

INTERNATIONAL STANDARD

**Organic light emitting diode (OLED) Light sources for general lighting – Safety –
Part 1: General requirements and tests**



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**Organic light emitting diode (OLED) Light sources for general lighting – Safety –
Part 1: General requirements and tests**

INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ORGANIC LIGHT EMITTING DIODE (OLED) LIGHT
SOURCES FOR GENERAL LIGHTING – SAFETY –****Part 1: General requirements and tests****FOREWORD**

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 62868-1 edition 1.1 contains the first edition (2020-05) [documents 34A/2177/FDIS and 34A/2185/RVD] and its amendment 1 (2025-02) [documents 34A/2421/FDIS and 34A/2433/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 62868-1 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This first edition cancels and replaces IEC 62868 published in 2014.

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

A list of all parts in the IEC 62868 series, published under the general title *Organic light emitting diode (OLED) light sources for general lighting – Safety*, can be found on the IEC website.

In this document, the following print types are used:

- requirements: roman type,
- *test specifications: italic type*,
- notes: smaller roman type.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
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INTRODUCTION

This part of IEC 62868 provides a set of general safety requirements and tests of OLED light sources which are applicable to general indoor lightings. This document specifies the requirements and tests for simple OLED light sources which do not include active electronic components and consist of rigid substrates. It applies to the common requirements and tests to verify the safety of all types of OLED light sources such as OLED modules and flexible OLED panels. This document applies to OLED panels and tiles which consist of rigid substrates. It also applies to any OLED light sources which are not specified in IEC 62868-2 (all parts)¹.

The parts which make up the IEC 62868-2 series, in referring to any clauses of this document, specify the extent of application of this document; they also include additional requirements and tests as necessary.

Where the requirements of any clauses of this document are referred to in the various parts that make up the IEC 62868-2 series by the phrase "The requirements of Clause n of IEC 62868-1 apply", this phrase will be interpreted as meaning that all requirements of the clauses in question of this document apply, except any which are clearly inapplicable to a particular type of OLED light source covered by the Part n of the IEC 62868-2 series concerned.

The safety requirements of this document are intended to ensure that electrical lightings constructed in accordance with this document do not endanger the safety of users or properties when the light sources are properly installed, maintained and used in applications.

Particular requirements and tests for OLED light sources which include any active electronic components and consist of flexible substrate will be the subject of a separate standard, as the need arises.

¹ Under preparation. Stage at the time of publication IEC AFDIS 62868-2-1:2020, IEC AFDIS 62868-2-2:2020 and IEC ACDV 62868-2-3:2020.

ORGANIC LIGHT EMITTING DIODE (OLED) LIGHT SOURCES FOR GENERAL LIGHTING – SAFETY –

Part 1: General requirements and tests

1 Scope

~~This part of IEC 62868 specifies general safety requirements of OLED products for use on DC supplies up to 1000 V or AC supplies up to 1000 V at 50 Hz or 60 Hz for indoors and similar general lighting purposes.~~

~~This document applies to any OLED light sources which are not covered by IEC 62868-2 (all parts).~~

~~NOTE 1—Only test methods for DC operated OLED light sources are provided in this document. Provisions for AC operated OLED products are under consideration.~~

~~NOTE 2—The construction of OLED tiles and panels is illustrated in Figure A.1 to Figure A.4 in Annex A.~~

~~NOTE 3—The OLED lighting system consisting of OLED panels or modules is illustrated in Annex D.~~

~~NOTE 4—This document applies to OLED light sources (tiles, panels, modules) which are composed of OLED luminaires or OLED lamps, and it is intended so that the OLED light source in accordance with this document fits in IEC 60598 (all parts) as a component of lighting equipment, in combination with other components.~~

~~NOTE 5—Where an appropriate Part 2 of IEC 62868 for an OLED light source does not exist, the nearest applicable Part 2 of IEC 62868 can be used as a guide to the requirements and tests.~~

This part of IEC 62868 specifies general safety requirements of organic light emitting diode (OLED) light sources (tiles, panels and modules and OLED lamps) for use on DC supplies up to 1 000 V or AC supplies up to 1 000 V at 50 Hz or 60 Hz for indoors and similar general lighting purposes.

Where an appropriate part of the IEC 62868-2 series for an OLED light source does not exist, the applicable part with the nearest configuration of the IEC 62868-2 series can be used as a guide to the requirements and tests in conjunction with this document.

NOTE 1 The OLED lighting system consisting of OLED panels or modules is illustrated in Annex D.

NOTE 2 This document applies to OLED light sources (tiles, panels, modules and lamps), and it is intended so that the OLED light source in accordance with this document fits in the IEC 60598 series as a component of lighting equipment, in combination with other components.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60598-1:2014/2020, *Luminaires – Part 1: General requirements and tests*
~~IEC 60598-1:2014/AMD1:2017~~

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

IEC 60598 (all parts), *Luminaires*

IEC 60838-2-2, *Miscellaneous lampholders – Part 2-2: Particular requirements – Connectors for LED-modules*

IEC 62504, *General lighting – Light emitting diode (LED) products and related equipment – Terms and definitions*

IEC TR 62854:2014, *Sharp edge testing apparatus and test procedure for lighting equipment – Tests for sharpness of edge*

IEC TS 62972, *General lighting – Organic light emitting diode (OLED) products and related equipment – Terms and definitions*

ISO 4046-4:2016, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 62504 and IEC TS 62972 and the following apply.

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

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

3.1

organic light emitting diode

OLED

light emitting semiconductor consisting of an electroluminescent zone made of organic compounds, situated between two electrodes

~~Note 1 to entry: This note applies to the French language only.~~

3.2

OLED tile

smallest functional OLED light source which cannot be separated into smaller OLED lighting elements containing at least one contact ledge with at least one positive and one negative pole for connection to the electrical power supply

3.3

OLED panel

independently operable unit OLED ~~product~~ light source containing an OLED tile and means of connection to the electrical supply

Note 1 to entry: An OLED panel may have a connector, PCB (printed circuit board), passive electronic components and optionally a frame.

3.4

OLED module

assembly of one or more OLED panels and active electronic components

~~Note 1 to entry: The classification of OLED modules is given in Annex E.~~

3.5

semi-integrated OLED module

OLED_{si} module

OLED module which carries the control unit of the controlgear, and is operated by the separated power supply of the controlgear

3.6

integrated OLED module

OLED_i module

OLED module incorporating controlgear and any additional elements necessary for stable operation of the light source, designed for direct connection to the supply voltage

3.7

integral OLED ~~module~~

OLED ~~module~~, designed to form a non-replaceable ~~part~~ component of a luminaire

Note 1 to entry: Refer to Annex D.

