BS EN 62868:2015

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Organic light emitting diode (OLED) panels for general lighting — Safety requirements

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National foreword

This British Standard is the UK implementation of EN 62868:2015. It is identical to IEC 62868:2014.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and Related Equipment, to Subcommittee CPL/34/1, Electric lamps.

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

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English Version

Organic light emitting diode (OLED) panels for general lighting - Safety requirements (IEC 62868:2014)

Panneaux à diodes électroluminescentes organiques (OLED) destinés à l'éclairage général - Exigences de sécurité (IEC 62868:2014)

Organische Licht emittierende Dioden (OLED)-Panels für die Allgemeinbeleuchtung - Sicherheitsanforderungen (IEC 62868:2014)

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European foreword

The text of document 34A/1786/FDIS, future edition 1 of IEC 62868, prepared by IEC/SC 34A "Lamps" of IEC/TC 34 "Lamps and related equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62868:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-05-06
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-10-30

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Endorsement notice

The text of the International Standard IEC 62868:2014 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

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

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

Publication	Year	Title	EN/HD	Year
IEC 60050	series	International electrotechnical vocabulary -- Chapter 00: General index	-	-
IEC 60068-2-6	2007	Environmental testing -- Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60598-1	-	Luminaires -- Part 1: General requirements and tests	EN 60598-1	-
IEC/TR 62854	2014	Sharp edge testing apparatus and test procedure for lighting equipment – Tests for sharpness of edge		
ISO 4046-4	2002	Paper, board, pulps and related terms - Vocabulary -- Part 4: Paper and board grades and converted products	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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

FDIS	Report on voting
34A/1786FDIS	34A/1806/RVD

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

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

In this standard, the following print types are used:

– requirements: roman type,

– *test specifications: italic type,*

– notes: smaller roman type.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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ORGANIC LIGHT EMITTING DIODE (OLED) PANELS FOR GENERAL LIGHTING – SAFETY REQUIREMENTS

1 Scope

This International Standard specifies the safety requirements of OLED tiles and panels for use on d.c. supplies up to 120 V or a.c. supplies up to 50 V at 50 Hz or 60 Hz for indoor and similar general lighting purpose.

NOTE 1 At this moment only test methods for d.c. operated OLED panels are provided. Provisions for a.c. operated OLED panels are under consideration.

NOTE 2 The construction of OLED tiles and panels is illustrated in Annex A.

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

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

IEC 60050 (all parts): *International electrotechnical vocabulary* (available at <http://www.electropedia.org>)

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

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

ISO 4046-4:2002, *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 60050-845 and the following apply.

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 containing an OLED tile and means of connection to electrical supply such as 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
rated value
quantity value for a characteristic of a product for specific operating conditions with the values and the conditions specified in the relevant standard, or assigned by the manufacturer or responsible vendor

3.6
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

3.7
stabilization
keeping an OLED panel switched on under specified electrical input to obtain stable conditions

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

3.8
stabilization time
time, which the OLED panel requires to obtain stable conditions with specified electrical input

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

3.9
dark spot
small area remarkably darker than surrounding light output area on the OLED panel

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

3.10
internal short circuit
unintentional conductive path between 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 panel shall be designed and manufactured in such a way as to operate safely during normal operation and not to cause any danger to persons and the environment.

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

It is understood that reference to an OLED panel also includes reference to OLED tiles in the requirements and tests of this standard.

4.2 General test requirements

The tests, unless otherwise specified, are carried out at an ambient temperature of 25 °C ± 5 °C.

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

The OLED panel under test shall be mounted according to 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 panel shall be maintained during the entire test.

5 Marking

5.1 Contents and location

Marking of the OLED panel shall be done according to Table 1.

Table 1 – Contents and location of marking

Parameters	Product	Packaging or product datasheet or leaflet
Manufacturer (or responsible vendor) or trademark	Mandatory	
Polarity	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 (d.c. or a.c.) 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 IP number, symbols for degree of protection shall be in accordance with Section 3 of IEC 60598-1.

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 panel) 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.

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

The OLED panel shall have sufficient mechanical strength.

Compliance is checked by the vibration test.

For the vibration test, the OLED panel shall be mounted according to 4.2.

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

– displacement: 0,35 mm
– acceleration: 50 m/s^2
– 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 panel shall be operated for 15 min under conditions according to 4.2.

Compliance:

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

Electrical contacts which could not be touched before the vibration test (e.g. those in OLED panels according to Figure A.3 and Figure A.4) shall not have become accessible after the test.

6.3 Internal short circuit

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

Compliance is checked by the following test:

An internal short circuit shall be provoked intentionally in the OLED panel under test according to instructions given by the manufacturer or according to 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 panel shall not be operated.

