luminaire, the luminaire shall be marked with the working voltage instead of the mains voltage. ^c 3.2.17 Interconnected luminaires. For fixed luminaires, this information may alternatively be provided within the installation instructions. ^d 3.2.13 Lighted objects. Only the symbol shall be provided on the luminaire. The explanation of the symbol shall be provided in the instruction accompanying the luminaire, where not already provided on the luminaire. ^e 3.2.23 The different conditions of this marking for fixed, portable and handheld luminaires are given in 3.2.23		

The earthing symbol referred to in 3.2.12 may be marked on the ballast, instead of the luminaire, if the ballast is of a non-replaceable type. The height of graphical symbols shall not be less than 5 mm, except for symbols for class II and class III classification which may be reduced to a minimum of 3 mm where the space available for marking is restricted. The height of letters and numerals either shown separately or with or as part of symbols shall not be less than 2 mm.

For combination luminaires where the type references or the rated inputs are different for different combinations, the main part and the alternative parts may be marked with a type reference or a rated input, as appropriate, provided that the type can be identified and the rated input of the complete unit may be established from a catalogue or a similar document.

For luminaires with electro-mechanical contact systems, the base plate shall be marked with the rated current of the electrical connection if the system can be used with a variety of different luminaire types.

3.2.1 Mark of origin (this may take the form of a trade mark, the manufacturer's identification mark or the name of the responsible vendor).

3.2.2 Rated voltage(s) in volts. Luminaires for tungsten filament lamps shall be marked only if the rated voltage is different from 250 V.

Portable class III luminaires shall be marked with the rated voltage on the outside of the luminaire.

Luminaires with built-in transformers or convertors, shall be marked with the nominal voltage and/or current of the light source to ensure correct replacement. This marking shall be positioned in accordance with 3.2.8.

3.2.3 The rated maximum ambient temperature t_a , if other than 25 °C (see Figure 1).

3.2.4 Symbol for class II luminaires where applicable (see Figure 1).

For portable luminaires provided with a supply cord, the symbol for class II construction, if applicable, shall be on the outside of the luminaire.

The class II symbol shall not be applied to semi-luminaires.

3.2.5 Symbol for class III luminaires where applicable (see Figure 1).

3.2.6 Marking (if applicable) with IP numbers for degree of protection against ingress of dust, solid objects and moisture (see Figure 1 and Annex J). Where X is used in an IP number in Figure 1, it indicates a missing numeral in the example, but both of the appropriate numerals shall be marked on the luminaire.

In cases where different IP numbers apply to distinct parts of the luminaire, the lower number shall be marked on the type label on the luminaire, even if IP20, whereas the higher number shall be marked separately on the part concerned. In cases where shades or similar devices upgrading, for example an IP20 luminaire to a higher IP rating when mounted, the IP20 marking shall be made invisible by the device in question without destroying the marking and the device shall visibly be provided with a new IP rating. The instruction sheet supplied with the luminaire shall include details of the IP numbers applying to the various parts of the luminaire. The use of different IP numbers on different parts of a luminaire or devices, to upgrade the IP rating, for example to a higher IP rating, is only applicable to fixed luminaires.

For recessed luminaires with two IP ratings, both ratings shall be visible during installation and it shall be obvious to which parts of the luminaire the ratings refer. The relevant information shall be provided even if the rating is IP20 or the lower rating is specified as ordinary

Marking of IP20 on ordinary luminaires is not required.

3.2.7 Maker's model number or type reference.

3.2.8 Rated wattage or the designation as indicated on the lamp data sheet of the type or types of lamp for which the luminaire is designed. Where the lamp wattage alone is insufficient, the number of lamps and the type shall also be given.

Luminaires for tungsten filament lamps shall be marked with the maximum rated wattage and number of lamps.

Marking of maximum rated wattage for luminaires for tungsten filament lamps with more than one lampholder may be in the form:

" $n \times \text{MAX... W}$ ", n being the number of lampholders.

3.2.9 Where applicable, the relevant symbol (see Figure 1) for luminaires not suitable for direct mounting on normally flammable surfaces. The symbol shall be explained on the luminaire or in the manufacturer's instructions provided with the luminaire. See Table N.1. The minimum size of the symbol shall be 25 mm for each side.