3.8

built-in OLED ~~module~~

OLED ~~module~~, designed to form a replaceable ~~part~~ component to be built into a luminaire and into a module, ~~a box, an enclosure or the like and not intended to be mounted outside a luminaire~~

Note 1 to entry: Refer to Annex D.

3.9

independent OLED ~~module~~

OLED ~~module~~, designed for being mounted or placed separately from a luminaire, from an additional box or enclosure or the like

~~Note 1 to entry: The independent OLED module provides all the necessary protection with regard to safety according to its classification and marking.~~

~~Note 2 to entry: An example of an independent OLED module is a system where the OLED module is connected via a glass fibre with the luminaire head.~~

Note 1 to entry: Refer to Annex D.

Note 2 to entry: Independent OLED light sources can be considered as an OLED luminaire.

3.10

rated value

quantity value for a characteristic of a ~~product~~ light source for specific operating conditions with the values and the conditions specified in the relevant standard, or assigned by the manufacturer or responsible vendor

3.11

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~~ light source with the requirements of the relevant standard

3.12

stabilization

<of OLED ~~products~~ light sources> keeping of an OLED ~~product~~ light source switched on under specified electrical input to obtain stable operation

Note 1 to entry: The mentioned operation can be photometric or electrical under specified conditions in the relevant test clause.

3.13

dark spot

small area remarkably darker than the surrounding light output area on the OLED-~~product~~ light source

Note 1 to entry: A dark spot can be due to lower current density or an open circuit in that area.

3.14

internal short circuit

unintentional conductive path between the OLED anode and OLED cathode localized on a small area

Note 1 to entry: An internal short circuit can look like a dark spot. It can lead to a significant heat generation in that area.

4 General

4.1 General requirements

An OLED-~~product~~ light source shall be designed and manufactured in such a way as to operate safely during its intended use and not to cause any danger to persons and the environment.

In case of a failure of an OLED-~~product~~ light source it shall fail safely.

~~Reference to an OLED product also includes reference to OLED tiles in the requirements and tests of this document.~~

4.2 General test requirements

Tests according to this document are type tests.

The tests, unless otherwise specified, are carried out at an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$.

The tests shall be conducted at the rated current with a tolerance of 1 % unless otherwise specified in this document.

The OLED-~~product~~ light source under test shall be mounted in accordance with the manufacturer's installation instructions. If more than one way of mounting is specified, the most onerous way shall be chosen for each test. For electrical tests, this is the position leading to the largest heat build-up of the light emitting surface. The orientation of the OLED-~~product~~ light source shall be maintained during the entire test.

Integral OLED light sources shall be regarded as integral components of luminaires according to IEC 60598-1:2020, 0.5.1.

In addition to the requirements of this document, independent OLED light sources shall comply with the IEC 60598 series.

5 Marking

5.1 Contents and location

Marking of the OLED-~~product~~ light source shall be done in accordance with Table 1.

Table 1 – Contents and location of marking

Parameters	Product	Packaging or product datasheet or leaflet
Manufacturer (or responsible vendor) or trademark	Mandatory	Mandatory
Polarity (in case of DC power supply)	Mandatory	
Neutral or earthing terminal	Mandatory	
Model number or production code	Mandatory	Mandatory
Rated current or rated current range		Mandatory
Rated voltage or rated voltage range		Mandatory
Rated power		Mandatory
Type of power supply (DC or AC) and frequency		Mandatory
Shape and dimension		Mandatory
Connecting information		Mandatory
Mounting instruction		Mandatory
Operating temperature range		Mandatory
IP number		Mandatory
Information for luminaire design		Mandatory

The connecting information shall include methods of mechanical and electrical connection. The information of the electrical connection may include the type of driver.

For marking of the IP number, symbols for degree of protection shall be in accordance with Section 3 of ~~IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017~~ IEC 60598-1:2020.

5.2 Durability and legibility of marking

Marking shall be durable and legible.

~~Compliance is checked by visual inspection and (for marking on the OLED product) by trying to remove the marking by rubbing the area lightly by hand for 15 s with a piece of smooth cloth, dampened with water.~~

Compliance is checked by the following.

- 1) *Presence and legibility of the marking required in 5.1 – by visual inspection.*
- 2) *The durability of the marking is checked by trying to remove it by rubbing lightly for 15 s with a piece of cloth soaked in water. After the test, the marking shall be legible, marking labels shall not be easily removable and they shall show no curling.*
- 3) *Availability of information required in 5.1 – by visual inspection.*

6 Construction

6.1 General

Wood, cotton, silk, paper and similar fibrous material shall not be used as insulation.

Compliance is checked by inspection.

6.2 Mechanical strength

6.2.1 Requirements

The OLED-~~product~~ panel shall have sufficient mechanical strength which shall be checked in accordance with 6.2.2.

6.2.2 Vibration test

The OLED light source shall have sufficient mechanical strength.

The following vibration test shall be performed.

Compliance is checked by the vibration test.

For the vibration test, the OLED-~~product~~ light source shall be mounted in accordance with 4.2.

A sinusoidal vibration test is conducted in accordance with IEC 60068-2-6 with the following parameters:

- displacement: 0,35 mm;
- acceleration: 50 m/s²;
- frequency range: 10 Hz to 500 Hz;
- axes of vibration: 3;
- duration: 3 × 10 cycles (10 times per axis).

After completion of the vibration test, the OLED-~~product~~ light source shall be operated for 15 min under the conditions specified in 4.2.

Compliance is checked as follows:

After the test, the OLED-~~product~~ light source is checked by inspection. Any splintered or broken glass is not accepted. Fire, smoke or flammable gas shall not be produced. The OLED ~~product~~ light source shall have no loosened parts which could impair safety.

~~*Electrical contacts which could not be touched before the vibration test (e.g. those in OLED products in accordance with Figure A.3 and Figure A.4) shall not have become accessible after the test.*~~

6.3 Internal short circuit

An OLED-~~product~~ light source with internal short circuit shall not cause any hazard.

The following internal short test shall be performed.

Compliance is checked by the internal short test.

An internal short circuit shall be provoked intentionally in the OLED-~~product~~ light source under test in accordance with instructions given by the manufacturer or in accordance with a method described in Annex C. The location of this internal short circuit shall be close to the edge of the light output area at around 2 mm distance.

Before starting the test, the test sample of the OLED-~~product~~ light source shall not be operated.

The test sample of the OLED ~~product~~ light source shall be operated at the rated current for 30 min for testing.

If the test sample does not generate an internal short circuit during the test operation, the internal short circuit test shall be repeated with the same sample.

If none of the methods described in the manufacturer's instructions and Annex C generate an internal short circuit after three attempts, the test sample passes the test.

