INTERNATIONAL STANDARD

ISO/IEC 15485

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Information technology — Data interchange on 120 mm optical disk cartridges using phase change PD format — Capacity: 650 Mbytes per cartridge

Technologies de l'information — Échange de données sur cartouches de disque optique de 120 mm *de diamètre utilisant un format PD de changement de phase — Capacité:* 650 Mbytes *par cartouche*

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

International Standard ISO/IEC 15485 was prepared by ECMA (as ECMA-240) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

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Annexes A to J form an integral part of this International Standard. Annexes K to Q are for information only.

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Introduction

This International Standard specifies the characteristics of 120 mm Optical Disk Cartridges (ODCs) with a capacity of 650 Mbytes using phase change technology. The format for the information on the disk is known as the PD format.

The 120 mm ODC has a large degree of commonality with CD-ROM so as to allow drive manufacturers to develop drives which can offer read compatibility with CD-ROM as defined in ISO/IEC 10149.

This International Standard specifies two types of ODCs (Type R/W and Type WORM) both of which are intended for use in dual-function optical disk drives with the capacility to handle both the 120 mm ODCs and CD-ROM disks such as those conforming to ISO/IEC 10149.

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Information technology — Date interchange on 120 mm optical disk cartridges using phase change PD format — Capacity: 650 Mbytes per cartridge

Section 1 - General

1 Scope

This International Standard specifies the characteristics of 120 mm Optical Disk Cartridges (ODCs) with a capacity of 650 Mbytes using Phase Change PD format. This present International Standard specifies two related, but different implementations of such cartridges, viz.

Type R/W Provides for data to be written, read and overwritten many times over the whole recording surface of the disk using the phase change recording and read-out method .

Type WORM Provides for data to be written once and read many times over the whole recording surface of the disk using the phase change recording and read-out method.

Type R/W and Type WORM are also referred to as "rewritable" and "write-once" respectively.

This International Standard specifies

- the conditions for conformance testing and the Reference Drive;
- the environments in which the cartridges are to be operated and stored;
- the mechanical and physical characteristics of the cartridge, so as to provide mechanical interchangeability between data processing systems;
- the format of the information on the disk known as the PD format, including the physical disposition of the tracks and sectors, the error correction codes, and the modulation method used;
- the characteristics of the embossed information on the disk;
- the phase change recording characteristics of the disk, enabling data processing systems to write data onto the disk;
- the minimum quality of user-written data on the disk, enabling data processing systems to read data from the disk.

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This International Standard provides for interchange between optical disk drives. Together with a standard for volume and file structure, it provides for full data interchange between data processing systems.

2 Conformance

2.1 Optical disk cartridge

An optical disk cartridge shall be in conformance with this International Standard if it meets the mandatory requirements specified herein for its Type.

2.2 Generating system

A generating system shall be in conformance with this International Standard if the ODC it generates is in accordance with 2.1.

2.3 Receiving system

A receiving system shall be in conformance with this International Standard if it is able to handle an ODC according to 2.1.

2.4 Compatibility statement

A claim of conformance by a generating or receiving system with this International Standard shall include a statement listing any other International Optical Disk Cartridge Standard(s) supported. This statement shall specify the number of the standard(s), including, where appropriate, the ODC type(s) and whether support includes reading only or both reading and writing.

3 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subjected to revision, and parties to

agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard listed below. Members of IEC and ISO maintain registers of currently valid International Standard.

IEC 950:1991, *Safety of information technology equipment.*

4 Definitions

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

4.1 addressable track: A continuous group of 64 sectors in which each sector can be addressed in a linear manner beginning with sector number 0.

4.2 band: A part of the Data Zone comprising a fixed number of consecutive physical tracks.

4.3 case: The housing for an optical disk, that protects the disk and facilitates disk interchange.

4.4 Channel bit: The elements by which the binary values ZERO and ONE are represented on the disk by either a space or a mark.

NOTE - In this International Standard each input bit is represented by two Channel bits. Their sequence depends on that of the input bits.

4.5 Clamping Zone: The annular part of the disk within which the clamping force is applied by the clamping device.

4.6 control track: A track containing the information on media parameters and format necessary for writing and reading the remaining tracks of the optical disk.