3.2.10 Information concerning special lamps, if applicable.

In particular, this applies to the symbols (see Figure 1) for luminaires for use with high-pressure sodium lamps having either an internal starting device or requiring an external ignitor where the lamp is required to be marked with the same symbol according to IEC 60662.

3.2.11 Symbol (see Figure 1), if applicable, for luminaires for lamps of similar shape to "cool beam" lamps but where the use of a dichroic reflectorized "cool beam" lamp might impair safety.

3.2.12 Except for type Z attachments, terminations shall be marked to identify live, neutral and earth in case of connection of the luminaire to the supply mains to ensure safe and satisfactory operation.

Symbols, when applied, indicating mains supply terminations shall be according to IEC 60417.

The earthing termination shall be marked by the relevant symbol of IEC 60417 only.

NOTE 1 Appropriate symbols from IEC 60417 are: Earth (IEC 60417-5017 (2006-08)), Functional earthing (IEC 60417-5018 (2006-10) and Protective earth (IEC 60417-5019 (2006-08)).

Where terminals are provided in a Class II luminaire for the continuity or termination of an earth conductor such terminals shall be marked with the letter E.

NOTE 2 Examples of such terminals are those used for looping or through wiring.

Leads (tails) used for the connection to extra low voltage d.c. supply, shall be colour coded red to indicate its intended connection to the positive termination, and shall be colour coded black to indicate its intended connection to the negative termination. Fixed terminations, when applied, shall be marked with the "+" sign to indicate the positive connection, and shall be marked with the "-" sign to indicate the negative connection.

NOTE 3 Terminations can be found at leads (tails), connection or terminal blocks and terminals of another construction.

Luminaires with supply cords which are not fitted with a plug shall include with the manufacturer's instructions any information necessary to ensure safe connection, e.g. deviations from the national standardised colour coding of the cores where this does not create the possibility of an unsafe situation during installation, use or maintenance.

NOTE 4 In some countries, luminaires with supply cords which are intended to be connected to the supply via a socket-outlet and which are not fitted with a plug are not permitted.

3.2.13 Symbol (see Figure 1) for minimum distance from lighted objects, if applicable, for luminaires which might otherwise overheat the lighted objects due to, for example, the applied lamp type, the shape of the reflector, the adjustability of the mounting means or the location of mounting as indicated in the installations instructions.

The minimum distance marked shall be determined by the temperature test described in item j) of 12.4.1.

The distance is measured on the optical axis of the luminaire from that part of the luminaire or lamp which is nearest to the lighted object.

The symbol for minimum distance and explanation of its meaning shall also be given either on the luminaire or in the instructions with the luminaire.

3.2.14 Symbol (see Figure 1), if applicable, for rough service luminaires.

3.2.15 Symbol (see Figure 1), if applicable, for luminaires which are designed for use with bowl mirror lamps.

NOTE Separate bowls for attachment to GLS lamps without reference to luminaire testing are not within the scope of this standard.

3.2.16 Luminaires incorporating a protective shield shall be marked either with:

- "Replace any cracked protective shield", or
- the symbol (see Figure 1).

3.2.17 The maximum number of luminaires that may be interconnected or the maximum total current that may be drawn by means of couplers provided for looping-in connection to the mains supply. For fixed luminaires, this information may alternatively be provided within the installation instructions.

3.2.18 A warning symbol or notice for luminaires with ignitors intended for use with double-ended high pressure discharge lamps and luminaires with double-capped Fa8 tubular lamps if the voltage measured according to Figure 26 exceeds 34 V peak.

- a) Warning symbol in accordance with IEC 60417-5036 (2002-10) visible during replacement of the lamp. The symbol shall be explained on the luminaire or in the manufacturer's instructions provided with the luminaire, or
- b) A warning notice near to the holder of a replaceable ignitor or replaceable switching element, if any: "Attention, remove replaceable device before replacement of lamp. After lamp-replacement reinsert replaceable device".

3.2.19 Symbol (see Figure 1) for luminaires which are designed to be used only with self-shielded tungsten halogen lamps or self-shielded metal halide lamps.

3.2.20 Where necessary, the means of adjustment where not obvious, needs to be identified.

NOTE Appropriate marking includes symbols (e.g. arrows) to indicate direction of movement, descriptive text or colours.

