

Imaging materials — Compact discs (CD-ROM) — Method for estimating the life expectancy based on the effects of temperature and relative humidity

ICS 35.220.30; 37.040.99

National foreword

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Summary of pages

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**Imaging materials — Compact discs
(CD-ROM) — Method for estimating the life
expectancy based on the effects of
temperature and relative humidity**

*Matériaux pour l'image — Disques compacts (CD-ROM) — Méthode
d'estimation de l'espérance de vie basée sur les effets de la température et
de l'humidité relative*



Reference number
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Contents

	Page
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Purpose and assumptions	3
5 Measurements	3
6 Accelerated stress test plan	4
7 Data evaluation	8
8 Disclaimer	10

Annexes

A Numbering system for related International Standards.....	11
B Step analysis outline	13
C Example of a test plan and data analysis	14
Bibliography.....	21

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 18921 was prepared by Technical Committee ISO/TC 42, *Photography*.

This International Standard is one of a series of standards dealing with the physical properties and stability of imaging materials. To facilitate identification of these International Standards, they are assigned a number within the block from 18900 – 18999 (see annex A).

Annexes A, B and C of this International Standard are for information only.

Imaging materials — Compact discs (CD-ROM) — Method for estimating the life expectancy based on the effects of temperature and relative humidity

1 Scope

This International Standard specifies a test method for estimating the life expectancy (LE) of information stored on compact disc (CD-ROM) media, including CD audio, but excluding recordable media. Only the effects of temperature and relative humidity on the media are considered.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 10149:1995, *Information technology — Data interchange on read-only 120 mm optical data disks (CD-ROM)*

IEC 60908:1999, *Audio recording — Compact disc digital audio system*

3 Terms and definitions

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

3.1

$F(t)$

probability that a random unit drawn from the population fails by time t , or the fraction of all units in the population which fails by time t

3.2

$R(t)$

probability that a unit drawn from the population will survive at least time t , or the fraction of units in the population that will survive at least time t

NOTE $R(t) = 1 - F(t)$.

3.3

baseline

condition representing the disc at time of manufacture

NOTE This is customarily the initial parameter measurement taken prior to any application of stress. The designation is usually $t = 0$ for a stress time equal to zero hours.

3.4

block error rate

BLER

ratio of erroneous blocks to total blocks measured at the input of the first (C1) decoder (before any error correction is applied)

NOTE The more commonly reported value for BLER is the number of erroneous blocks per second measured at the input of the C1-decoder during playback at the standard (1 ×) data rate.

[IEC 60908:1999]

3.5

CD-ROM

compact disc-read only medium

3.6

end-of-life

occurrence of any loss of information

3.7

information

signal or image recorded using the system

3.8

life expectancy

LE

length of time that information is predicted to be retrievable in a system under extended-term storage conditions

3.8.1

standardized life expectancy

SLE

minimum life span, predicted with 95 % confidence, of 95 % of the product stored at a temperature not exceeding 25 °C and a relative humidity (RH) not exceeding 50 % RH

3.9

retrievability

ability to access information as recorded

3.10

stress

experimental variable to which the specimen is exposed for the duration of the test interval

NOTE In this International Standard, the stress variables are confined to temperature and relative humidity.

3.11

system

combination of recording medium, hardware, software and documentation necessary to retrieve information

3.12

test cell

device that controls the stress to which the specimen is exposed

3.13

test pattern

distribution of the characters I and 0 within a block and the block-to-block variation

4 Purpose and assumptions

4.1 Purpose

The purpose of this International Standard is to establish a methodology for estimating the life expectancy of information stored on CD-ROMs. This methodology provides a technically and statistically sound procedure for obtaining and evaluating accelerated test data.

4.2 Assumptions

The validity of the procedure defined by this International Standard relies on three assumptions:

- the dominant failure mechanism acting at the usage condition is the same as at the accelerated conditions;
- the dominant failure mechanism is appropriately modelled by an Eyring acceleration model;
- life expectancy is appropriately modelled by the two parameter Weibull distribution (see [1] in the Bibliography). The shape parameter of the Weibull distribution is assumed to be independent of the stress level.

5 Measurements

5.1 Block error rate (BLER)

The objective of measuring the block error rate (BLER) is to establish a practical estimation of the system's ability to read the pre-recorded bits using a standard drive. This International Standard considers BLER to be a high level estimate of the performance of the system. A change in BLER in response to the time at an elevated temperature and humidity is the principal quality parameter.

The true end-of-life is loss of information. Ideally, each specimen is tested until actual time of failure occurs. Realistically, this is impractical. For the purposes of this International Standard, the maximum ten-second average of the BLER, as specified in ISO/IEC 10149, shall be 220. This is very dependent on the system and its use here is an arbitrary level chosen as a conservative prediction of the onset of unacceptable errors and thereby the end of disc life.

5.2 Test equipment

5.2.1 Compact disc test system

Any compact disc test system (tester) that is in accordance with ISO/IEC 10149 may be used. The make, model and version of the test equipment (including software) shall be reported with the test results.

5.2.2 Calibration and repeatability

Calibration according to the tester manufacturer's procedure shall be performed prior to any measurement data being collected. A calibration disc shall be available from the tester manufacturer.

In addition to the calibration disc, one control disc shall be maintained at ambient conditions and its maximum BLER measured before and after each data collection interval. A control chart shall be maintained for this control disc with $\pm 3 \sigma$ action limits. The mean and standard deviation of the control disc shall be established by collecting at least five measurements. Should any individual maximum BLER reading exceed the action limit, the problem shall be corrected and all data collected since the last valid control point shall be remeasured.

If it becomes necessary to replace the tester, a method shall be followed for correlating tester outputs (see [2] in the Bibliography).