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

If the test sample does not generate the 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 instruction and Annex C generate an internal short circuit after three attempts, the test sample passes the test.

Compliance: An OLED panel 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 4046-4:2002, spread below the OLED panel. 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.

6.5 Resistance to dust, solid objects and moisture

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

NOTE IP numbers for degrees of protection are explained in IEC 60598-1 Annex J.

7 Mechanical hazard

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

Compliance is checked by inspection and means of the sharp edge tester according to IEC TR 62854.

8 Fault conditions

An OLED panel shall not impair safety under fault conditions that may occur during the intended use.

Compliance is checked with the following overpower test.

The overpower 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.

The OLED panel shall be operated with rated current. The power shall be monitored at the input side. 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 panel 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 4046-4:2002, spread below the OLED panel. Any splintered or broken glass is not accepted.

9 Insulation resistance and electric strength

9.1 Insulation resistance

The requirements according to 10.2.1 of IEC 60598-1 apply.

9.2 Electric strength

The requirements according to 10.2.2 of IEC 60598-1 apply.

10 Thermal stress

OLED panels 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 panel shall be operated with rated current. After stabilization the test shall be continued for 60 min.

Compliance is checked by inspection. An OLED panel passes this test, if no failure occurs. In case of performance failure, an OLED panel 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 applies to individual OLED panels.

12 Resistance to heat and fire

12.1 Resistance to heat

An OLED panel shall have sufficient heat resistance. The exterior of the insulation material should have a function of protecting 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.

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

Compliance is checked by the ball pressure test according to13.2.1 of IEC 60598-1.

12.2 Resistance to fire

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 Section 13 of IEC 60598-1 for materials other than ceramic.

The test specimen is the entire OLED panel.

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 30 mm^2, each having a thickness identical to the smallest thickness of the OLED panel.

13 Photobiological safety

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

14 Terminals

For screw terminals, the requirements of Section 14 of IEC 60598-1 shall be used, if applicable.

For screwless terminals, the requirements of Section 15 of IEC 60598-1 shall be used, if applicable.

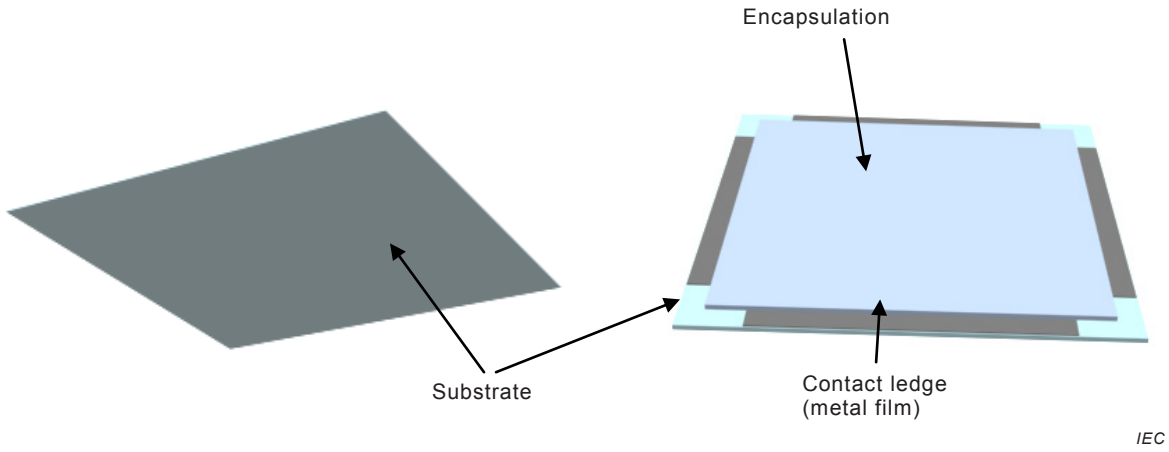
15 Information for luminaire design

Information is given in Annex B.

Annex A
(informative)