3.2.21 The relevant symbol (see Figure 1) for luminaires not suitable for covering with thermally insulated material. The symbol shall be explained on the luminaire or in the manufacturer's instructions provided with the luminaire. See Table N.1. The minimum size of the symbol shall be 25 mm for each side.

A warning notice and symbol is required when a luminaire is not suitable for covering with thermally insulated material.

3.2.22 Symbol (see Figure 1) if applicable, for luminaires with internal replaceable fuses. Such a luminaire shall, in addition, be provided with information regarding the rated current (in A or mA) of the fuse. Where the time/current characteristic of the fuse is important for safety, the rating and type of every fuse shall be marked on the holder or in the proximity of the fuse in accordance with what is stated in the relevant fuse standard.

3.2.23 Warning symbol "Do not stare at the operating light source" (see Figure 1) for portable and handheld luminaires that have been classified as having a threshold illuminance E_{thr} in accordance with IEC/TR 62778. This marking shall be visible as detailed by condition 'c' of Clause 3.2 and Table 3.1. In addition the symbol should be positioned so that it can be read without looking into the operating light source. This requirement is applicable only when the E_{thr} is reached at a distance further than 200 mm from the luminaire.

For fixed luminaires that have been classified as having a threshold illuminance E_{thr} in accordance with IEC/TR 62778 the manufacturer's instructions provided with the luminaire shall give the following text, where x m is the distance at which the threshold illuminance E_{thr} condition occurs. This requirement is applicable only when the E_{thr} is reached at a distance further than 200 mm from the luminaire.

“The luminaire should be positioned so that prolonged staring into the luminaire at a distance closer than x m is not expected”.

NOTE According to IEC/TR 62778, x m is the distance d_{thr} between the light source and the eyes of the viewer and it is calculated from the lighting distribution measurement of the luminaire.

In addition luminaires incorporating light sources that have been classified as having a threshold illuminance E_{thr} condition in accordance with IEC/TR 62778 and which are directly visible during luminaire maintenance shall be marked with the warning symbol “Do not stare at the operating light source” (see Figure 1). This marking shall be visible as detailed by conditions ‘a’ and ‘c’ of Subclause 3.2 and Table 3.1.

3.2.24 Where required for protection against electric shock, covers fixed over non-user replaceable light sources shall be marked with the ‘caution, risk of electric shock’ symbol given by IEC 60417-6042 (2011-11). The minimum height of this symbol shall be 15 mm (see Figure 1).

3.3 Additional information

In addition to the above marking, all details which are necessary to ensure proper installation, use and maintenance shall be given either on the luminaire, semi-luminaire or on built-in ballasts or in the manufacturer's instructions provided with the luminaire for instance:

3.3.1 For combination luminaires, the permissible ambient temperature, the class of protection or the protection against ingress of dust, solid objects and moisture of an alternative part if not at least equal to that of the basic luminaire.

3.3.2 Nominal frequency in hertz.

3.3.3 Operating temperatures:

- a) The rated maximum operating temperature (of a winding) t_w in degrees Celsius.
- b) The rated maximum operating temperature (of a capacitor) t_c in degrees Celsius.
- c) The maximum temperature to which the insulation of supply cables and interconnecting cables will be subjected within the luminaire under the most unfavourable conditions of normal operation, if in excess of 90 °C (see footnote c to Table 12.2 relating to unsleeved fixed wiring). The symbol to indicate this requirement is given in Figure 1.
- d) Spacing requirements to be observed during installation.

3.3.4 In case a luminaire is only suitable for direct mounting on non-combustible surfaces and the relevant symbol (see Figure 1) is not applied, a warning notice shall be attached to the luminaire or given in the manufacturer's instructions explaining that the luminaire can under no circumstances be mounted on normally flammable surfaces.

Because of their application, luminaires which are provided with an adaptor for mounting on a track shall meet the requirements for direct mounting on normally flammable surfaces.

3.3.5 A wiring diagram, except where the luminaire is suitable for direct connection to the mains supply.

3.3.6 Special conditions for which the luminaire, including the ballast, is suitable, for instance, whether or not the luminaire is intended for looping-in.

3.3.7 Luminaires provided with metal halide lamps shall, if applicable, be provided with the following warning notice:

“The luminaire shall only be used complete with its protective shield”.