Compliance: An OLED ~~product~~ light source passes this test if there is no emission of flames or molten material during the test. Any hot material from the sample shall not ignite a tissue paper, as specified in 4.187 of ISO 4046-4:2016, spread below the OLED ~~product~~ light source. Any splintered or broken glass is not accepted.

6.4 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 sharp-edged screws shall not protrude into wireways.

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

6.5 Resistance to dust, solid objects and moisture

If an IP number is rated, the OLED ~~product~~ light source shall comply with Section 9 of ~~IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017~~ IEC 60598-1:2020.

NOTE IP numbers for degrees of protection are explained in IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017, Annex J.

7 Mechanical hazard

An OLED ~~product~~ light source with glass edges or corners shall be free from sharp edges or points that could create hazards during installation, normal operation or maintenance.

An OLED ~~product~~ light source with thin metal foil or thin plastic film shall have protections against sharp edges or points that could create hazards during installation, normal operation, or maintenance.

Compliance is checked by inspection and means of the sharp edge tester in accordance with IEC TR 62854.

8 Fault conditions

8.1 General

An OLED ~~product~~ light source shall not impair safety under fault conditions that may occur during the intended use. ~~The following overpower test shall be performed.~~

~~Compliance is checked by the overpower test.~~

The ~~overpower~~ fault condition test shall be conducted at an ambient temperature of (25 °C ± 5) °C unless otherwise specified by the manufacturer or responsible vendor. The temperature shall be maintained within ±2 °C during the test.

Compliance is checked by the overload test.

8.2 Overload condition

The OLED ~~product~~ light source shall be operated with rated current and the power monitored (at the input side) and the input power shall be increased until 150 % of the rated current or power is reached. The test shall be continued for 15 min.

Compliance is checked by inspection. An OLED ~~product~~ light source passes this fault test if there is no emission of flames or molten material during the test. Any hot material from the sample shall not ignite a tissue paper, as specified in 4.187 of ISO 4046-4:2016, spread below the OLED ~~product~~ light source. Any splintered or broken glass is not accepted.

8.3 Input stability test

The OLED light source shall be operated with the rated current. The input power and voltage shall be monitored at the input side. The test shall be continued for 15 min.

Compliance is checked as follows:

The voltage shall remain within the range of the rated voltage ± 10 % during the test.

9 Insulation resistance and electric strength

9.1 General requirements

The requirements of IEC 60598-1:2020, 10.1 and 10.2 apply.

~~9.1~~ 9.2 Insulation resistance

The requirements of ~~10.2.1 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017~~ IEC 60598-1:2020, 10.2.1 apply.

~~9.2~~ 9.3 Electric strength

The requirements of ~~10.2.2 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017~~ IEC 60598-1:2020, 10.2.2 apply.

10 Thermal stress

OLED ~~products~~ light sources shall sustain thermal stress.

The thermal stress test shall be conducted at a specified ambient temperature in a climate chamber. The temperature shall be any convenient temperature in the range between 60 °C and 70 °C. The temperature shall be maintained within ± 2 °C during the stabilization and test.

The OLED ~~product~~ light source shall be operated with rated current. After stabilization, the test shall be continued for 60 min.

Compliance is checked by inspection. An OLED ~~product~~ light source passes this test if no failure occurs. In case of performance failure, an OLED ~~product~~ light source is considered to pass this test, if no fire, smoke or flammable gas is produced. Any splintered or broken glass is not accepted.

11 Creepage distances and clearances

~~Section 11 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 applies to individual OLED products.~~

The requirements of IEC 60598-1:2020, Section 11 apply to individual OLED light sources.

12 Resistance to heat and fire

12.1 Resistance to heat

An OLED ~~product~~ light source shall have sufficient heat resistance. The exterior of the insulation material should have a function of protection against an electric shock and have heat resistance.

External parts of insulating material providing protection against electric shock, and parts of insulating material retaining live parts in position shall be sufficiently resistant to heat using a ball pressure test in accordance with 13.2.1 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017.

The ball pressure test does not have to be applied to plastic parts of an OLED ~~product~~ light source which provide supplementary insulation.

Compliance is checked by the ball pressure test in accordance with 13.2.1 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017.

12.2 Resistance to ~~fire~~ flame and ignition

Parts of insulating material retaining live parts in position, and external parts of insulating material providing protection against electric shock shall be resistant to flame and ignition.

Compliance is checked by the test of 13.3 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 for materials other than ceramic.

The test specimen is the entire OLED ~~product~~ light source.

If the specimen is too small to be tested in a manner mentioned above, the foregoing test shall apply to separated specimens which are made of the same material and are at least 30 mm², each having a thickness identical to the smallest thickness of the OLED ~~product~~ light source.

13 Photobiological safety

~~Most OLED products are not expected to reach a level of UV, infrared or blue light hazard that requires marking, but high power OLED products may create a blue light hazard. Photobiological safety requirements and tests of high power OLED light sources are under consideration.~~

OLED light sources are not expected to reach a level of UV, infrared or blue light hazard that requires marking, or measurement.

14 Terminals

For screw terminals, the requirements of Section 14 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 shall be used, if applicable.

For screwless terminals, the requirements of Section 15 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 shall be used, if applicable.

For connectors, the requirements of IEC 60838-2-2 shall be used, if applicable.

15 Information for luminaire design

Information is given in Annex B.

16 Protection against accidental contact with live parts

The requirements of IEC 61347-1:2015, Clause 10 and IEC 61347-1:2015/AMD1:2017, Clause 10 apply.

17 Screws, current-carrying parts and connections

The requirements of IEC 61347-1:2015, Clause 14 and IEC 61347-1:2015/AMD1:2017, Clause 14 apply.

18 Resistance to corrosion

The requirements of IEC 61347-1:2015, Clause 19 apply.

19 Provisions for protective earthing

The requirements of IEC 61347-1:2015, Clause 8 and IEC 61347-1:2015/AMD1:2017, Clause 8 apply.

