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INTERNATIONAL STANDARD

colour inside

Printed electronics – Part 502-2: Quality assessment – Organic light emitting diode (OLED) elements – Combined mechanical and environmental stress test methods for flexible OLED elements

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FOREWORD

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International Standard IEC 62899-502-2 has been prepared by IEC technical committee 119: Printed Electronics.

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

FDIS	Report on voting
119/271/FDIS	119/278/RVD

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

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

A list of all parts in the IEC 62899 series, published under the general title *Printed electronics*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Electronic devices made by printing processes have very unique characteristics, as they are flexible, with foldable, rollable and/or conformable capabilities, compared to the electronic devices made through conventional non-printing processes that are mostly rigid. Given these characteristics, these devices can show different phenomena from those by non-printing processes under some conditions. In order to evaluate these phenomena, several unique evaluation methods are used for these devices made by the printing process. This document will provide one of them.

PRINTED ELECTRONICS –

Part 502-2: Quality assessment – Organic light emitting diode (OLED) elements – Combined mechanical and environmental stress test methods for flexible OLED elements

1 Scope

This part of IEC 62899 specifies the combined mechanical and environmental stress test methods for flexible OLED (organic light emitting diode) elements fabricated using the printing method. Mechanical stress tests include the static and cycling vending test, and the dynamic and static rolling test.

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 60068-1:2013, *Environmental testing – Part 1: General and guidance*

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

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

IEC 62341-6-2, *Organic light emitting diode (OLED) displays – Part 6-2: Measuring methods of visual quality and ambient performance*

IEC 62341-6-3, *Organic light emitting diode (OLED) displays – Part 6-3: Measuring methods of image quality*

IEC 62715-5-1, *Flexible display devices – Part 5-1: Measuring methods of optical performance*

IEC 62715-5-3, *Flexible display devices – Part 5-3: Visual assessment of image quality and defects*

IEC 62715-6-1, *Flexible display devices – Part 6-1: Mechanical test methods – Deformation tests*

IEC 62899-502-1, *Printed electronics – Part 502-1: Quality assessment – Organic light emitting diode (OLED) elements – Mechanical stress testing of OLED elements formed on flexible substrates*

IEC 62922, *Organic light emitting diode (OLED) panels for general lighting – Performance requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62899-502-1 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

4 General

4.1 Overview

The flexible OLED elements can show some level of property variation applied by mechanical stress in certain environmental conditions such as a hot or cool atmosphere. In order to evaluate adequately these variations, environmental test conditions combined with a mechanical test are introduced.

4.2 Structure of measuring equipment

The system diagrams and/or operating conditions of the measuring equipment shall comply with the structure specification of each item.

4.3 Standard conditions

The standard testing conditions shall be as follows:

– temperature: 25 °C
– atmosphere: 101,3 kPa

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 4.5 and corrected by calculation to the standard reference atmosphere above.

4.4 Standard atmospheric conditions for referee 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 referee measurements and tests

Temperature [a] °C	Relative humidity [b] % RH	Air pressure [b] kPa
20 ± 1 (close)/ ± 2 (wide)	63 to 67 (close), 60 to 70 (wide)	86 to 106
25 ± 1 (close)/ ± 2 (wide)	48 to 52 (close), 45 to 55 (wide)	86 to 106
30 ± 1 (close)/ ± 2 (wide) 35 ± 1 (close)2/ ± 2 (wide)	45 to 75	86 to 106

[a] The close tolerances may be used for the referee measurements. The wider tolerances may be used only when allowed by the relevant specification.

[b] Inclusive values.

4.5 Standard atmospheric conditions for measurements and tests

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

- temperature: (25 ± 5) °C
- relative humidity: (60 ± 15) %
- atmospheric pressure: (96 ± 10) kPa

4.6 Recovery conditions

The recovery conditions specified in IEC 60068-1:2013, 4.4 shall be applied.

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

The OLED element shall then remain under standard atmospheric conditions for recovery for a period adequate for the attainment of temperature stability, for a minimum of 1 h.

If required by the relevant specification, the element shall be switched on or loaded and measured continuously during the recovery period.

If the standard conditions given above are not appropriate for the device to be tested, the relevant specification may call for other recovery conditions.

4.7 Operating conditions

Apply the proper driving current and voltage to the OLED element to provide luminosity at normal intended operation.

4.8 Flexible OLED element test configuration

Unless otherwise specified, the OLED element shall be tested in a state that is ready for normal operation without any protective elements added, nor voltage applied.

5 Measurements and analysis

5.1 General

Both before and after the combined stress testing in Clause 6, the following measurements on the electrical, optical and mechanical characteristics of OLED element(s) shall be performed in the standard environmental conditions defined in Clause 4. Measurement samples shall be prepared according to 5.2 before the measurements defined in 5.3 and 5.4. Both IEC 62922 and IEC 62341-6-1 are applied to measure the optical and electro-optical parameters.

a) Visual inspection (see 5.3): Visual inspection shall be performed according to IEC 62715-5-3.
b) IVL (intensity of electric current, voltage, luminance) characteristics (see 5.4).
c) Luminous flux (see 5.5): Optical performance measurement shall refer to IEC 62715-5-1.
d) Mechanical status (5.6).
e) Image quality: Image quality measurement shall refer to IEC 62341-6-2 and IEC 62341-6-3.

Depending on the purpose of the test, only one, some, or all of the methods shall be used. The measuring frequency and evaluation criteria shall be specified in the detailed specifications.