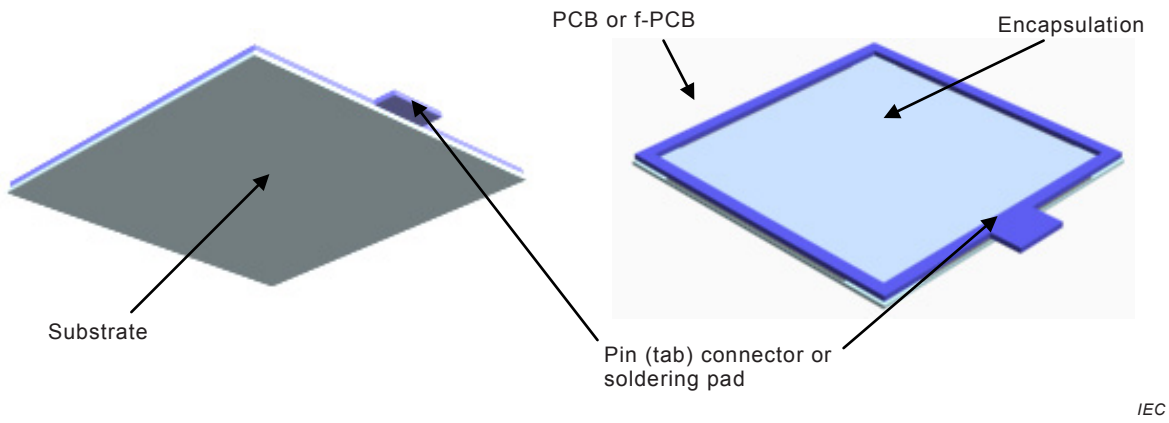
Construction of OLED panels

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



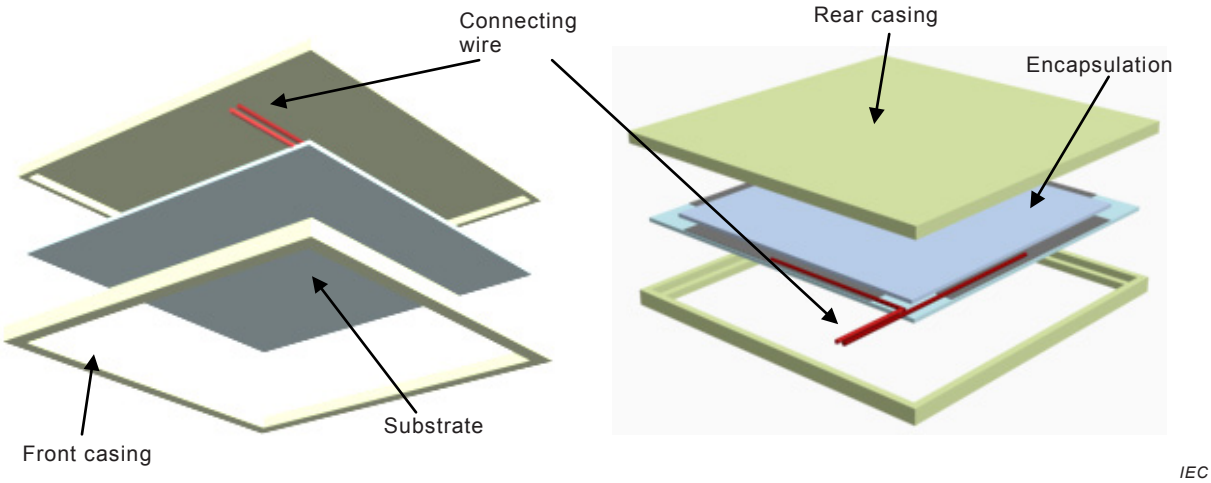
NOTE The front view is given on the left and the rear view on the right. The OLED tile is the most elementary OLED product consisting of a substrate, encapsulation, OLED stack and metal ledge without a printed circuit board (PCB), electrical connecting parts, and casing.

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



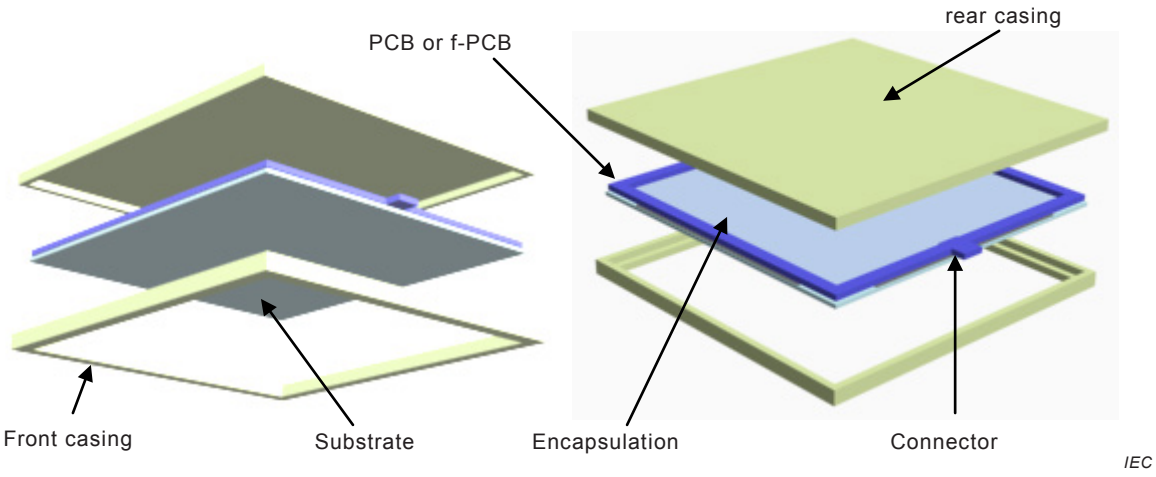
NOTE The front view is given on the left and the rear view on the right. The OLED panel (Example 1) consists of OLED tile and PCB or flexible PCB for electrical contacts, and electrical connecting parts.