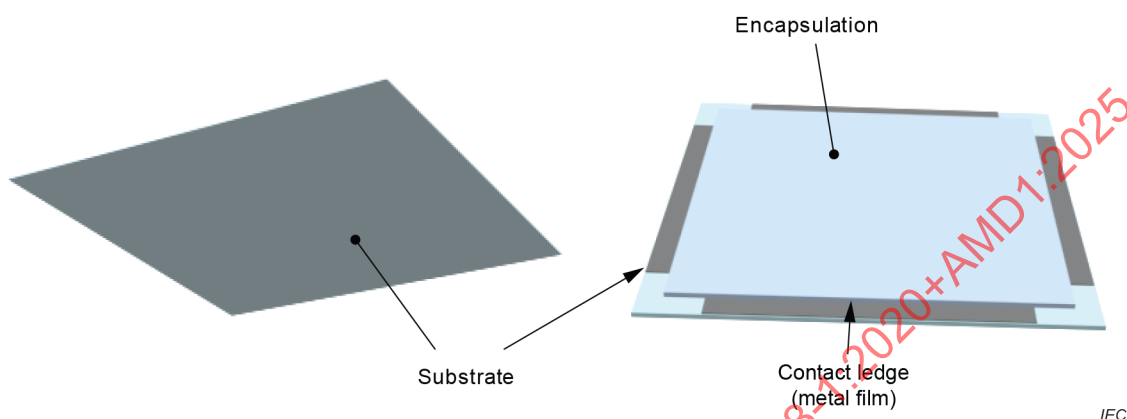
Delete Annex A and Annex E.

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Annex A (informative)

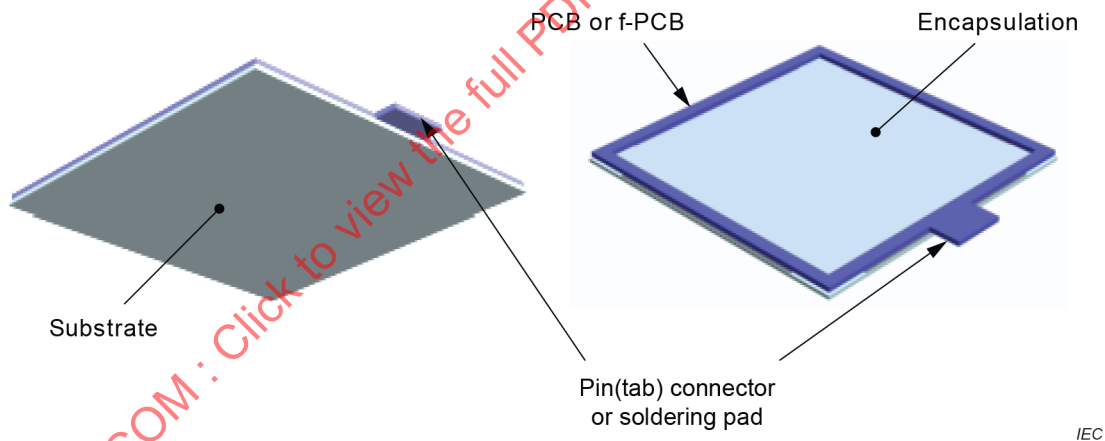
Construction of OLED panels

Figure A.1 to Figure A.4 provide schematic diagrams of OLED tiles and panels.



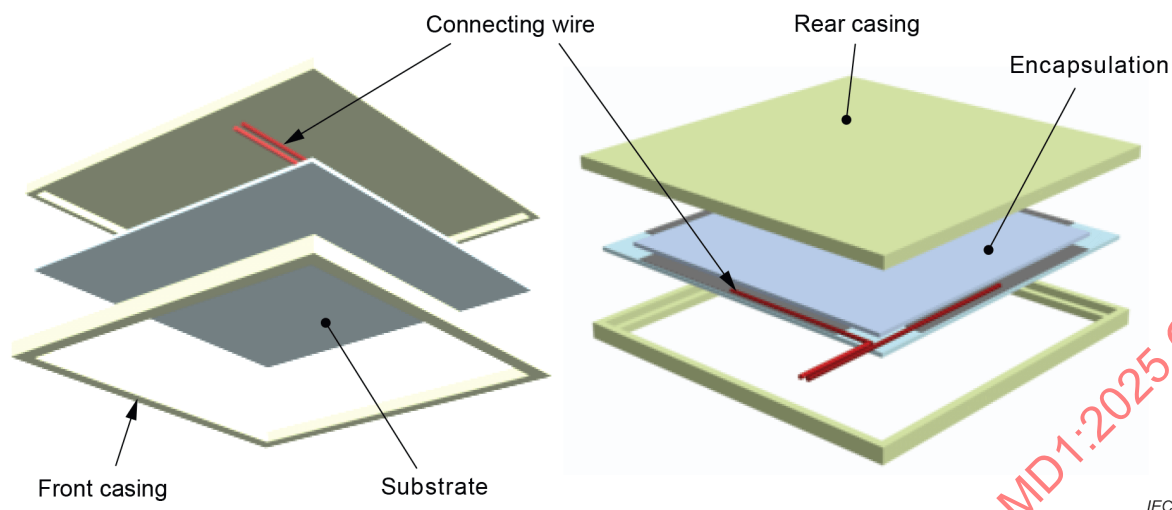
NOTE The front view is given on the left and the rear view on the right. The OLED tile is the most elementary OLED-product light source consisting of a substrate, encapsulation, OLED stack and metal ledge without a printed circuit board (PCB), electrical connecting parts, and casing.

Figure A.1 – Schematic diagram of OLED tile for lighting



NOTE The front view is given on the left and the rear view on the right. The OLED panel (Example 1) consists of an OLED tile and PCB or flexible PCB for electrical contacts, and electrical connecting parts.

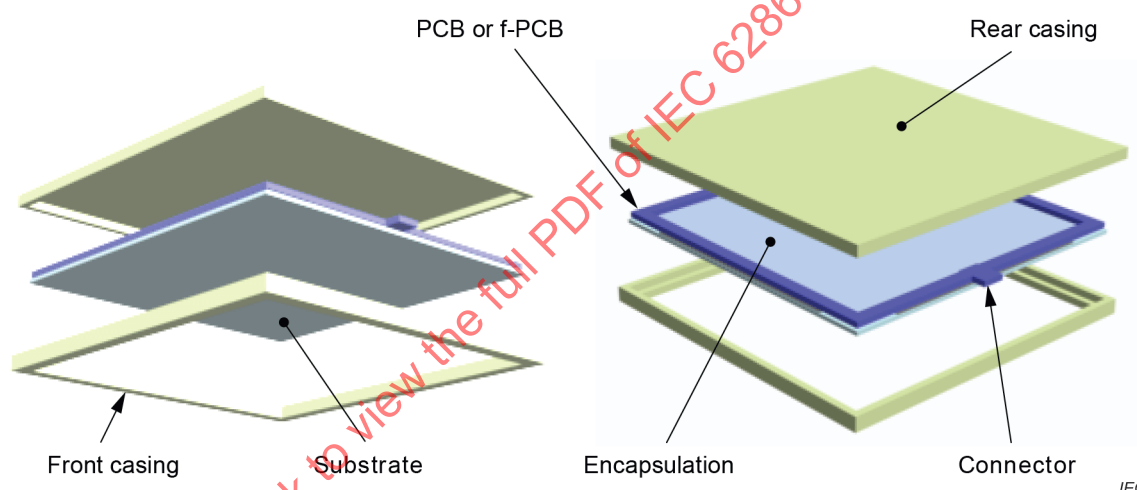
Figure A.2 – Schematic diagram of OLED panel (Example 1) for lighting



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NOTE The front view is given on the left and the rear view on the right. The OLED panel (Example 2) consists of an OLED tile, wires and soldering pads for electrical contacts, and external casing.

