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INTERNATIONAL STANDARD

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Organic light emitting diode (OLED) light sources for general lighting – Safety – Part 2-3: Particular requirements – Flexible OLED tiles and panels

Sources lumineuses à diodes électroluminescentes organiques (OLED) destinées à l'éclairage général – Sécurité – Partie 2-3: Exigences particulières – Dalles et panneaux OLED flexibles

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IEC 62868-2-3 has been prepared by subcommittee 34A: Electric light sources, of IEC technical committee 34: Lighting. It is an International Standard.

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

Draft	Report on voting
34A/2254/FDIS	34A/2261/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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.

This International Standard is to be used in conjunction with IEC 62868-1:2020.

In this document, the following print type is used:

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

Part 2-3: Particular requirements – Flexible OLED tiles and panels

1 Scope

This part of IEC 62868 specifies the safety requirements for flexible organic light emitting diode tiles and panels for use on supplies up to 120 V ripple free DC for indoor and similar general lighting purposes and designed for being bent during the manufacturing process of curved luminaires.

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 61747-40-1:2019, *Liquid crystal display devices – Part 40-1: Mechanical testing of display cover glass for mobile devices – Guidelines*

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

IEC 62715-6-3:2020, *Flexible display devices – Part 6-3: Mechanical test methods – Impact and hardness tests*

IEC 62868-1:2020, *Organic light emitting diode (OLED) light sources for general lighting – Safety – Part 1: General requirements and tests*

IEC TS 62972:2016, *General lighting – Organic light emitting diode (OLED) products and related equipment – Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62504, IEC 62868-1 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/
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3.1
flexible OLED
OLED that is mechanically bendable in one or more of the steps of substrate handling, manufacturing, storage, use, operation, shipping, and relocation

3.2
flexible OLED tile
smallest functional flexible OLED which cannot be separated into smaller flexible 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
flexible OLED panel
independently operable unit flexible OLED product containing a flexible OLED tile and means of connection to the electrical supply such as a connector, printed circuit board (PCB), passive electronic components and optionally a frame

3.4
glass-based flexible OLED
flexible OLED light source having a substrate and/or encapsulation material that are composed of thin glass

3.5
film-based flexible OLED
flexible OLED light source having components that are made of either barrier film or metal foil

3.6
barrier film
<for OLED product> film that keeps water vapour out of an OLED light source

3.7
minimum bending radius
<of safety> limit radius to which the flexible panel may be bent in either a convex or concave curvature without damaging the panel

3.8
maximum bending cycle
<of safety> maximum number of times a flexible panel may be bent without damaging the panel

3.9
as-received
representative of standard sample preparation and handling practices, and therefore free of intentional mechanical damage such as abrasion, scratching, or indentation

Note 1 to entry: The strength of glass is not an intrinsic material property, and like other brittle elastic materials, is highly dependent upon the surface flaw population. The term "as-received" is meant to represent the surface condition upon specimen receipt and is distinguished from a condition where damage has been intentionally introduced prior to testing.

[SOURCE: IEC 61747-40-1:2019, 3.2]

4 General

4.1 General requirements

The requirements of IEC 62868-1:2020, 4.1 apply.

4.2 General test requirements

The requirements of IEC 62868-1:2020, 4.2 apply.

The tests shall be carried out using a flexible OLED panel bent with the minimum bending radius specified by the manufacturer. For those flexible panels which are specified for a specific curvature, the test shall be conducted using the shape and condition specified by the manufacturer in the installation instructions.

Stabilization shall be conducted in the same conditions, for example the position and flat or bent, as the tests.

5 Marking

5.1 Contents and location

The requirements of IEC 62868-1:2020, 5.1 apply. IEC 62868-1:2020, Table 1 applies together with Table 1 of this document.

Table 1 – Additional marking

Parameters	Product	Packaging or product datasheet or leaflet
Flexible OLED classification[a]		Mandatory
Minimum bending radius[b]		Mandatory
Maximum bending cycles[b]		Mandatory
[a] See Table B.1 for flexible OLED classification. [b] These values can be different from those of the performance.		

