

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Organic light emitting diode (OLED) displays –
Part 5: Environmental testing methods

Afficheurs à diodes électroluminescentes organiques (DELO) –
Partie 5: Méthodes d'essai d'environnement

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –**Part 5: Environmental testing methods**

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

FDIS	Report on voting
110/192A/FDIS	110/203/RVD

Full information on the voting for the approval on 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.

A list of all the parts in the IEC 62341 series, under the general title *Organic light emitting diode (OLED) displays*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

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- withdrawn;
- replaced by a revised edition, or
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ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –

Part 5: Environmental testing methods

1 Scope

This part of IEC 62341 defines testing methods for evaluating environmental endurance of organic light emitting diode display modules (OLED display modules) for use and storage under the assumed usage environment.

2 Normative references

The following referenced documents are indispensable for the application 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, *International Electrotechnical Vocabulary (IEV)*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-5, *Environmental testing – Part 2: Tests – Test Sa: Simulated solar radiation at ground level*

IEC 60068-2-13, *Environmental testing – Part 2: Tests-Test M: Low air pressure*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61747-5:1998, *Liquid crystal and solid-state display devices – Part 5: Environmental, endurance and mechanical test methods*

IEC 62341-1-2, *Organic light emitting diode displays – Part 1-2: Terminology and letter symbols*

IEC 62341-6-1:2009, *Organic light emitting diode displays – Part 6-1: Measuring methods of optical and electro-optical parameters*

3 Terms, definitions and letter symbols

For the purpose of this document, the terms, definitions and symbols defined in IEC 62341-1-2, IEC 60068-1 and IEC 60050, as well as the following apply.

3.1 operating test pressure

P_{op}
air pressure at which the OLED display module is operated during the tests

3.2 storage test pressure

P_{st}
air pressure at which the OLED display module is stored in a non-operating state during the tests

4 Structure of testing equipment

The system diagrams and/or operating conditions of the testing equipment shall comply with the structure specified in each item.

5 Standard conditions

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5.1 Standard reference atmosphere (standards.iteh.ai)

Temperature: 25 °C

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Air pressure: 101,3 kPa

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NOTE No requirement for relative humidity is given because correction by calculation is generally not possible.

If the parameters to be measured depend on temperature and/or pressure, and their dependence on temperature and pressure is known, the parameter values can be measured under the conditions specified in 5.3 and corrected by calculation to the standard reference atmosphere above.

5.2 Standard atmospheric conditions for reference measurements and tests

If the parameters to be measured depend on temperature, pressure and humidity and their dependence on temperature, pressure and humidity is unknown, the atmospheres to be specified shall be selected from the following values, as shown in Table 1. The selected values shall be noted in the relevant specifications.

Table 1 – Standard conditions for reference measurements and tests

Temperature ^a °C	Relative humidity ^b % RH	Air pressure ^b kPa
20 ±2/ ±1 25 ±2/ ±1 30 ±2/ ±1 35 ±2/ ±1	45 to 75	86 to 106
^a The close tolerances may be used for the reference measurements. The wider tolerances may be used only when allowed by the relevant specification ^b Inclusive values.		

5.3 Standard atmospheric conditions for measurements and tests

Unless otherwise specified, all tests and measurements shall be carried out under standard atmospheric conditions.

- a) Temperature : 15 °C to 35 °C.
- b) Relative humidity : 25 % to 85 %, where appropriate.
- c) Air pressure : 86 kPa to 106 kPa.

The absolute humidity of the atmosphere shall not exceed 22 g/m³.

5.4 Standard atmospheric conditions for assisted drying

The conditions specified in 5.5 of IEC 60068-1:1988 shall be applied.

5.5 Recovery conditions

The recovery conditions specified in 5.4 of IEC 60068-1:1988 shall be applied.

5.6 Standard measuring conditions

The standard measuring conditions specified in IEC 62341-6-1:2009 shall be applied.

5.7 Operating conditions (standards.iteh.ai)

Apply a white level (100 % grey level) to the full screen of the OLED display module. For some display applications (such as video and still images), the luminance can be reduced.

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Table 2 shows some examples of combinations of applications and luminance levels.

Table 2 – Application and luminance (examples)

Display applications	Full screen luminance
TVs	15 % (of the 4 % window luminance)
Digital camera	20 % (of the 4 % window luminance)
Cell phone	30 % (of the 4 % window luminance)

NOTE The 4 % window luminance is defined in IEC 62341-6-1:2009, 6.1.3.2.

If different conditions are used, they shall be noted in the report.

5.8 Standard OLED display module test configuration

Unless otherwise specified, the OLED display modules shall be tested without any protective elements added, nor voltage applied.

6 Measurements and analysis

The following items may be evaluated on initial, intermediate and final measurements:

- a) visual examination and inspection;
- b) optical performance;

c) electro-optical performance.