Figure A.3 – Schematic diagram of OLED panel (Example 2) for lighting



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NOTE The front view is given on the left and the rear view on the right. The OLED panel (Example 3) consists of an OLED tile, a PCB or a flexible PCB for electrical contacts, and external casing.

Figure A.4 – Schematic diagram of OLED panel (Example 3) for lighting

Annex B (informative)

Information for luminaire design

Internal short circuits can pose a risk to users and should be considered when designing luminaires incorporating OLED ~~products~~ light sources.

An internal short circuit has a resistance significantly lower than that of the organic electroluminescent layers. This alters the current distribution through the OLED ~~product~~ light source and usually leads to a significantly increased current density at the location of the internal short circuit. As a result, (parts of) the OLED ~~product~~ light source will no longer emit light.

The internal short circuit typically has a non-zero residual resistance. Due to this residual resistance power is consumed in the internal short circuit resulting in significant heat generation. Local temperatures in excess of 100 °C can be observed and are maintained until the OLED ~~product~~ light source is no longer powered.

If a constant current power supply is used, the voltage drop across the OLED will typically be lowered, reducing total power consumption. If a constant voltage power supply is used, the current will typically be increased until it is limited by the power supply or until the voltage drop across the internal short circuit matches that of the OLED ~~product~~ light source under normal operation, generally increasing power consumption significantly.

Temperatures created by a short circuit can be measured for example by applying a thermocouple to the OLED ~~product~~ light source at the location of the short circuit. Internal short circuits can be created for this purpose by the procedure described in 6.3. A thermocouple should be applied after the short is generated but before the OLED ~~product~~ light source is powered for the first time.

NOTE Temperatures measured in this way can differ from temperatures that occur in ~~products~~ light sources under fault conditions as the method of generating an artificial internal short circuit differs from faults in actual ~~products~~ light sources.

Possible risks from internal short circuits include:

- burns or scalds from touching the hot spot;
- ignition of flammable materials in the vicinity of the OLED ~~product~~ light source;
- ignition of flammable materials placed on the OLED ~~product~~ light source by users;
- faults of other components due to operation under abnormal conditions;
- splinters, melting material, etc. covered in 6.3.

Luminaire designers should assess the risk that is posed by such an internal short circuit. The following should be taken into consideration:

- knowledge of users about OLED ~~product~~ light source fault conditions compared with conventional lamps (OLED ~~products~~ light sources are often touchable in normal operation but may be hot in fault conditions);
- appearance (visibility) of internal short circuit to user;
- accessibility of OLED ~~product~~ light source and internal short circuit;
- temperature increase from internal short circuits compared to normal operating temperatures of the OLED ~~product~~ light source;
- temperature generated by internal short circuits and burn thresholds for skin (see IEC Guide 117);
- total power dissipated in the internal short circuit.

Adequate measures should be taken to minimize the risk to users.

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Annex C (normative)

Method of provoking an internal short circuit

C.1 Method for an OLED panel with glass substrates

An internal short circuit shall be provoked by applying a small solder tip (preheated to minimum 430 °C) to the glass surface or by laser treatment. The solder tip shall not be applied for longer than necessary and shall be removed immediately when a short has been created.

In case the final ~~product~~ light source of an OLED panel has an external outcoupling system (e.g. outcoupling foil) or a plastic film, slightly peel off the external layer just enough to expose the glass and allow for the provoking of the internal short circuit and then reattach the peeled off layer to the glass after the short circuit has been created.

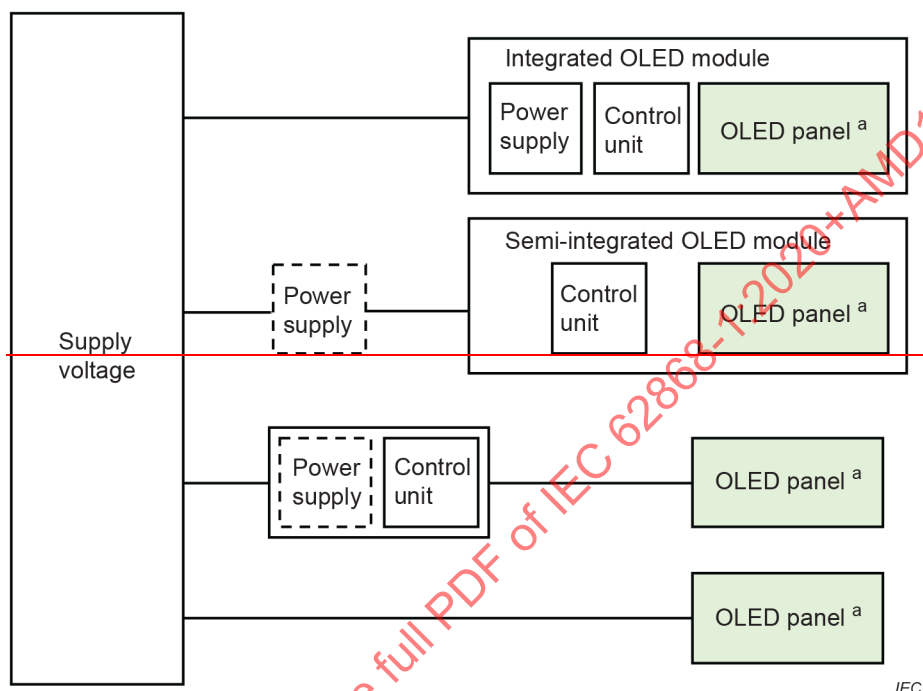
C.2 Method for an OLED panel with flexible plastic substrates

In the case of an OLED panel equipped with a flexible plastic substrate, the internal short circuit shall be provoked by applying vertical pressure on the surface of the panel with a round tip of steel for about 1 s. The temperature of the tip shall be 25 °C ± 5 °C and the radius of curvature of the round tip shall be 0,5 mm ± 0,05 mm. It is advisable that the force applied on the tip be about 100 N.

Annex D (informative)

~~Overview of the OLED lighting system consisting of OLED panel or module~~ **OLED lighting system overview**

~~See~~ Figure D.1 shows a diagrammatic overview of OLED lighting systems consisting of OLED tiles, panels or modules.