3.3.8 The manufacturer of semi-luminaires shall supply information on limitations of use of such devices, particularly where overheating may be caused by the position or thermal distribution of the replaceable light source being different from the light sources they will replace.

3.3.9 In addition, the manufacturer shall be prepared to supply information on the power factor and the supply current.

For connections suitable for both resistive and inductive loads, the rated current for the inductive load shall be indicated between brackets and shall immediately follow the rated current for the resistive load. The marking may accordingly be as follows:

$$3(1)A\ 250\ V\ \text{or}\ 3(1)/250\ \text{or}\ \frac{3(1)}{250}$$

NOTE This marking is in accordance with IEC 61058-1.

The rated current values do not apply to circuits in general but only to the rating of the luminaire as a whole.

3.3.10 Suitability for use "indoors" including the related ambient temperature.

3.3.11 For luminaires using remote control gear, the range of lamps for which the luminaire is designed.

3.3.12 For clip-mounted luminaires, a warning when the luminaire is not suitable for mounting on tubular material.

3.3.13 The manufacturer shall provide the specifications of all protective shields.

3.3.14 Where necessary for correct operation, the luminaire shall be marked with the symbol for nature of supply (see Figure 1).

3.3.15 The rated current at rated voltage shall be declared by the manufacturer for any socket outlet incorporated in the luminaire, if less than the rated value.

3.3.16 The information about rough service luminaires concerning:

- the connection to IPX4 rated socket outlets;
- the correct mounting taking into account the temporary installation;
- the correct fixing to a stand, and also where the stand is not supplied with the luminaire, the maximum height of a possible stand, and its required stability by the indication of the number and minimum length of the legs.

3.3.17 For luminaires with type X, Y or Z attachments, the mounting instructions shall contain the substance of the following information.

- For type X attachments having a specially prepared cord:
if the external flexible cable or cord of this luminaire is damaged, it shall be replaced by a special cord or cord exclusively available from the manufacturer or his service agent.
- For type Y attachments:
if the external flexible cable or cord of this luminaire is damaged, it shall be exclusively replaced by the manufacturer or his service agent or a similar qualified person in order to avoid a hazard.
- For type Z attachments:
the external flexible cable or cord of this luminaire cannot be replaced; if the cord is damaged, the luminaire shall be destroyed.

3.3.18 Luminaires which are other than ordinary, provided with a PVC supply cord, shall be provided with information about the intended use, i.e. "For indoor use only".

3.3.19 For luminaires which generate a protective conductor current greater than 10 mA and intended for permanent connection, the protective conductor current shall be clearly stated in the manufacturers' instructions.

3.3.20 Wall mounted, settable and adjustable luminaires not intended to be mounted within arms reach shall be provided with information to advise their correct installation, i.e. "Only to be installed outside arms reach".

3.3.21 Luminaires with non replaceable and non-user replaceable light source, the instruction sheet shall contain the substance of the following information:

- For non replacable lightsources:
"The light source of this luminaire is not replaceable; when the light source reaches its end of life the whole luminaire shall be replaced"
- For non-user replaceable light sources:
"The light source contained in this luminaire shall only be replaced by the manufacturer or his service agent or a similar qualified person."



Caution, risk of electric shock

(Source: IEC 60417-6042 (2011-11))

3.3.22 For controllable luminaires the classification of insulation that has been maintained between LV supply and control conductors shall be provided. E.g. basic insulation, reinforced insulation.

NOTE Maintenance of the declared insulation barrier for the luminaire can also be dependent on other external components/products connected to the same control bus. This is the responsibility of the control system designer, not the luminaire manufacturer.

3.4 Test of marking

Compliance with the requirements of 3.2 and 3.3 is checked by inspection and by the following test:

The durability of the marking is checked by trying to remove it by rubbing lightly for 15 s with a piece of cloth soaked with water and, after drying, for a further 15 s with a piece of cloth soaked with petroleum spirit and by inspection after the tests detailed in Section 12 have been completed.

After the test, the marking shall be legible, marking labels shall not be easily removable and they shall show no curling.

NOTE The petroleum spirit used typically consists of a solvent hexane with a content of aromatics of maximum 0,1 % by volume, a value of 29 % for kauri-butanol, an initial boiling-point of approximately 65 °C, a dry-point of approximately 69 °C and a density of approximately 0,68 g/cm³.

