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TECHNICAL REPORT

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Multimedia systems and equipment – Multimedia e-publishing and e-book – Guideline for protection against mechanical stress during distribution of e-books in CD and DVD media

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MULTIMEDIA SYSTEMS AND EQUIPMENT – MULTIMEDIA E-PUBLISHING AND E-BOOK – GUIDELINE FOR PROTECTION AGAINST MECHANICAL STRESS DURING DISTRIBUTION OF E-BOOKS IN CD AND DVD MEDIA

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IEC 62780, which is a technical report, has been prepared by technical area 10: Multimedia e-publishing and e-book technologies, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
100/1927/DTR	100/1972/RVC

Full information on the voting for the approval of this technical report 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.

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

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

INTRODUCTION

Some e-books are distributed by using interchangeable optical storage media such as CDs and DVDs. Those storage media are distributed being bound in paper books/magazines or attached to them in other appropriate manners. The media bound or included in books/magazines are suffered from strong pressure during their distribution and/or keeping, and sometimes become so damaged (broken or distorted) that e-book data can no longer be read.

In order to minimize those damages of e-books during their distribution, a guideline for protection against mechanical stress during distribution of e-books is required. Existing standards of optical storage media specify nothing about stress-strain characteristics. The guideline should specify how to deal with interchangeable optical storage media bound or included in paper books/magazines. Those specifications should be based on the stress-strain characteristics of the interchangeable optical storage media.

MULTIMEDIA SYSTEMS AND EQUIPMENT – MULTIMEDIA E-PUBLISHING AND E-BOOK – GUIDELINE FOR PROTECTION AGAINST MECHANICAL STRESS DURING DISTRIBUTION OF E-BOOKS IN CD AND DVD MEDIA

1 Scope

This Technical Report provides protection schemes against mechanical stress during distribution or keeping of e-books (see IEC 62229) stored in interchangeable optical storage media such as CDs and DVDs, and shows the stress-strain characteristics of the interchangeable storage media from which the protection schemes are derived.

This Technical Report supplements the information of handling multimedia e-books defined in IEC/TS 62229.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62229:2005, *Multimedia systems and equipment – Multimedia e-publishing and e-book – Conceptual model for multimedia e-publishing*

3 Terms and definitions

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

3.1
residual strain
permanent strain after unloading

3.2
retaining force of disk center hole
friction force between the center hole of a disk and the protrusion of the disk holder in a disk case, to hold the disc in the disk case

Note 1 to entry: This force depends on the diameter of the center hole, the diameter of the disk holder protrusion, material and the surface finish of the protrusion, and of the structure of the disk holder.

3.3
elastic limit
residual strain generated when stress limit is exceeded

3.4
casebound book
book consisting of a stitched book block and bound in a hard cover

3.5
gutter
page edge for binding

Note 1 to entry: See JIS Z 8125.

3.6
saddle stitching
binding by gutter wiring

Note 1 to entry: See JIS Z 8125.

3.7
adhesive binding
binding by gutter pasting

Note 1 to entry: See JIS Z 8125.

4 Residual strain of CD and DVD media

No residual strain is generated in CD and DVD media when the deflection at the point of 35 mm distance from the center of the disk is lower than 8,8 mm. Those characteristics are given by the simulation and experiments shown in Clause A.2. Therefore, CD and DVD media should be kept within the limit bending during their distribution.

NOTE The characteristics are valid for all the CD and DVD media used in e-books and other CD/DVD applications.

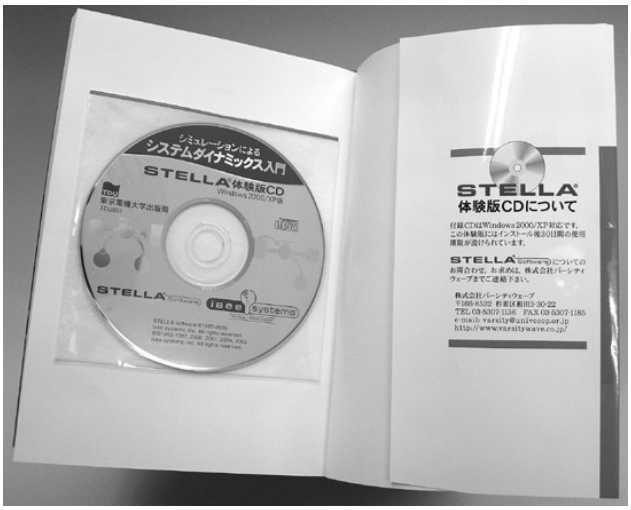
In order to keep the loading within the elastic limit during the distribution of e-books stored in CD and DVD media, bound in paper books/magazines or attached to them, the protection schemes of 5.1 and 5.2 are recommended.

