

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Flexible organic light emitting diode (OLED) panels for general lighting –
Performance requirements**

**Panneaux à diodes électroluminescentes organiques (OLED) flexibles destinés à
l'éclairage général – Exigences de performance**

<https://standards.iteh.ai/catalog/standards/sist/598b4a8a-7f3d-4d21-b694-d67dec11fffa/iec-63286-2022>



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

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Draft	Report on voting
34A/2291/FDIS	34A/2303/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.

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

1 Scope

This document specifies the performance requirements of 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.

The requirements of this document relate only to type testing.

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 60050-845, *International Electrotechnical Vocabulary (IEV) – Part 845: Lighting*, available at <http://www.electropedia.org>

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

[IEC 63286:2022](#)

IEC 62868-2-3, *Organic light emitting diode (OLED) light sources for general lighting – Safety – Part 2-3: Particular requirements – Flexible OLED tiles and panels*

IEC 62922:2016, *Organic light emitting diode (OLED) panels for general lighting – Performance requirements*
IEC 62922:2016/AMD1:2021

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

CIE 025:2015, *Test Method for LED Lamps, LED Luminaires and LED Modules*

CIE S 025-SP1:2019, *Test Method for OLED Luminaires and OLED Light Sources*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-845, IEC 62504, IEC 62868-2-3, IEC 62922, and IEC TS 62972 and the following apply.

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3.1 minimum bending radius

<of performance> limit radius to which a flexible OLED panel can be bent in either a convex or concave curvature without causing an operating failure

Note 1 to entry: The minimum bending radius is normally declared by the manufacturer or responsible vendor.

3.2 maximum bent condition

condition of the panel bent to the minimum bending radius

3.3 maximum bending cycle

<of performance> maximum number of times a flexible OLED panel can be bent in either a convex and concave curvature without causing an operating failure

Note 1 to entry: The maximum bending cycle is normally declared by the manufacturer or responsible vendor.

3.4 convex configuration convex curvature

configuration where a flexible OLED is curved along a surface of curvature with its light-emitting side directed outward

3.5 concave configuration concave curvature

configuration where a flexible OLED is curved along a surface of curvature with its light-emitting side directed inward

3.6 flat configuration

configuration where a flexible OLED is without curvature whatever the direction

4 General statement and test conditions

4.1 General

The requirements of this document apply in addition to the requirements of IEC 62868-2-3.

It is understood that reference to a flexible OLED panel also includes reference to flexible OLED tiles in the requirements and tests of this document.

4.2 General test conditions

Unless otherwise specified, all measurements shall be made in an ambient temperature of (25 ± 5) °C under a draught-free condition.

The tests shall be carried out using a flexible OLED panel in the maximum of three configurations: flat configuration under the test conditions specified in IEC 62922, bent to the maximum bent condition specified by the manufacturer in both the concave and convex configurations. For those flexible OLED panels which are specified for a specific curvature, the test for the bent condition shall be conducted using a shape and condition specified by the manufacturer.

The tests shall be conducted at the rated current or voltage unless otherwise specified in this document.

The test conditions for constant current and constant voltage operation according to IEC 62922:2016, 4.2 apply.

4.3 Stabilization

4.3.1 General requirements for stabilization

Stabilization is conducted in a draught-free room at a temperature of $(25 \pm 5) ^\circ\text{C}$. The temperature shall be maintained within $\pm 2 ^\circ\text{C}$ during stabilization. The temperature shall be measured in the integrating sphere or the point within 1,5 m from the OLED panel. If stabilization conditions, according to 4.3.2 or 4.3.3, are not achieved within 60 min, the measurement may be started and the observed fluctuations shall be reported.

Stabilization shall be carried out using a flexible OLED panel bent to the maximum bent condition. For those flexible OLED panels which are specified for a specific curvature, the test shall be conducted using the shape and condition specified by the manufacturer.

4.3.2 Current-driven stabilization

The requirements according to IEC 62922:2016, 4.3.2 apply.

4.3.3 Voltage-driven stabilization

The requirements according to IEC 62922:2016, 4.3.3 apply.

5 Marking

5.1 Mandatory marking

Information on the parameters shown in Table 1 shall be provided by the manufacturer or responsible vendor and be located as described.