SECTION 4: CONSTRUCTION

4.1 General

This section specifies general constructional requirements for luminaires. See also Annex L.

4.2 Replaceable components

Luminaires incorporating components or parts intended to be replaceable shall be so designed that there is sufficient space to permit replacement of such components or parts without difficulty and without impairing safety.

NOTE Sealed-in components and riveted parts are not replaceable components.

4.3 Wireways

Wireways shall be smooth and free from sharp edges, burrs, flashes and the like, which might cause abrasion of the insulation of the wiring. Parts such as metal set screws shall not protrude into wireways.

Compliance is checked by inspection and, if necessary, by dismantling and reassembling the luminaire.

4.4 Lampholders

4.4.1 The requirements for electrical safety of integral lampholders shall be those applicable to the luminaire as a whole with the lampholder and lamp in fully assembled position, as for normal use.

In addition, integral lampholders shall, when mounted in the luminaire, comply with the requirements concerning safety during insertion of the lamp as specified in the appropriate lampholder standard.

4.4.2 Connection of wiring to integral lampholder contacts may be made by any method giving reliable electrical contact over the service life of the lampholder.

4.4.3 Luminaires for tubular fluorescent lamps designed for end-to-end mounting shall be so designed that the lamp may be changed in the middle luminaire of a row without adjusting any other luminaire. In multi-lamp luminaires for tubular fluorescent lamps, the changing of any one lamp shall not impair the security of the other lamps.

Compliance with the requirements of 4.4.1 to 4.4.3 is checked by inspection.

4.4.4 Lampholders which are put into position by the user shall be capable of easy and correct positioning.

The distance between the pair of fixed lampholders for a fluorescent lamp intended to be set in a fixed position shall comply with the relevant standard sheet of IEC 60061-2 or (if IEC 60061-2 does not apply), the lampholder manufacturer's mounting instructions. Lampholders for tungsten filament lamps and lampholders for single-capped fluorescent lamps shall be adequately fixed to the body of the luminaire. The fixing device of lampholders shall have adequate mechanical strength so as to withstand such rough handling as may be expected in normal use. These requirements apply both to lampholders put in position by the user and to lampholders put in position by the luminaire manufacturer.

Compliance is checked by inspection, measuring and, if applicable, by the following mechanical tests.

i) *Lampholders for a fluorescent lamp, with a test-cap in position, are subjected, for 1 min, to a pressure applied to the centre of the cap in the direction of its axis of:*

- 15 N for G5 lampholders;
- 30 N for G13 lampholders;
- 30 N for lampholders for single-capped fluorescent lamps (G23, G10q, GR8 etc.).
Values for other lampholders are under consideration.

NOTE For these tests, caps from standardized lamps can be used as the test caps.

After the test, the distance between the holders shall comply with the relevant standard sheet of IEC 60061-2 and the lampholder shall show no damage. The test-cap for this test shall comply with the following standard sheets in IEC 60061-3:

7006-47C for G5 lampholders,

7006-60C for G13 lampholders,

test-caps for other lampholders are under consideration.

After the test on lampholders for single-capped fluorescent lamps, the lampholder shall not have moved from its position and the fixing device shall show no permanent deformation, so that the lamp, when reinserted, will come in its intended position.

ii) *Mounting brackets for Edison screw or bayonet-capped lampholders are subjected to testing for 1 min, to the following bending moments:*

for E14 and B15 lampholders 1,2 Nm;

for E26, E27 and B22 lampholders 2,0 Nm;

for E39 and E40 lampholders 4,0 Nm.

After the test, the lampholder shall not have moved from its position and the fixing device shall show no permanent deformation, so that the lamp, when reinserted, shall be in its intended position.

4.4.5 For luminaires with ignitors, the peak pulse voltage occurring across contacts in lampholders which are part of the pulse voltage circuit shall not be greater than the pulse voltage marked on the lampholder or, in the absence of such marking, shall not be greater than:

- for 250 V rated lampholders 2,5 kV;
- for 500 V rated ES lampholders 4 kV;
- for 750 V rated ES lampholders 5 kV.