^a—The OLED panels used on DC supplies up to 1 000 V or AC supplies up to 1 000 V at 50 Hz or 60 Hz are within the scope of this document. The electric power can be supplied from the control gear or wall supply.

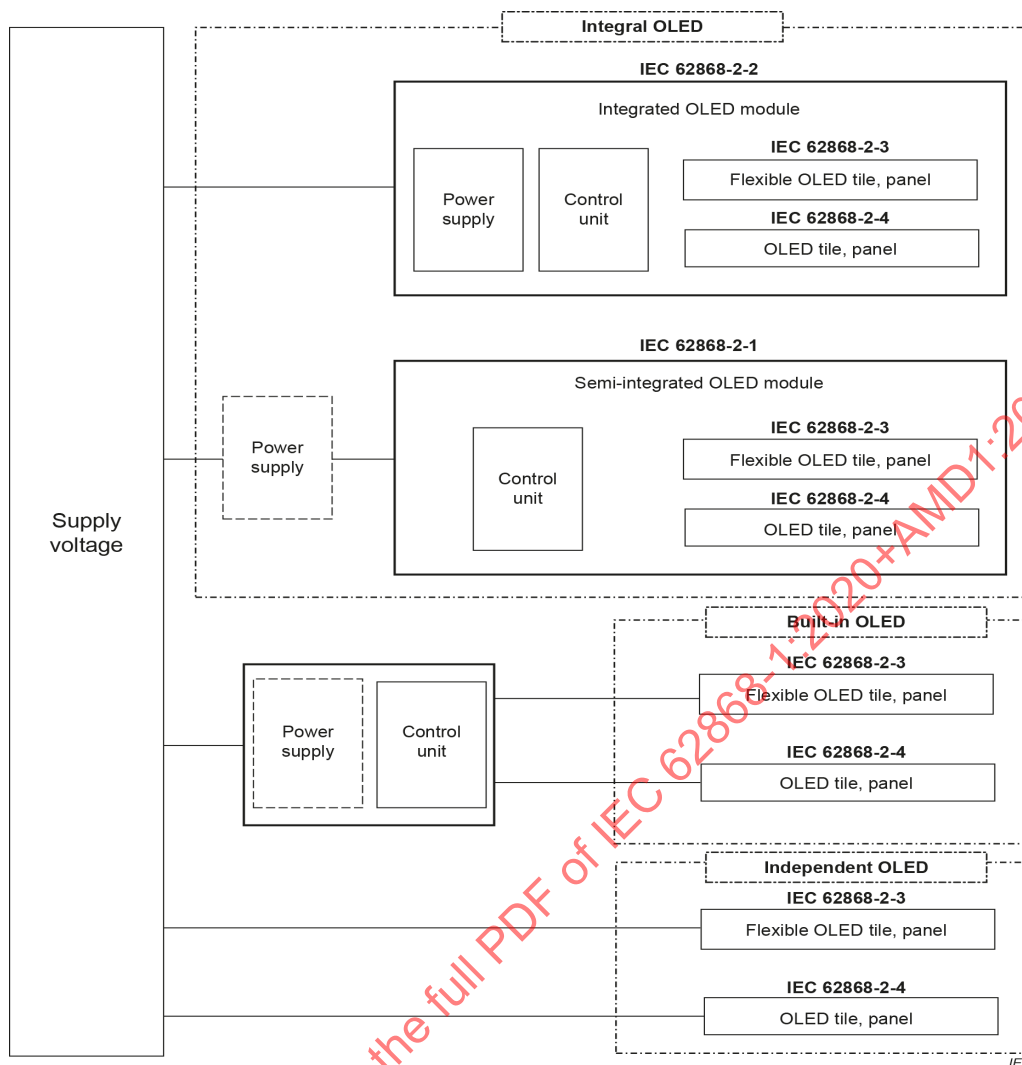


Figure D.1 – Schematic diagram of OLED lighting system consisting of OLED panel or module

Annex E

(informative)

Classification of OLED modules

E.1 Power supply classification

OLED modules are classified according to the method of power supply as follows:

- OLED tile;
- OLED panel (non-integrated OLED module);
- semi-integrated OLED modules (OLEDsi modules);
- integrated OLED modules (OLEDi modules).

E.2 Installation method classification

OLED modules are classified according to the method of installation as follows:

- integral;
- built-in;
- independent.

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IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at <http://www.electropedia.org>)

~~IEC 60598 (all parts), *Luminaires*~~

IEC 62868-2 (all parts), *Organic light emitting diode (OLED) light sources for general lighting – Safety – Part 2: Particular requirements*²

IEC GUIDE 117, *Electrotechnical equipment – Temperatures of touchable hot surfaces*

² Under preparation. Stage at the time of publication IEC AFDIS 62868-2-1:2020, IEC AFDIS 62868-2-2:2020 and IEC ACDV 62868-2-3:2020.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ORGANIC LIGHT EMITTING DIODE (OLED) LIGHT
SOURCES FOR GENERAL LIGHTING – SAFETY –****Part 1: General requirements and tests****FOREWORD**

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 62868-1 edition 1.1 contains the first edition (2020-05) [documents 34A/2177/FDIS and 34A/2185/RVD] and its amendment 1 (2025-02) [documents 34A/2421/FDIS and 34A/2433/RVD].

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 62868-1 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This first edition cancels and replaces IEC 62868 published in 2014.

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

A list of all parts in the IEC 62868 series, published under the general title *Organic light emitting diode (OLED) light sources for general lighting – Safety*, can be found on the IEC website.

In this document, the following print types are used:

- requirements: roman type,
- *test specifications: italic type*,
- notes: smaller roman type.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

This part of IEC 62868 provides a set of general safety requirements and tests of OLED light sources which are applicable to general indoor lightings. This document specifies the requirements and tests for simple OLED light sources which do not include active electronic components and consist of rigid substrates. It applies to the common requirements and tests to verify the safety of all types of OLED light sources such as OLED modules and flexible OLED panels. This document applies to OLED panels and tiles which consist of rigid substrates. It also applies to any OLED light sources which are not specified in IEC 62868-2 (all parts)¹.

The parts which make up the IEC 62868-2 series, in referring to any clauses of this document, specify the extent of application of this document; they also include additional requirements and tests as necessary.

Where the requirements of any clauses of this document are referred to in the various parts that make up the IEC 62868-2 series by the phrase "The requirements of Clause n of IEC 62868-1 apply", this phrase will be interpreted as meaning that all requirements of the clauses in question of this document apply, except any which are clearly inapplicable to a particular type of OLED light source covered by the Part n of the IEC 62868-2 series concerned.