5 Guideline for protection of CD and DVD media

5.1 Medium inclusion within a book or magazine

5.1.1 Attaching a medium envelope on a page

A medium envelope made by paper or film is attached on a page, as shown in Figure 1. The medium inclusion scheme can be applied to books (with saddle stitching or adhesive binding) or magazines with such thickness that up to 20 books or magazines can be wrapped for conveying.



IEC 1345/12

Figure 1 – Attaching a medium envelope on a page

5.1.2 Attaching a medium envelope to a gutter

A medium envelope made by paper or film is attached to a gutter, as shown in Figure 2. The medium inclusion scheme can be applied to books (with saddle stitching or adhesive binding) or magazines with such thicknesses that up to 20 books or magazines can be wrapped together.

IEC 1346/12

Figure 2 a – Paper envelope

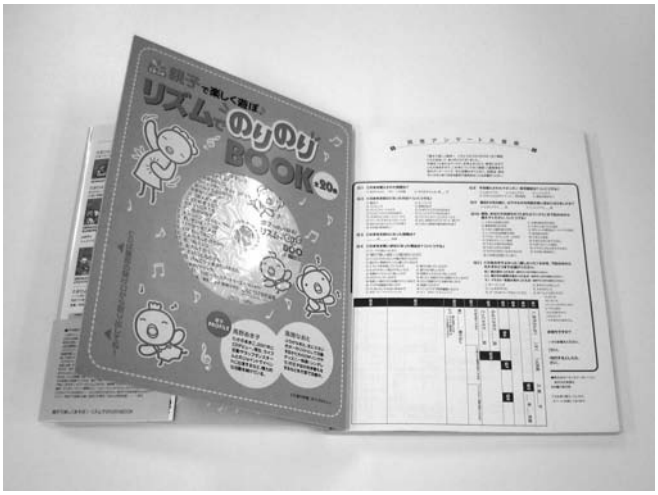
IEC 1347/12

Figure 2 b – Film envelope

Figure 2 – Attaching a medium envelope (of paper or film) on a gutter

5.1.3 Binding a substrate including a medium

A medium is included in a substrate that is bound in a book with adhesive binding or a magazine, as shown in Figure 3. In this inclusion of a medium, the substrate is requested to protect the medium within the bending limit as specified in Clause 4.



IEC 1348/12

Figure 3 – Bookbinding of a substrate that includes a medium

5.1.4 Attaching a substrate including a medium to a cover of a casebound book

A medium is included in a substrate that is attached to a cover of a casebound book, as shown in Figure 4. In this inclusion of a medium, the substrate is requested to protect a medium within the bending limit, as specified in Clause 4.

IEC 1349/12

Figure 4 – Attaching a substrate that includes a medium on a cover of casebound book

5.2 Media clamped in a medium case

When a medium is included in a medium case, it is clamped onto the center hole. The retaining force of the clamps of the disk center hole should be released within the bending limit as specified in Clause 4.

Annex A
(informative)

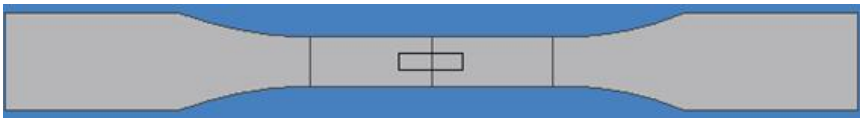
Experiments and simulation of mechanical properties of CD and DVD media

A.1 Mechanical properties of media material

A.1.1 Stress-strain diagram

The tensile tests were carried out to confirm a mechanical property of the polycarbonate material used for CD and DVD media. A simple test piece (TP) of polycarbonate with 175 mm maximum length, 4 mm mean thickness and 20 mm minimum width (see Figure A.1) was prepared for the tensile tests. A strain gauge is fixed on the center of the TP by epoxy adhesive.