Compliance is checked by measurement of the voltage occurring across the lampholder contacts during the pulse test of 10.2.2 for luminaires with ignitors.

4.4.6 For luminaires with ignitors incorporating Edison screw lampholders, the centre contact of the lampholder shall be connected to the lead which supplies the pulse voltage.

Compliance is checked by inspection.

4.4.7 The insulating parts of lampholders and plugs incorporated in rough service luminaires shall be of a material resistant to tracking.

Compliance is checked by the test of 13.4.

4.4.8 Lamp connectors shall comply with all the requirements for lamp holders other than those related to retaining the lamp in position. Means for retaining the lamp shall be provided by other parts of the luminaire.

Compliance is checked by inspection and test as required by 4.4.1 to 4.4.7.

NOTE The difference between lamp connectors and lampholders is clearly identified on the relevant data sheets of IEC 60061 (series).

4.4.9 Caps or bases originally developed for single-capped ELV lamps shall not be used in luminaires intended for use with general purpose tungsten halogen lamps with rated voltages higher than 50 V.

NOTE Examples of such ELV fits are: G4, GU4, GY4, GX5.3, GU5.3, G6.35, GY6.35, GU7 and G53.

Luminaires intended for use with GU10 lamps only (with aluminised reflector) shall be provided with GU10 lampholders only.

Compliance is checked by inspection.

4.4.10 The use of a light source or light sources, designed to be connected by a lampholder or connector according to IEC 60061 (series), but used without the relevant lampholder or connector and with the electrical connections made in another way (e.g. with the wire soldered directly to the pins), is not allowed.

Compliance is checked by inspection.

4.5 Starterholders

Starterholders in luminaires other than class II shall accept starters which comply with IEC 60155.

Class II luminaires may require starters of class II construction.

For class II luminaires where the starter can be touched with the standard test finger when the luminaire is fully assembled for use or open for the replacement of lamps or starters, the starterholder shall be one accepting only starters complying with the requirements for starters for class II luminaires given in IEC 60155.

Compliance is checked by inspection.

4.6 Terminal blocks

If luminaires are provided with connecting leads (tails) requiring a separate terminal block for the connection to the fixed wiring, adequate space for this terminal block shall be provided within the luminaire, or within a box delivered with the luminaire, or specified by the manufacturer.

This requirement applies to terminal blocks for connecting leads (tails) with conductor nominal cross-sectional areas not exceeding 2,5 mm².

Compliance is checked by measurement and by an installation test, using one terminal block for each two conductors to be connected together, as shown in Figure 2, and fixed wiring having a length of approximately 80 mm. The dimensions of the terminal blocks are those specified by the manufacturer or, in the absence of such a specification, 10 mm × 20 mm × 25 mm.

Unsecured terminal blocks are permitted when they are designed and insulated such that creepage distances and clearances in accordance with Section 11 are always maintained for any position of the terminal block, and that damage to internal wiring is prevented.

4.7 Terminals and supply connections

4.7.1 In portable luminaires of class I and II and in fixed luminaires of class I and II that are frequently adjusted, adequate precautions shall be taken to prevent metal parts from becoming live due to a detached wire or screw. This requirement applies to all terminals (including supply terminals).

NOTE The requirement can be met by securing the wires adjacent to their entry to the terminals, by suitable dimensioning of the enclosure for the terminals, by the use of an enclosure of insulating material or by the provision of an insulating lining in the enclosure.

Examples of methods deemed efficient to prevent a wire from becoming detached are:

- a) wires are retained by a cord anchorage adjacent to the terminals;
- b) conductor is clamped by a spring type screwless terminal;
- c) the wire conductor is anchored to the tag before soldering, unless breakage close to the soldering place is likely to occur as a result of vibration;
- d) wires are twisted together in a reliable manner;
- e) wires are fastened together by insulation tape, sleeves, or the like;
- f) the wire conductor is inserted into a hole in a printed board, bent and soldered, the hole having a diameter slightly greater than the conductor;
- g) the wire conductor is securely wrapped around the terminal by means of a special tool (see Figure 19);
- h) the wire conductor is crimped to the terminal by means of a special tool (see Figure 19).

The methods a) to h) apply to internal wiring and the methods a) and b) to rewirable external flexible cords.

Compliance is checked by inspection and based upon the assumption that only one conductor can become detached at the same time.