The safety requirements of this document are intended to ensure that electrical lightings constructed in accordance with this document do not endanger the safety of users or properties when the light sources are properly installed, maintained and used in applications.

Particular requirements and tests for OLED light sources which include any active electronic components and consist of flexible substrate will be the subject of a separate standard, as the need arises.

¹ Under preparation. Stage at the time of publication IEC AFDIS 62868-2-1:2020, IEC AFDIS 62868-2-2:2020 and IEC ACDV 62868-2-3:2020.

ORGANIC LIGHT EMITTING DIODE (OLED) LIGHT SOURCES FOR GENERAL LIGHTING – SAFETY –

Part 1: General requirements and tests

1 Scope

This part of IEC 62868 specifies general safety requirements of organic light emitting diode (OLED) light sources (tiles, panels and modules and OLED lamps) for use on DC supplies up to 1 000 V or AC supplies up to 1 000 V at 50 Hz or 60 Hz for indoors and similar general lighting purposes.

Where an appropriate part of the IEC 62868-2 series for an OLED light source does not exist, the applicable part with the nearest configuration of the IEC 62868-2 series can be used as a guide to the requirements and tests in conjunction with this document.

NOTE 1 The OLED lighting system consisting of OLED panels or modules is illustrated in Annex D.

NOTE 2 This document applies to OLED light sources (tiles, panels, modules and lamps), and it is intended so that the OLED light source in accordance with this document fits in the IEC 60598 series as a component of lighting equipment, in combination with other components.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60598-1:2020, *Luminaires – Part 1: General requirements and tests*

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

IEC 60598 (all parts), *Luminaires*

IEC 60838-2-2, *Miscellaneous lampholders – Part 2-2: Particular requirements – Connectors for LED-modules*

IEC 62504, *General lighting – Light emitting diode (LED) products and related equipment – Terms and definitions*

IEC TR 62854:2014, *Sharp edge testing apparatus and test procedure for lighting equipment – Tests for sharpness of edge*

IEC TS 62972, *General lighting – Organic light emitting diode (OLED) products and related equipment – Terms and definitions*

ISO 4046-4:2016, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 62504 and IEC TS 62972 and the following apply.

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

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

3.1

organic light emitting diode

OLED

light emitting semiconductor consisting of an electroluminescent zone made of organic compounds, situated between two electrodes

3.2

OLED tile

smallest functional OLED light source which cannot be separated into smaller OLED lighting elements containing at least one contact ledge with at least one positive and one negative pole for connection to the electrical power supply

3.3

OLED panel

independently operable unit OLED light source containing an OLED tile and means of connection to the electrical supply

Note 1 to entry: An OLED panel may have a connector, PCB (printed circuit board), passive electronic components and optionally a frame.

3.4

OLED module

assembly of one or more OLED panels and active electronic components

3.5

semi-integrated OLED module

OLEDsi module

OLED module which carries the control unit of the controlgear, and is operated by the separated power supply of the controlgear

3.6

integrated OLED module

OLEDi module

OLED module incorporating controlgear and any additional elements necessary for stable operation of the light source, designed for direct connection to the supply voltage

3.7

integral OLED

OLED, designed to form a non-replaceable component of a luminaire

Note 1 to entry: Refer to Annex D.

3.8

built-in OLED

OLED, designed to form a replaceable component to be built into a luminaire and into a module

Note 1 to entry: Refer to Annex D.

3.9

independent OLED

OLED, designed for being mounted or placed separately from a luminaire, from an additional box or enclosure or the like

Note 1 to entry: Refer to Annex D.

Note 2 to entry: Independent OLED light sources can be considered as an OLED luminaire.

3.10

rated value

quantity value for a characteristic of a light source for specific operating conditions with the values and the conditions specified in the relevant standard, or assigned by the manufacturer or responsible vendor

3.11

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 light source with the requirements of the relevant standard

3.12

stabilization

<of OLED light sources> keeping of an OLED light source switched on under specified electrical input to obtain stable operation

Note 1 to entry: The mentioned operation can be photometric or electrical under specified conditions in the relevant test clause.

3.13

dark spot

small area remarkably darker than the surrounding light output area on the OLED light source

Note 1 to entry: A dark spot can be due to lower current density or an open circuit in that area.

3.14

internal short circuit

unintentional conductive path between the OLED anode and OLED cathode localized on a small area

Note 1 to entry: An internal short circuit can look like a dark spot. It can lead to a significant heat generation in that area.

4 General

4.1 General requirements

An OLED light source shall be designed and manufactured in such a way as to operate safely during its intended use and not to cause any danger to persons and the environment.

In case of a failure of an OLED light source it shall fail safely.

4.2 General test requirements

Tests according to this document are type tests.

The tests, unless otherwise specified, are carried out at an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$.

The tests shall be conducted at the rated current with a tolerance of 1 % unless otherwise specified in this document.

The OLED light source under test shall be mounted in accordance with the manufacturer's installation instructions. If more than one way of mounting is specified, the most onerous way shall be chosen for each test. For electrical tests, this is the position leading to the largest heat build-up of the light emitting surface. The orientation of the OLED light source shall be maintained during the entire test.

Integral OLED light sources shall be regarded as integral components of luminaires according to IEC 60598-1:2020, 0.5.1.

In addition to the requirements of this document, independent OLED light sources shall comply with the IEC 60598 series.

5 Marking

5.1 Contents and location

Marking of the OLED light source shall be done in accordance with Table 1.

Table 1 – Contents and location of marking

Parameters	Product	Packaging or product datasheet or leaflet
Manufacturer (or responsible vendor) or trademark	Mandatory	Mandatory
Polarity (in case of DC power supply)	Mandatory	
Neutral or earthing terminal	Mandatory	
Model number or production code	Mandatory	Mandatory
Rated current or rated current range		Mandatory
Rated voltage or rated voltage range		Mandatory
Rated power		Mandatory
Type of power supply (DC or AC) and frequency		Mandatory
Shape and dimension		Mandatory
Connecting information		Mandatory
Mounting instruction		Mandatory
Operating temperature range		Mandatory
IP number		Mandatory
Information for luminaire design		Mandatory

The connecting information shall include methods of mechanical and electrical connection. The information of the electrical connection may include the type of driver.

For marking of the IP number, symbols for degree of protection shall be in accordance with Section 3 of IEC 60598-1:2020.

5.2 Durability and legibility of marking

Marking shall be durable and legible.

Compliance is checked by the following.