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



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 an external casing.

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



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 an 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 panels.

An internal short circuit has a resistance significantly lower than that of the organic electroluminescent layers. This alters the current distribution through the OLED panel and usually leads to a significantly increased current density at the location of the internal short circuit. As a result, (parts of) the OLED panel 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 panel 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 panel 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 panel 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 panel is powered for the first time.

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

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 panel;
– ignition of flammable materials placed on the OLED panel by users;
– faults of other components due to operation under abnormal conditions;
– splinters, melting material etc. covered in 6.3 of this standard.

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 panel fault conditions compared with conventional lamps (OLED panels are often touchable in normal operation but may be hot in fault conditions);
– appearance (visibility) of internal short circuit to user;
– accessibility of OLED panel and internal short circuit;
– temperature increase from internal short circuits compared to normal operating temperatures of the OLED panel;
– temperature generated by internal short circuits and burn thresholds for skin (compare IEC Guide 117);
– total power dissipated in the internal short circuit.

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

Annex C
(normative)

Method of provoking 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 be applied as short as necessary and shall be removed immediately when a short has been created. In case the final product 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 for provoking treatment of the internal short circuit and then reattach the peeled off layer to the glass after the treatment.

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

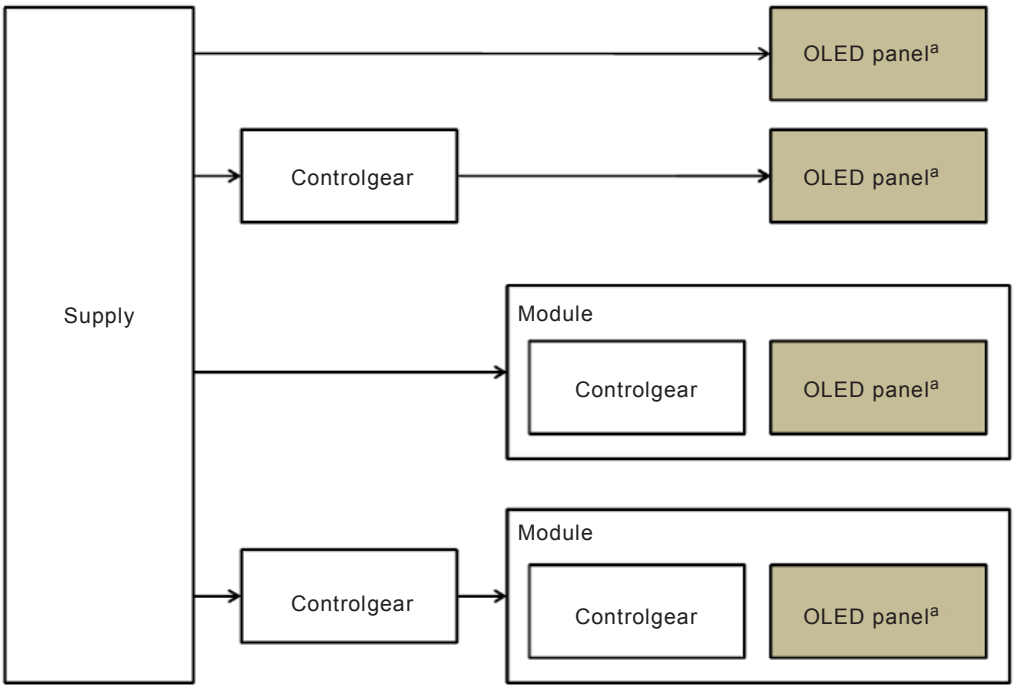
In the case of an OLED panel equipped with a flexible plastic substrate, the internal short circuit shall be provoked by applying vertical pressure on the surface of the panel with round tip of steel for about 1 s. The temperature of the tip shall be 25 °C ± 5 °C and the radius of curvature of the round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

C.3 Other methods

Under consideration

Annex D
(informative)

Overview of the OLED lighting system consisting of OLED panel or module



[a] In scope if output of controlgear or supply is up to 120 V d.c. or 50 V a.c. at 50 Hz or 60 Hz

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

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