4.7.2 Supply terminals shall be located or shielded in such a way that, if a wire of a stranded conductor escapes from a terminal when the conductors are fitted, there is no risk of contact between live parts and metal parts which can be touched with the standard test finger when the luminaire is fully assembled for use or open for the replacement of replaceable light sources or starters.

Compliance is checked by inspection and by the following test.

An 8 mm length of insulation is removed from the end of a flexible conductor having the largest cross-sectional area specified in Section 5. One wire of the stranded conductor is left free and the remainder are fully inserted and clamped in the terminal. The free wire is bent, without tearing the insulation back, in every possible direction, but without making sharp bends around barriers.

The free wire of a conductor connected to a live terminal shall not touch any metal part which is accessible or connected to an accessible metal part, and the free wire of a conductor connected to an earthing terminal shall not touch any live part.

This test does not apply to lampholders which have been separately approved to an appropriate IEC standard and to terminals of components where the construction method justifies a shorter length of free wire.

4.7.3 Terminals for supply cords, shall be suitable for connection to be made by means of screws, nuts or equally effective devices.

Connecting leads (tails) shall comply with the requirements of Section 5.

NOTE 1 For luminaires designed to be connected by means of rigid (solid or stranded) conductors, screwless terminals of the spring type are effective devices, including the earth connection. No requirements are specified at present for using such terminals for the connection of supply cords.

NOTE 2 For luminaires designed to be connected by means of a supply cord and having a rated current not exceeding 3 A, soldered, welded, crimped and similar connections, including snap-on connectors, are effective devices, including an earth connection. Other similar connections include screwless terminals, insulation piercing or insulation displacement clamping terminals.

NOTE 3 For luminaires having a rated current exceeding 3 A, snap-on connectors are suitable if the connection can also be made without making use of the receptacle, for example, by means of a screwed connection for which a threaded hole is provided in the tab.

4.7.3.1 Welding method and material

The conductor shall be stranded or solid wire of copper materials. For thin wires, a ferrule may be used.

The welding method shall be spot welding only.

NOTE Other methods of welding are under consideration.

Welding of wire and plate is allowed, but welding of wires together is not allowed.

Welded connections are used in Type Z attachments only.

Welded connections shall withstand the mechanical, electrical and heat test in normal use.

Compliance is checked by inspection and by the following tests.

a) *Mechanical test*

Apply the test of, 15.6.2

If the wire is fixed by a cord anchorage, the mechanical test is not applicable.

b) *Electrical test*

Apply the tests of 15.6.3.

c) *Heat test*

Apply the tests of 15.6.3.2.3 and 15.6.3.2.4.

4.7.4 Terminals, other than those for supply connection, which are not covered by separate standards for components, shall comply with the requirements of Sections 14 and 15.

Terminals of lampholders, switches and similar parts used for multiple connection of internal wiring shall have dimensions adequate for the purpose and shall not be used for the connection of external wiring.

Compliance is checked by inspection and by the tests of Sections 14 and 15.

4.7.5 If the external wiring or supply cord is unsuitable for the temperatures reached inside the luminaire, either a connection shall be provided at the point of entry of the external wiring into the luminaire for the use of heat-resistant wiring after this point, or heat-resisting parts shall be supplied with the luminaire to cover the part of the wiring placed inside it, which exceeds the wiring temperature limit.

Compliance is checked by inspection.

4.7.6 If during the installation or maintenance of a luminaire, electrical connections are made by a multi-pole plug and socket, unsafe connections shall be prevented.

Compliance is checked by inspection and by trying to make unsafe connections, e.g. by shifting the plug positions. The force applied to the plug during compliance checks shall take into account forces up to 30 N in any direction.

4.8 Switches

Switches shall be adequately rated and so fixed that they are secured against rotation and cannot be removed by hand.

Switches in flexible cables or cords and switched lampholders shall not be used in luminaires which are other than ordinary, unless the degree of protection against dust, solid objects or moisture of the switch is in accordance with the classification of the luminaire.

For luminaires intended for use on a polarized supply and where the luminaire has a single-pole on/off switch, the switch shall be wired into the live side of the supply or the side other than that identified as the neutral side.

Electronic switches, when incorporated in or supplied with the luminaire, shall comply with the requirements of IEC 61058-1.

