

ISO/IEC 16963:2017
NBN ISO/IEC 16963:2021

 **NBN**



**Information technology – Digitally recorded media for
information interchange and storage – Test method for the
estimation of lifetime of optical disks for long-term data storage
(ISO/IEC 16963:2017)**

Valid from 20-05-2021

ICS: 35.220.30

Third edition
2017-07

Corrected version
2019-04

**Information technology — Digitally
recorded media for information
interchange and storage — Test
method for the estimation of lifetime of
optical disks for long-term data storage**

*Technologies de l'information — Supports pour l'échange
d'informations et le stockage enregistrés numériquement — Méthode
d'essai pour l'estimation de la durée de vie de disques optiques pour le
stockage à long terme*



Reference number
ISO/IEC 16963:2017(E)

© ISO/IEC 2017

ISO/IEC 16963:2017(E)



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2017

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Abbreviated terms	4
5 Conformance	4
6 Convention and notations	5
6.1 Representation numbers.....	5
6.2 Variables.....	5
6.3 Names.....	5
7 Measurements	5
7.1 Summary.....	5
7.1.1 Stress incubation and measuring.....	5
7.1.2 Assumptions.....	5
7.1.3 Data error.....	6
7.1.4 Data quality.....	7
7.1.5 Regression.....	7
7.2 Test specimen.....	7
7.3 Recording conditions.....	8
7.3.1 General.....	8
7.3.2 Recording test environment.....	8
7.4 Playback conditions.....	8
7.4.1 Playback tester.....	8
7.4.2 Playback test environment.....	8
7.4.3 Calibration.....	9
7.5 Disk testing locations.....	9
7.5.1 General.....	9
7.5.2 Rigorous testing location.....	9
7.5.3 Basic testing location.....	9
8 Accelerated stress test	9
8.1 General.....	9
8.2 Stress conditions.....	10
8.2.1 General.....	10
8.2.2 Temperature.....	11
8.2.3 Relative humidity.....	11
8.2.4 Incubation and ramp profiles.....	11
8.3 Measuring-time intervals.....	12
8.4 Design of stress conditions.....	13
8.5 Disk orientation.....	13
9 Lifetime estimation	13
9.1 Time-to-failure.....	13
9.2 Accelerated-ageing test method.....	14
9.2.1 Eyring acceleration model (Eyring method).....	14
9.2.2 Arrhenius acceleration model (Arrhenius method).....	14
9.3 Data analysis and judgment of effectiveness.....	15
9.4 Result of estimated disk life.....	15
Annex A (normative) Outline of Disk-life estimation method and data-analysis steps	16
Annex B (normative) Disk-life estimation for Controlled storage-condition (Eyring method)	23

ISO/IEC 16963:2017(E)

Annex C (normative) Disk-life estimation for Harsh storage-condition (Arrhenius method)	38
Annex D (normative) Alternative non-destructive stress-condition	43
Annex E (informative) Interval estimation for B_5 Life using maximum likelihood	45
Annex F (informative) RSER measurement of BD disks	51
Bibliography	52

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology, SC 23, Digitally recorded media for information interchange and storage*.

This third edition cancels and replaces the second edition (ISO/IEC 16963:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

- minor enhancement has been made so that the stress condition and the disk testing location are independent of each other and the cross-combinations of them are applicable; and
- minor editorial changes have been made to conform to the latest version of the ISO/IEC Directives Part 2.

This corrected version of ISO/IEC 16963:2017 incorporates the following corrections:

- correction of the formula in [E.3](#) that uses function $\ln L = \ln L(\beta, \sigma)$ to express the Fisher information matrix I in [E.2](#).

ISO/IEC 16963:2017(E)

Introduction

Markets and industry have developed a common understanding that the property referred to as the lifetime of data recorded to optical disks plays an increasingly important role in many applications. Disparate standardized test methodologies exist for Magneto-Optical disks versus recordable compact disks and DVD systems. The first edition of this document provided a common methodology applicable for various purposes that included lifetime testing of then available writable CD and DVD optical disks.

ISO/IEC JTC 1/SC 23/JWG 1, which is a joint working group comprising ISO/TC 42, ISO/TC 171/SC 1 and ISO/IEC JTC 1/SC 23, initiated work on this subject and developed initial drafts with assistance from Ecma International TC 31.

After the issuance of the first edition of this document, ISO/IEC standards for the physical formats of BD Recordable and Rewritable disks were published. Accordingly, ISO/IEC JTC 1/SC 23/JWG 1 started work again to include testing of writable BD optical disks in the second edition of this document. Additional details for lifetime estimation are also incorporated.

The third edition was issued as a minor enhancement of this document. It is clarified that the stress condition and the disk testing location are independent each other and the cross-combinations of them are applicable.

Information technology — Digitally recorded media for information interchange and storage — Test method for the estimation of lifetime of optical disks for long-term data storage

1 Scope

This document specifies an accelerated ageing test method for estimating the lifetime of the retrievability of information stored on recordable or rewritable optical disks.

The method is based on the theoretical assumption that the lifetime of data recorded on an optical disk has a lognormal distribution.

Detailed testing is specified for the following formats: DVD-R/RW/RAM disks, +R/+RW disks, CD-R/RW disks and BD recordable/rewritable disks. The testing can be applied to additional optical-disk formats with substitution of the appropriate specifications and can also be updated by the committee in the future as required.

This document includes:

- stress conditions:
 - Basic and Rigorous stress-conditions for testing and subsequent analysis using both the Eyring and Arrhenius methods;
- ambient storage conditions in which the lifetime of data stored on optical disk is estimated:
 - a Controlled storage-condition, $Temp = 25\text{ °C}$ and $RH = 50\%$, representing full-time air conditioning. The Eyring method is used to estimate the lifetime under this storage condition;
 - a Harsh storage-condition, $Temp = 30\text{ °C}$ and $RH = 80\%$, representing the most severe conditions in which users handle and store optical disks. The Arrhenius method is used to estimate the lifetime under this storage condition;
- a description of the evaluation system;
- procedures for specimen preparation and data acquisition;
- definitions and methods used in testing specific disk types;
- analysis of test results to determine the lifetime of stored data;
- a format for reporting the estimated lifetime of stored data.

The methodology includes only the effects of temperature and relative humidity. It does not attempt to model degradation due to complex failure mechanism kinetics, nor does it test for exposure to light, corrosive gases, contaminants, handling, or variations in playback subsystems. Disks exposed to these additional sources of stress or higher levels of temperature and relative humidity are expected to experience shorter usable lifetime.

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.