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INTERNATIONAL STANDARD

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Liquid crystal display devices – Part 40-5: Mechanical testing of display cover glass for mobile devices – Strength against dynamic impact by a sharp object with the specimen rigidly supported

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

FDIS	Report on voting
110/936/FDIS	110/958/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 61747 series, published under the general title *Liquid crystal 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

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- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

Mobile electronic devices have become increasingly sophisticated and often incorporate displays for the purposes of user interface and viewing. Such displays commonly incorporate a transparent cover glass, which aids in protecting the display against the introduction of damage through routine device transport and use, as well as occasional or accidental misuse.

The purpose of this document is to provide mechanical testing procedures for cover glasses utilized in such applications. Such glasses can be strengthened, for example via an ion-exchange process, which acts to increase mechanical strength through the introduction of a surface compressive layer.

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Asahi Glass Co., Ltd.

1-5-1Marunouch,Chiyoda-ku, Tokyo, 10-8405 Japan

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LIQUID CRYSTAL DISPLAY DEVICES –

Part 40-5: Mechanical testing of display cover glass for mobile devices – Strength against dynamic impact by a sharp object with the specimen rigidly supported

1 Scope

This part of IEC 61747 is a mechanical performance testing procedure for cover glass used in electronic displays in mobile devices. This document focuses on the measurement of surface impact energy required to fracture a specimen due to the collision of sharp particles onto the surface of a cover glass. This is achieved by dropping a ball on a sheet of coated abrasives placed on the cover glass, which is rigidly supported. The failure mode is associated with damage introduction via sharp contact. Crack propagation is enhanced by central tension in the case of strengthened glass. This failure mode represents one of several field failure modes observed in mobile devices.

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 61649:2008, *Weibull analysis*

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

ISO 6344-1, *Coated abrasives – Grain size analysis – Part 1: Grain size distribution test*

ISO 8512-2, *Surface plates – Part 2: Granite*

JIS R6111, *Artificial abrasives*

3 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
specimen
individual piece of glass to be tested for failure

3.2
sample
group of specimens sharing a common pedigree (such as manufacturing process and period of production), for which failure statistics can be generated and reported

3.3
sample size
number of specimens in a sample

3.4
nominal value
value about which a tolerance range is specified

3.5
coated abrasives
abrasive tool including abrasive grain which adheres to a flexible substrate, such as paper or fabric, with a bonding agent

3.6
rigidly supported
specimen-supporting condition in which one of the surfaces is in contact with a flat, minimally-compliant surface without adhesives

4 General

This test simulates the fracture of a cover glass on its surface when rigidly supported. Typically, surface fracture is caused by the dynamic contact with a sharp object, and central tension enhances the crack propagation. In this document, coated abrasives are employed to replicate ordinary ground surface and the impact is introduced by dropping a steel ball.

This test is statistical in nature. A ball is dropped onto each of a number of specimens in a sample. The energy required to break each specimen is recorded. Statistics that might be specified are calculated and reported. The energy required to break a given specimen is determined by starting with a minimum drop height and then increasing the drop height by a fixed increment for drops that do not result in breakage.

The typical energy required to break specimens will depend on the thickness of the specimen and the internal stress distribution. Sample breakage values should only be compared when the thickness of the samples is the same.

The specimens to be tested are typically larger than 40 mm x 40 mm with a thickness ranging from 0,55 mm to 2,0 mm. The combination of ball mass and drop height yields the breakage energy. The apparatus allows for drops of up to 50 cm. A ball mass of 4 g can be adequate for specimens with a thickness ranging from 0,55 mm to 1,0 mm. Thicker or stronger specimens can require a larger ball for a 100 % breakage from a drop height of 50 cm.

Clause 5 describes the apparatus. Clause 6 describes the procedures for both the sample as a whole as well as for an individual specimen. Clause 7 describes the calculations.

It is assumed that all measurements are performed by personnel skilled in the general art of mechanical property measurements. Furthermore, it shall be assured that all equipment is suitably calibrated as is known to skilled personnel and that records of the calibration data and traceability are kept.