- 1) *Presence and legibility of the marking required in 5.1 – by visual inspection.*

- 2) *The durability of the marking is checked by trying to remove it by rubbing lightly for 15 s with a piece of cloth soaked in water. After the test, the marking shall be legible, marking labels shall not be easily removable and they shall show no curling.*
- 3) *Availability of information required in 5.1 – by visual inspection.*

6 Construction

6.1 General

Wood, cotton, silk, paper and similar fibrous material shall not be used as insulation.

Compliance is checked by inspection.

6.2 Mechanical strength

6.2.1 Requirements

The OLED panel shall have sufficient mechanical strength which shall be checked in accordance with 6.2.2.

6.2.2 Vibration test

The OLED light source shall have sufficient mechanical strength.

The following vibration test shall be performed.

Compliance is checked by the vibration test.

For the vibration test, the OLED light source shall be mounted in accordance with 4.2.

A sinusoidal vibration test is conducted in accordance with IEC 60068-2-6 with the following parameters:

- displacement: 0,35 mm;
- acceleration: 50 m/s²;
- frequency range: 10 Hz to 500 Hz;
- axes of vibration: 3;
- duration: 3 × 10 cycles (10 times per axis).

After completion of the vibration test, the OLED light source shall be operated for 15 min under the conditions specified in 4.2.

Compliance is checked as follows:

After the test, the OLED light source is checked by inspection. Any splintered or broken glass is not accepted. Fire, smoke or flammable gas shall not be produced. The OLED light source shall have no loosened parts which could impair safety.

6.3 Internal short circuit

An OLED light source with internal short circuit shall not cause any hazard.

The following internal short test shall be performed.

Compliance is checked by the internal short test.

An internal short circuit shall be provoked intentionally in the OLED light source under test in accordance with instructions given by the manufacturer or in accordance with a method described in Annex C. The location of this internal short circuit shall be close to the edge of the light output area at around 2 mm distance.

Before starting the test, the test sample of the OLED light source shall not be operated.

The test sample of the OLED light source shall be operated at the rated current for 30 min for testing.

If the test sample does not generate an internal short circuit during the test operation, the internal short circuit test shall be repeated with the same sample.

If none of the methods described in the manufacturer's instructions and Annex C generate an internal short circuit after three attempts, the test sample passes the test.

Compliance: An OLED light source passes this test if there is no emission of flames or molten material during the test. Any hot material from the sample shall not ignite a tissue paper, as specified in 4.187 of ISO 4046-4:2016, spread below the OLED light source. Any splintered or broken glass is not accepted.

6.4 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 sharp-edged screws shall not protrude into wireways.

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

6.5 Resistance to dust, solid objects and moisture

If an IP number is rated, the OLED light source shall comply with Section 9 of IEC 60598-1:2020.

NOTE IP numbers for degrees of protection are explained in IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017, Annex J.

7 Mechanical hazard

An OLED light source with glass edges or corners shall be free from sharp edges or points that could create hazards during installation, normal operation or maintenance.

An OLED light source with thin metal foil or thin plastic film shall have protections against sharp edges or points that could create hazards during installation, normal operation, or maintenance.

Compliance is checked by inspection and means of the sharp edge tester in accordance with IEC TR 62854.

8 Fault conditions

8.1 General

An OLED light source shall not impair safety under fault conditions that may occur during the intended use. The fault condition test shall be conducted at an ambient temperature of

$(25 \pm 5)^\circ\text{C}$ unless otherwise specified by the manufacturer or responsible vendor. The temperature shall be maintained within $\pm 2^\circ\text{C}$ during the test.

Compliance is checked by the overload test.

8.2 Overload condition

The OLED light source shall be operated with rated current and the power monitored (at the input side) and the input power shall be increased until 150 % of the rated current or power is reached. The test shall be continued for 15 min.

Compliance is checked by inspection. An OLED light source passes this fault test if there is no emission of flames or molten material during the test. Any hot material from the sample shall not ignite a tissue paper, as specified in 4.187 of ISO 4046-4:2016, spread below the OLED light source. Any splintered or broken glass is not accepted.

8.3 Input stability test

The OLED light source shall be operated with the rated current. The input power and voltage shall be monitored at the input side. The test shall be continued for 15 min.

Compliance is checked as follows:

The voltage shall remain within the range of the rated voltage $\pm 10\%$ during the test.

9 Insulation resistance and electric strength

9.1 General requirements

The requirements of IEC 60598-1:2020, 10.1 and 10.2 apply.

9.2 Insulation resistance

The requirements of IEC 60598-1:2020, 10.2.1 apply.

9.3 Electric strength

The requirements of IEC 60598-1:2020, 10.2.2 apply.

10 Thermal stress

OLED light sources shall sustain thermal stress.

The thermal stress test shall be conducted at a specified ambient temperature in a climate chamber. The temperature shall be any convenient temperature in the range between 60°C and 70°C . The temperature shall be maintained within $\pm 2^\circ\text{C}$ during the stabilization and test.

The OLED light source shall be operated with rated current. After stabilization, the test shall be continued for 60 min.

Compliance is checked by inspection. An OLED light source passes this test if no failure occurs. In case of performance failure, an OLED light source is considered to pass this test, if no fire, smoke or flammable gas is produced. Any splintered or broken glass is not accepted.

11 Creepage distances and clearances

The requirements of IEC 60598-1:2020, Section 11 apply to individual OLED light sources.

12 Resistance to heat and fire

12.1 Resistance to heat

An OLED light source shall have sufficient heat resistance. The exterior of the insulation material should have a function of protection against an electric shock and have heat resistance.

External parts of insulating material providing protection against electric shock, and parts of insulating material retaining live parts in position shall be sufficiently resistant to heat using a ball pressure test in accordance with 13.2.1 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017.

The ball pressure test does not have to be applied to plastic parts of an OLED light source which provide supplementary insulation.

Compliance is checked by the ball pressure test in accordance with 13.2.1 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017.

12.2 Resistance to flame and ignition

Parts of insulating material retaining live parts in position, and external parts of insulating material providing protection against electric shock shall be resistant to flame and ignition.

Compliance is checked by the test of 13.3 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 for materials other than ceramic.

The test specimen is the entire OLED light source.

If the specimen is too small to be tested in a manner mentioned above, the foregoing test shall apply to separated specimens which are made of the same material and are at least 30 mm², each having a thickness identical to the smallest thickness of the OLED light source.

13 Photobiological safety

OLED light sources are not expected to reach a level of UV, infrared or blue light hazard that requires marking, or measurement.

14 Terminals

For screw terminals, the requirements of Section 14 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 shall be used, if applicable.

For screwless terminals, the requirements of Section 15 of IEC 60598-1:2014 and IEC 60598-1:2014/AMD1:2017 shall be used, if applicable.

For connectors, the requirements of IEC 60838-2-2 shall be used, if applicable.