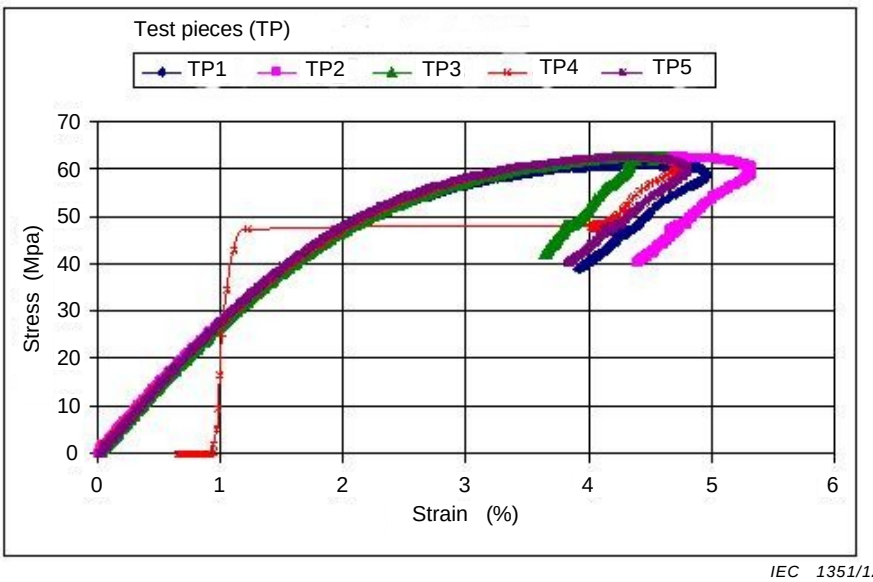
A combined TP with the same size and shape, consisting of two polycarbonate pieces combined by adhesive material, was constructed for the tensile test, taking account of the DVD media structure.



IEC 1350/12

Figure A.1 – Shape of the test piece

The tensile was subjected to a testing speed of 50 mm/min and a stress-strain diagram was obtained as shown in Figure A.2. Nonlinearity of the elastic modulus was observed at 1,5 % strain and more. In the range of linearity within 0,7 % strain, Young's modulus is 2,89 GPa. No particular difference between the mechanical properties of simple TP and combined TP was recognized.



IEC 1351/12

Figure A.2 – Stress-strain diagram

A.1.2 Elastic limit

In order to get the elastic limit of the polycarbonate, loading and unloading were carried out on tensile tests and the behaviour of the strain was observed during the tests. It shows that the polycarbonate CD and DVD media material deforms in the same way as an elastic material with up to the maximum strain of 0,7 % (see Figure A.3).

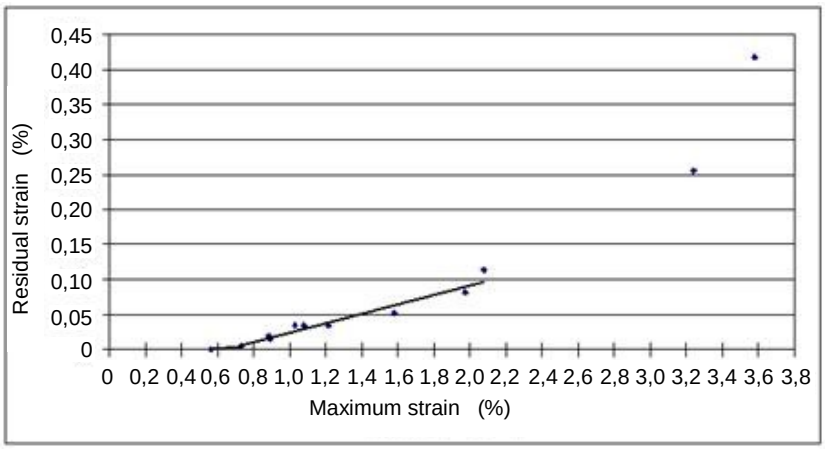


Figure A.3 – Elastic limit observed in loading and unloading experiments

A.2 Bending test and its limit of the deformation of CD and DVD media

A.2.1 Computer simulation

Using material properties obtained by the experiment described in A.1.1, nonlinear finite element simulation was executed for DVD media. It shows that the stress increases around the center hole of disks (see Figure A.4).