Compliance is checked by inspection.

4.9 Insulating linings and sleeves

4.9.1 Insulating linings and sleeves shall be so designed that they are reliably retained in position when switches, lampholders, terminals, wires or similar parts have been mounted.

NOTE Self-hardening resins, such as epoxy resins, can be used to fix linings.

Compliance is checked by inspection and by manual test.

4.9.2 Insulated linings, sleeves and similar parts shall have adequate mechanical, electrical and thermal strength.

Compliance is checked by inspection, by manual test and by the electric strength test in accordance with Section 10. The thermal properties of wire and sleeve are checked in accordance with Section 12. Heat resistant sleeves used as covering for wires attaining a temperature exceeding the values given in Table 12.2 of Section 12 shall comply with the requirements of IEC 60684 (series), taking into account the temperature measured on the wire in question. The sleeve shall be resistant to a temperature exceeding the temperature measured on the wire by 20 °C or withstand the following test.

- a) *Three test specimens of the sleeve, about 15 cm in length, are subjected to the humidity test of 9.3 and subsequently to the insulation resistance and electric strength tests according to Section 10. A suitable uninsulated copper conductor or metal rod is passed through the specimens, and the outside is covered by a metal foil in such a way that no flashover at the ends of the samples can occur. The measurement of the insulation resistance and the electric strength test is then made between the copper conductor/metal rod and the metal foil.*
- b) *After the copper conductors/metal rods and metal foils have been removed, the specimens are placed in a heating cabinet for 240 h at a temperature of $T + 20\text{ °C}$, T being the measured temperature of the wire.*
- c) *The specimens are allowed to cool to room temperature and are then prepared as indicated in item a) above.*

Measurement of the insulation resistance and electric strength is then made between the copper conductor/metal rod and the metal foil.

Compliance is checked by the insulation resistance values and test voltages specified in Tables 10.1 and 10.2 in Section 10.

4.10 Double and reinforced insulation

4.10.1 For metal encased class II luminaires, contact between:

- mounting surfaces and parts with basic insulation only,
- accessible metal parts and basic insulation,

shall be effectively prevented.

NOTE 1 This does not exclude the use of bare conductors if adequate protection is provided.

This wiring includes internal and external wiring of the luminaire, and fixed wiring of the installation.

Class II fixed luminaires shall be so designed that the required degree of protection against electric shock is not impaired as a result of the installation of the luminaire, for example by contact with metal conduits or metal sheaths of cables.

Capacitors shall not be connected between live parts and the body of metal encased class II luminaires, with the exception of interference suppression capacitors and switches meeting the requirements of 4.8.

The interference suppression capacitors shall comply with the requirements of IEC 60384-14 and the method of their connection shall be in accordance with 8.6 of IEC 60065:2001.

NOTE 2 Contact between accessible metal parts and the basic insulation of internal wiring can be prevented by sleeves or similar parts which comply with the requirements for supplementary insulation.

Compliance is checked by inspection.

4.10.2 Any assembly gap with a width greater than 0,3 mm in supplementary insulation shall not be coincidental with any such gap in basic insulation, nor shall any such gap in reinforced insulation give straight access to live parts.

Openings larger than 0,3 mm in double or in reinforced insulation shall be designed so that live parts cannot be touched with the conical pin of test probe 13 shown in Figure 9 of IEC 61032:1997.

NOTE In order to ensure effective forced ventilation or water draining in luminaires, it can be necessary to provide openings in the double or reinforced insulation.

In addition, compliance shall be ensured with the required degree of protection against electric shock in accordance with the IP classification of the luminaire.

Compliance is checked by inspection and measurement using the relevant probe(s) in accordance with the required degree of protection against electric shock.

4.10.3 Parts of class II luminaires which serve as supplementary insulation or reinforced insulation, shall either:

- be fixed so that they cannot be removed without being seriously damaged; or
- be unable to be replaced in an incorrect position.

Where sleeving is used as supplementary insulation on internal wiring, and where insulated linings are used in lampholders as supplementary insulation on external or internal wiring, the sleeving and lining shall be retained in position by positive means

A sleeve is considered to be fixed by positive means if it can only be removed by breaking or cutting or if it is clamped at both ends or its movement on internal wiring is restricted by