The measuring method, measuring frequency and evaluation criteria shall be specified in the detailed specifications.

7 Environmental tests

7.1 General

The actual values used for all measurements such as temperature shall be noted in the report.

The environmental testing method is often used as one of several endurance testing methods. When the testing method defined in this standard is used as one of these endurance testing methods, review the testing period and/or conditions appropriately as specified in the relevant specification.

7.2 Storage at high temperature

7.2.1 Purpose

The purpose of this test is to check the performance of the OLED display module after high temperature storage.

7.2.2 Storage conditions

Test Bb of IEC 60068-2-2:2007 shall be applied with the following specific conditions.

Test Bb: Dry heat for non heat-dissipating specimens with gradual change of temperature.

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a) Temperature <https://standards.iteh.ai/catalog/standards/sist/6f36eca6-c6cc-4dfe-b7cb-112bb0a34bde/iec-62341-5-2009>

The temperature shall be selected from the values given below depending on application.

$(X \pm 3) ^\circ\text{C}$ ($X = 100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30$)

The temperature used shall be noted in the report.

b) Duration

The duration shall be selected from the values given below depending on application.

2 h, 16 h, 24 h, 48 h, 72 h, 96 h, 120 h, 192 h, 240 h, 300 h, 500 h and 1 000 h

The duration used shall be noted in the report.

c) Humidity

The absolute humidity of the atmosphere should not exceed 20 g/m^3 (corresponding approximately to 50 % relative humidity at $35 ^\circ\text{C}$).

7.2.3 Recovery

The OLED display module shall be subjected to the recovery procedure in the chamber or otherwise as appropriate.

a) The OLED display module shall then remain under standard atmospheric conditions for recovery for a period adequate for the attainment of temperature stability.

- b) If required by the relevant specification, the OLED display module shall be switched on or loaded and measured continuously during the recovery period.
- c) If the standard conditions given above are not appropriate for the OLED display module to be tested, the relevant specification may call for other recovery conditions.

7.3 Storage at low temperature

7.3.1 Purpose

The purpose of this test is to check the performance of the OLED display module after low temperature storage.

7.3.2 Storage conditions

Test Ab of IEC 60068-2-1:2007 shall be applied with the following specific conditions.

Test Ab: Cold for non heat-dissipating specimens with gradual change of temperature.

a) Temperature

The temperature shall be selected from the values given below depending on application.

$$(X \pm 3) \text{ }^{\circ}\text{C} \quad (X = -50, -45, -40, -35, -30, -25, -20, -15, -10, -5, 0)$$

The temperature used shall be noted in the report.

b) Duration

The duration shall be selected from the values given below depending on application.

2 h, 16 h, 24 h, 48 h, 72 h, 96 h, 120 h, 192 h, 240 h, 300 h, 500 h and 1 000 h

The duration used shall be noted in the report.

7.4 Damp heat, steady state, non-operational

7.4.1 Purpose

The purpose of this test is to check the performance of the OLED display module after high temperature and high humidity storage.

7.4.2 Storage conditions

IEC 60068-2-78:2001 shall be applied with the following specific conditions.

a) Temperature

The temperature shall be selected from the values given below depending on application.

$$(X \pm 3) \text{ }^{\circ}\text{C} \quad (X = 60, 55, 50, 45, 40, 35, 30)$$

The temperature used shall be noted in the report.

b) Humidity (93 ± 3) % RH or (85 ± 3) % RH

The humidity used shall be noted in the report.

c) Duration

The duration shall be selected from the values given below depending on application.

2 h, 16 h, 24 h, 48 h, 72 h, 96 h, 120 h, 192 h, 240 h, 300 h, 500 h and 1 000 h

The duration used shall be noted in the report.

7.5 Operation at high temperature

7.5.1 Purpose

The purpose of this test is to check the performance of the OLED display module during and after operation at high temperature operating conditions.

7.5.2 Test conditions

Test Bd or Be of IEC 60068-2-2:2007 shall be applied with the following specific conditions.

The relevant specification shall define the Test (Bd or Be) to be used.

Depending on application, the combination of temperature and operating time should be considered.

Test Bd: Dry heat for heat-dissipating specimens with gradual change of temperature that are not powered during the conditioning period.

Test Be: Dry heat for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test.

a) Temperature

The temperature shall be selected from the values given below depending on application.

$(X \pm 3) ^\circ\text{C}$ (X = 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30)

The temperature used shall be noted in the report.

b) Operating time

The operating time at test temperature shall be selected from the values given below depending on application.

2 h, 4 h, 8 h, 12 h, 24 h, 48 h, 72 h and 96 h

The operating time used shall be noted in the report.

c) Operating conditions

The operating conditions are specified in 5.7.

7.6 Operation at low temperature

7.6.1 Purpose

The purpose of this test is to check the performance of the OLED display module during and after operation at low temperature operating conditions.