Table 1 – Mandatory marking and location of marking

Parameters	Configuration	Product	Packaging	Product data sheet, leaflet or website
a) Rated total luminous flux (lm)	flat			x
	convex			x
	concave			x
b) Rated average luminance (cd/m^2)	flat			x
	convex			x
	concave			x
c) Rated chromaticity coordinates and chromaticity coordinates range	flat			x
	convex			x
	concave			x
d) Rated correlated colour temperature (K)	flat			x
	convex			x
	concave			x
e) Rated colour rendering index	flat			x
	convex			x
	concave			x
f) Rated luminous efficacy (lm/W)	flat			x

Parameters	Configuration	Product	Packaging	Product data sheet, leaflet or website
	convex			x
	concave			x
g) Luminous intensity distribution	flat			x
	convex			x
	concave			x
h) Luminance uniformity (%)	flat			x
	convex			x
	concave			x
i) Surface chromaticity uniformity	flat			x
	convex			x
	concave			x
j) Angular chromaticity uniformity	flat			x
	convex			x
	concave			x
k) Minimum bending radius ^a (performance) (mm)	convex	x		
	concave	x		
l) Maximum bending cycle ^a (performance) (times)	convex	x		
	concave	x		
m) Rated median useful life (h)	flat			x
	convex			x
	concave			x
n) Rated luminous flux maintenance factor (%)	flat			x
	convex			x
	concave			x
o) Rated maintained operating voltage (V)	flat			x
	convex			x
	concave			x
p) Rated maintained chromaticity	flat			x
	convex			x
	concave			x

^a These values can be different from those of safety.

5.2 Additional marking

For flexible OLED panels, additional information of the parameters related to configurations other than flat or the maximum bent condition, may be provided by the manufacturer or responsible vendor. See Table 2 as an example.

Table 2 – Additional marking

Parameters	Configuration				
	flat	Additional bending radius (convex or concave)			Minimum bending radius
		XX ₁ (mm) ^a	XX ₂ (mm) ^a	XX _n (mm) ^a
a) rated luminous flux (lm)	YYY ₀ ^a	YYY ₁ ^a	YYY ₂ ^a	YYY _n ^a
b) rated average luminance uniformity (%)	ZZZ ₀ ^a	ZZZ ₁ ^a	ZZZ ₂ ^a	ZZZ _n ^a

^a Values to be declared by the manufacturer or responsible vendor.

5.3 Information on reliability of electrical connection

The requirements according to IEC 62922:2016, 5.2 apply.

6 Initial photometric and electrical characteristics

6.1 General

The initial photometric and electrical measurement of the flexible OLED panel shall be conducted in the flat configuration, the maximum bent condition and other configurations if declared according to Table 2.

The panel shall be supported by a semi-cylinder for each configuration.

In case some measurements cannot be conducted in the maximum bent condition, appropriate conditions shall be declared in the data sheet.

The initial values of photometric characteristics shall be measured after stabilization of the flexible OLED panel.

For operation, stabilization and test conditions of the flexible OLED panel, 4.2 and 4.3 apply.

Unless otherwise specified, for general conditions of photometric and colorimetric measurements, CIE S 025 and CIE S 025-SP1 shall apply.

6.2 Input power

The input power test of the flexible OLED panel shall be conducted with the rated DC current or DC voltage.

Compliance:

For all the tested samples, the measured input power shall not exceed the rated power by more than 10 % after stabilization.

6.3 Luminous flux

For the measurement of the luminous flux of a flexible OLED panel in the flat configuration, IEC 62922:2016, 7.2 applies. For the convex or concave configurations, Annex A applies.

Compliance:

For all the tested samples, the initial luminous flux (flat configuration), the initial luminous flux (convex configuration) and the initial luminous flux (concave configuration) shall not deviate by more than 10 % from the rated initial values.

6.4 Luminous efficacy

A flexible OLED panel efficacy shall be calculated from the measured initial luminous flux of the individual OLED panel, divided by the measured initial input power of the same individual flexible OLED panel in each configuration.

Compliance:

For all the tested samples, the initial luminous efficacy (flat configuration), the initial luminous efficacy (convex configuration) and the initial luminous efficacy (concave configuration) shall not be less than 90 % of their respective rated initial values.

6.5 Chromaticity coordinates

If the spectral information is obtained through the luminous flux measurement, the chromaticity coordinates can be calculated in accordance with IEC 62922:2016, 7.4 and IEC 62922:2016/AMD1:2021, 7.4. Otherwise, the spectral power distribution measurement shall be conducted and the chromaticity coordinates shall be calculated from the spectral distribution in each configuration and shall be reported. For the bent configurations, Annex A applies.

The measurement set-up shall correspond to the OLED panel configuration as specified in Annex A for the selected measurement method.

Compliance:

Where only a rated chromaticity coordinate pair is given in the data sheet: the chromaticity difference $\Delta(u',v')$ between the rated and measured chromaticity coordinates shall be less than 0,005. Where a range of chromaticity coordinates is declared, the measured chromaticity coordinates of an OLED panel shall not fall outside the rated range of chromaticity coordinates.

6.6 Correlated colour temperature (CCT)

If the spectral information is obtained through the luminous flux measurement, the CCT can be calculated in accordance with IEC 62922:2016, 7.5. Otherwise, the spectral power distribution measurement shall be conducted and the CCT shall be calculated from the spectral distribution in each configuration and shall be reported. For the bent configurations, Annex A applies.