5.2 Durability and legibility of marking

The requirements of IEC 62868-1:2020, 5.2 apply.

6 Construction

6.1 General

The requirements of IEC 62868-1:2020, 6.1 apply.

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

6.2 Mechanical strength

6.2.1 Requirements

The OLED panel shall have sufficient mechanical strength which shall be checked by 6.2.2 and 6.2.3.

6.2.2 Vibration test

Compliance is checked by carrying out the test in accordance with IEC 62868-1:2020, 6.2.

6.2.3 Strength and impact test

The strength and impact test shall be conducted depending on the classification of the OLED panel (see Annex B and Table B.1).

a) Glass-based flexible OLED product

The strength and impact test shall be conducted according to Table 2, in accordance with IEC 61747-40-1:2019, 5.1, 5.2 and 5.4.

Test (1) shall be conducted if the edges of bare panels are exposed after installation in the luminaire. As long as the panel is installed into the luminaire and no edge has been exposed, this test is not mandatory.

Where no glass edge is exposed, such as being installed into a luminaire or being covered with protecting films, tests (2) and (3) shall be conducted.

Where no glass surface is exposed, such as being installed into a luminaire or being covered with protecting films, tests (1) and (2) shall be conducted.

Table 2 – Mechanical attributes and measurement methods

Test	Failure location	Failure mechanism	Subject (typical)	Attribute	Test method	Unit	Corresponding document
(1)	Edge	Overstress of edge flaws	As-received glass	Edge strength	Uniaxial flexure strength (four-point bend)	MPa	IEC 61747-40-2
(2)	Surface	Overstress from blunt impact	As-received glass	Surface impact resistance	Biaxial flexure energy-to-failure (ball drop)	J	IEC 61747-40-3
(3)	Surface	Overstress of surface flaws	As-received glass	Surface strength	Biaxial flexure stress (ring-on-ring)	N	IEC 61747-40-4
(4)	Surface	Sharp contact damage introduction propagated by central tension under rigid support condition	As-received glass	Resistance against surface sharp contact damage and propagation under rigid support condition	Sharp contact impact under rigid support condition (ball drop on coated abrasives)	J	IEC 61747-40-5
(5)	Surface	Sharp contact damage in combination with or followed immediately by flexural stress	Abraded glass	Retained strength	Abraded biaxial flexural strength (abraded ring-on-ring)	N	IEC 61747-40-6
NOTE This table is reproduced from IEC 61747-40-1:2019, Table 1.							

Compliance:

Compliance is checked by carrying out the following tests specified in Table 2.

After each test, the OLED panel is checked by inspection. As the inside of the panel might have been damaged, conducting fault condition check is desirable. Fault condition is checked in accordance with 8.1. The OLED product shall be deemed to have failed the test if:

- *any of the glass is splintered or broken,*
- *fire, smoke or flammable gas is produced,*
- *there are any loosened parts which could impair safety.*

b) Film-based flexible OLED panel

Impact testing for film-based flexible OLED panels shall be carried out by the following tests, in accordance with IEC 62715-6-3:2020, 6.2 to 6.5:

- ball drop test;
- hitting test;
- pendulum side impact test;
- scratch and abrasion test.

Compliance:

After the tests, the OLED panel shall be checked by inspection. As the inside of the panel might have been damaged, conducting a fault condition check is desirable. Fault condition is checked in accordance with 8.1. The OLED panel shall be deemed to have failed the test if:

- *fire, smoke or flammable gas is produced,*
- *there are any loosened parts which could impair safety.*

6.3 Internal short circuit

The requirements of IEC 62868-1:2020, 6.3 apply.

6.4 Wireways

The requirements of IEC 62868-1:2020, 6.4 apply.

6.5 Resistance to dust, solid objects and moisture

The requirements of IEC 62868-1:2020, 6.5 apply.

7 Mechanical hazard

The requirements of IEC 62868-1:2020, Clause 7 apply.

8 Fault conditions

8.1 General

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