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# INTERNATIONAL STANDARD



## Flexible display devices -STANDARD PREVIEW Part 6-3: Mechanical test methods – Impact and hardness tests (standards.iten.al)

<u>IEC 62715-6-3:2020</u> https://standards.iteh.ai/catalog/standards/sist/90eb546b-c502-4c8a-9506-2f5c6aa3e6a3/iec-62715-6-3-2020





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IEC Central Office 3, rue de Varembé CH-1211 Geneva 20 Switzerland Tel.: +41 22 919 02 11 info@iec.ch www.jec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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#### INTERNATIONAL ELECTROTECHNICAL COMMISSION

## FLEXIBLE DISPLAY DEVICES –

## Part 6-3: Mechanical test methods – Impact and hardness tests

#### FOREWORD

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International Standard IEC 62715-6-3 has been prepared by IEC technical committee 110: Electronic displays.

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

FDIS	Report on voting
110/1225/FDIS	110/1247/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 62715 series, published under the general title *Flexible display devices*, 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- withdrawn,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.

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## FLEXIBLE DISPLAY DEVICES -

## Part 6-3: Mechanical test methods – Impact and hardness tests

#### 1 Scope

The object of this part of IEC 62715 is to define the standard test methods to evaluate the mechanical robustness of flexible display modules, especially mechanical robustness regarding impact and hardness, which include displays such as liquid crystal displays (LCDs), e-paper, and organic light emitting diode (OLED) displays, against external forces applied to a panel.

#### 2 Normative references

The following documents are referred to in the text in a way that some or all of their content constitutes requirements for 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 62341-5:2009, Organic light emitting diode displays - Part 5: Environmental testing methods

## (standards.iteh.ai)

ISO 19252, Plastics: Determination of scratch properties

IEC 62715-6-3:2020

ASTM D7207-13, Standard Test Method for Evaluation of Scratch Resistance of Polymeric Coatings and Plastics Using an Instrumented Scratch Machine

#### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions.

For the purposes of this document, the following terms and definitions 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

### 3.1.1

#### pendulum side impact test

evaluation of the mechanical robustness properties of the material against an external impact applied from the side using a pendulum

## 3.1.2

#### steel wool

special alloy steel which is processed into a thin and long fibrous form to be used as an abrasive

Note 1 to entry: The cross section surface is polyhedral with edges.

Note 2 to entry: There are several kinds of steel wool depending on the diameter of the used fibre. The steel wool type is #0000. The average line diameter of #0000 is about 0,012 mm.

#### 3.2 Abbreviated terms

- LCD liquid crystal display
- organic light emitting diode OLED
- TFT thin film transistor

#### 4 Standard atmospheric conditions

The standard atmospheric conditions defined in IEC 62341-5:2009, 5.3, shall apply as follows:

- 6 -

- 25 °C ± 3 °C temperature:
- 25 % RH to 85 % RH relative humidity:
- 86 kPa.to 106 kPa atmospheric pressure:

unless otherwise specifically agreed between customer and supplier.

When different tests are carried out, the temperature condition shall be specified because the temperature is critical for the robustness properties as they relate to TFT characteristics and panel image quality characteristics. These robustness tests shall be done at the standard atmospheric conditions.

#### Sample preparation 5

## iTeh STANDARD PREVIEW

#### 5.1 General

The specimen shall be the display module since the final evaluation has to be made based on the quality of the panel image such as luminescence, colour chromaticity, uniformity, line defect, and point defect. The mechanical robustness test can cause the deterioration of image quality on a panel [4] pto/ 19] dards.itch.ai/catalog/standards/sist/90eb546b-c502-4c8a-9506 2f5c6aa3e6a3/iec-62715-6-3-2020

#### 5.2 Sample preparation

The display module being tested shall be flat during the impact and hardness tests to get the correct test results. The module should be fixed on a plate using additional instruments or materials (for example, adhesive or holder). Both adhesive and holder should not affect the measurement. The flatness and size of the sample shall be determined between the supplier and customer. The temperature, humidity, and storage time (for example, 24 h) prior to testing for sample preparation shall be controlled and reported to obtain reproducible test results.

#### 6 Mechanical test methods - Impact and hardness tests

#### 6.1 General

The selection of the appropriate test methods shall be based on the requirements of the application. For each mechanical robustness test, the relevant test method specification shall be stated along with the explanation of the purpose of each unique test.

#### 6.2 **Ball drop test**

#### 6.2.1 General

This test is especially applicable for the evaluation of the mechanical robustness properties of flexible display devices by measuring their performance change after ball drop.

<sup>1</sup> Numbers in square brackets refer to the Bibliography.

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#### 6.2.2 Purpose

The purpose of this test is to evaluate the mechanical robustness properties of the specimen against a point shock which shall happen in actual use of the flexible display product. The ball drop test might cover several typical characteristic parameters of the display panel image quality. The typical parameters of the display panel image quality might include luminescence, colour chromaticity, uniformity, line defect, and point defect.

#### 6.2.3 Test apparatus

The ball drop test equipment includes a metal (or rubber or plastic) ball and a hard plate as shown in Figure 1. The body of the specimen shall be put on the hard plate. The test conditions of the ball drop test, such as the height of the ball from the panel (for example, 5 cm to 10 cm) which can be different from the panel size (for example, size of mobile or size of tablet or bigger size), the type (quality) of the ball (for example, metal, rubber, or plastic), the diameter of the ball, the weight of the ball (for example, 10 g to 50 g), the hitting position of the panel during the ball drop test, and the number of ball drop tests, shall be mentioned because the characteristics of the display panel image quality might depend on the test conditions mentioned above. In order to obtain consistent ball drop height during the test, special equipment to drop the ball at a reproducible height is available such as a mechanical grip and a magnetic plate. Different designs and materials of the hard plate beneath the specimen have significant impact on the test result. The design and materials of the hard plate shall be precisely mentioned or defined. An electromagnetically assisted ball drop test can be available as shown in Figure 1 where the steel ball can be attached by an electromagnet. After the first hit, the ball shall not successively collide against the panel in order to prevent additional damage caused by the second hit of the ball which can cause inconsistent result.



Figure 1 – Apparatus for ball drop test equipment

#### 6.2.4 Test procedure

The ball drop test shall be performed by dropping a metal (or rubber or plastic) ball at a constant height and hitting the panel perpendicularly. In order to correctly evaluate the mechanical robustness of the panel, several positions of the panel (for example, a total of nine points per panel, three points for each of the left, centre, and right area) shall be selected equally to represent the overall robustness of the panel; if necessary, an identical ball drop test might be carried out on several panels to obtain more accurate overall performance. After the first hit, the ball shall not successively collide against the panel in order to prevent additional damage coming from the second hit of the ball which can cause inconsistent results. The evaluation of the panel image may be carried out in a period of time after the ball drop test (time interval), which shall be mentioned.