The measurement set-up shall correspond to the OLED panel configuration as specified in Annex A for the selected measurement method.

A requirement is not needed here as it is given for chromaticity coordinates already.

6.7 Colour rendering index (CRI)

If the spectral information is obtained through the luminous flux measurement, the CRI can be calculated in accordance with IEC 62922:2016, 7.6. Otherwise, the spectral power distribution measurement shall be conducted and the CRI shall be calculated from the spectral distribution in each configuration and shall be reported. For the bent configurations, Annex A applies.

The measurement set-up shall correspond to the OLED panel configuration as specified in Annex A for the selected measurement method.

Compliance:

The calculated values of the initial CRI shall not be lower than 5 points from the rated CRI of the same configuration.

6.8 Average luminance

6.8.1 Initial average luminance (flat configuration)

The initial average luminance of a flexible OLED panel in flat configuration is measured in accordance with IEC 62922:2016, 7.7.1 and IEC 62922:2016/AMD1:2021, 7.7.1. The measurement point locations on the flexible panel shall be the same as the locations specified in IEC 62922:2016/AMD1:2021, Clause G.4.

Compliance:

For all the tested samples, the initial average luminance (flat configuration) shall not deviate by more than 10 % from the rated initial average luminance (flat configuration).

6.8.2 Initial average luminance (convex configuration)

A flexible OLED panel shall be placed on a semi-cylindrical base whose radius is the minimum bending radius in the convex configuration. The number and the positions of the spots on the flexible OLED panel to be measured shall be identical to the flat configuration. For the measurement, Annex A applies.

The arithmetic average of all luminance values of the measured areas is taken as the initial average luminance in the convex configuration.

Compliance:

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For all the tested samples, the initial average luminance (flat configuration) shall not deviate by more than 10 % from the rated initial average luminance (flat configuration).

6.8.3 Initial average luminance (concave configuration)

A flexible OLED panel shall be placed on a semi-cylindrical base whose radius is the minimum bending radius in the concave configuration. The number and the positions of the spots on the flexible OLED panel to be measured shall be identical to the flat configuration. For the measurement, Annex A applies.

The arithmetic average of all luminance values of the measured areas is taken as the initial average luminance in the concave configuration.

Compliance:

For all the tested samples, the initial average luminance (flat configuration) shall not deviate by more than 10 % from the rated initial average luminance (flat configuration).

6.9 Luminance uniformity

The initial luminance uniformity shall be not more than 5 % (flat configuration)/15 % (convex or concave configuration) below the rated luminance uniformity.

The initial luminance uniformity shall be calculated from the luminance distributions derived from the average luminance measurement. The initial luminance uniformity in the flat, convex and concave configurations are derived from the average luminance distribution measured in each configuration, respectively. The luminance uniformity, U (expressed in per cent), of the panel is characterized by the following formula, as specified in IEC 62922. L_{\max} and L_{\min} denote the maximum and the minimum luminance values in the measured luminance distribution for each configuration.

$$U = \left[1 - (L_{\max} - L_{\min}) / (L_{\max} + L_{\min}) \right] \times 100 = \left[2 \times L_{\min} / (L_{\max} + L_{\min}) \right] \times 100\% \quad (1)$$

6.10 Luminous intensity distribution

Luminous intensity distribution data shall be available. This data shall be provided in accordance with an established international or regional format. It shall be available in an electronic file format (see IEC 62922:2016, Annex A).

The luminous intensity distributions shall be obtained for the flexible panel in flat, convex and concave configurations. Unless otherwise specified by the manufacturer, the luminous intensity distribution of a flexible OLED panel shall be measured in far-field conditions, where the inverse-square law is sufficiently satisfied.

6.11 Surface chromaticity uniformity

The chromaticities at different points of the grid specified in IEC 62922:2016/AMD1:2021, Clause G.4 are measured. These chromaticity coordinates are used to determine the chromaticity difference between all pairs of areas i and j , where $i \neq j$ by applying Formula (2).

$$\Delta(u', v')_{ij} = \sqrt{(u'_i - u'_j)^2 + (v'_i - v'_j)^2} \quad (2)$$

The surface chromaticity uniformity is defined as the largest chromaticity difference $\Delta(u', v')_{ij}$ between any two areas.

The surface chromaticity uniformity is calculated in flat, convex and concave configurations, based on the corresponding data set.

Compliance:

The surface chromaticity uniformity values for flat, convex and concave configurations shall not deviate by more than 0,003 from their respective rated values.

6.12 Angular chromaticity uniformity

For the measurement of the angular chromaticity uniformity of a flexible OLED panel in flat, convex and concave configurations, Annex A shall apply.

The angular chromaticity uniformity is the average of the chromaticity differences between all pairs of chromaticity coordinates.

Compliance:

The angular chromaticity uniformity values for flat, convex and concave configurations shall not deviate by more than 0,003 from their respective rated values.