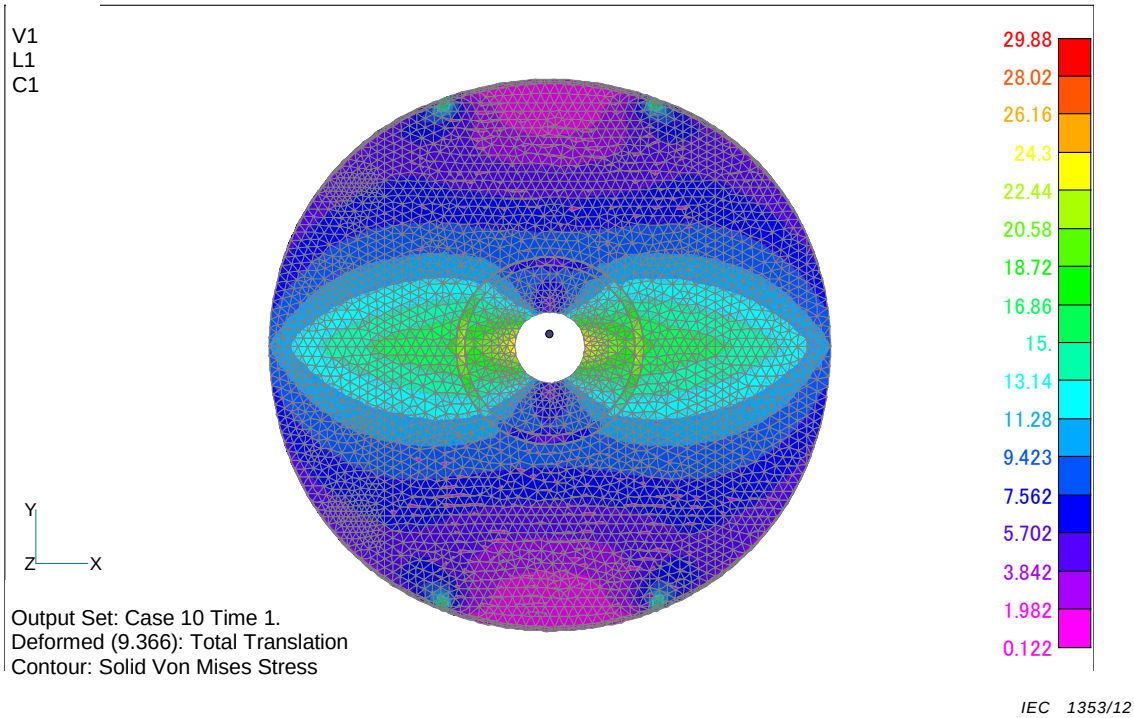


Figure A.4 – Stress distribution in DVD media

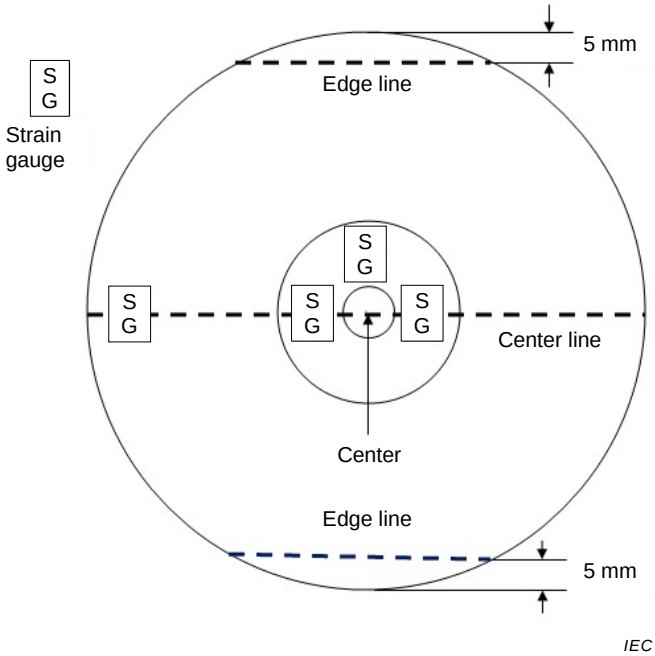
A.2.2 Bending test of CD and DVD media

Experimental bending tests were carried out for CD and DVD media using the test equipment as shown in Figure A.5. A disk was supported at the edge lines of the disk media and load in the nominal direction was applied to the center line of the disk media (see Figure A.6). Two dial gages for measuring deflection were set on the center line at the points of 35 mm distance from the center of the disk. Strain gauges were attached at several points on the disk surface, as shown in Figure A.6.

The experiment shows that higher stresses are observed around the center hole. The stresses are identical to results obtained from the finite element simulation (see A.2.1). On CD and DVD media, as described in Clause A.1, with the nominal direction to the disk recording surface, a bending force was applied to the center line of the disk. The result is that no residual strain is generated when the deflection at the point of 35 mm distance from the center of the disk is lower than 8,8 mm.

IEC 1354/12

Figure A.5 – Bending test equipment



IEC 1355/12

Figure A.6 – Support and load positions on the disc medium

Bibliography

The following documents have served as references in the preparation of this technical report:

IEC/TC100 TA10/14, *New work item expected; Guidelines for e-book distribution by interchangeable storage media, 2006-09*

JIS Z 8125:2004, *Graphic arts – Glossary – Digital printing terms*

CD/DVD packaging, Toppan printing, 2005-11

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