4.7 Cyclic Redundancy Check (CRC): A method for detecting errors in data.

4.8 defect management: A method for handling the defective areas on the disk.

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4.9 disk reference plane: A plane defined by the perfectly flat annular surface of an ideal spindle onto which the clamping zone of the disk is clamped, and which is normal to the axis of rotation.

4.10 embossed mark: A mark so formed as to be unalterable by optical means.

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4.11 entrance surface: The surface of the disk onto which the optical beam first impinges.

4.12 Error Correction Code (ECC): An error-detecting code designed to correct certain kinds of errors in data.

4.13 field: A subdivision of a sector.

4.14 format: The arrangement of information on the disk.

4.15 interleaving: The process of allocating the physical sequence of units of data so as to render the data more immune to burst errors.

4.16 land and groove. A trench-like feature of the disk, applied before the recording of any information, and used to define the track location. The groove is located nearer to the entrance surface than the land with which it is paired to form a track.

4.17 mark: A feature of the recording layer that may take the form of an amorphous spot, crystalline spot, a pit, or other form that can be sensed by the optical system. The pattern of marks represents the data on the disk.

NOTE - Subdivisions of a sector that are named 'mark' are not marks in the sense of this definition.

4.25 read power: The optical power, incident at the entrance surface of the disk, used when reading.

4.26 recording layer: A layer of the disk on, or in, which data is written during manufacture and/or use.

4.27 Reed-Solomon code: An error detection and/or correction code for the correction of errors that occur in bursts or are strongly correlated.

4.28 rewritable disk: An optical disk in which the data in specified areas can be rewritten by an optical beam.

4.29 sector: The smallest addressable part of a track in the Information Zone of a disk that can be accessed independently of other addressable parts of the zone.

4.30 spindle: The part of the disk drive which contacts the disk.

4.31 substrate: A transparent layer of the disk, provided for mechanical support of the recording layer, through which the optical beam accesses the recording layer.

4.32 write once disk: An optical disk in which the data in specified areas is irreversibly written and read many times by an optical beam.

4.33 ZCAV: A disk format requiring Zoned Constant Angular Velocity operations.

4.34 zone: An annular area of the disk.

5 Conventions and notations

5.1 Representation of numbers

A measured value is rounded off to the least significant digit of the corresponding specified value. It implies that a specified value of 1,26 with a positive tolerance of +0,01, and a negative tolerance of -0,02 allows a range of measured values from 1,235 to 1,275.

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- Letters and digits in parentheses represent numbers in hexadecimal notation. [i.e. (F0) etc.]
- The setting of a bit is denoted by ZERO or ONE.
- Numbers in binary notation and bit combinations are represented by strings of digits 0 and 1.
- Numbers in binary notation and bit combinations are shown with the most significant bit to the left.
- Negative values of numbers in binary notation are given in TWO's complement.
- In each field the data is recorded so that the most significant byte (byte 0) is recorded first. Within each byte the least significant bit is numbered 0 and is recorded last, the most significant bit (numbered 7 in an 8-bit byte) is recorded first. This order of recording applies also to the data input of the Error Detection and Correction circuits and to their output.
- Unless otherwise stated, all track numbers refer to addressable tracks.

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5.2 Names

The names of entities, e.g. specific tracks,fields, etc., are given with a capital.

6 List of acronyms

AM	Address Mark
CRC	Cyclic Redundancy Check
DC	Direct Current (d.c.)
DDS	Disk Definition Structure
DMA	Defect Management Area
DMS	Defect Management Sector
ECC	Error Correction Code
ID	Identifier
LSB	Least Significant Byte
MSB	Most Significant Byte
ODC	Optical Disk Cartridge
ODF	Offset Detection Field
PA	Postamble
PC	Phase Change

PDL	Primary Defect List
RLL(2,7)	Run Length Limited (code)
R/W	rewritable
SDL	Secondary Defect List
SM	Sector Mark
VFO	Variable Frequency Oscillator
WDL	Working Defect List
WORM	Write Once Read Many
ZCAV	Zoned Constant Angular Velocity

7 General description of the optical disk cartridge

The optical disk cartridge that is the subject of this International Standard consists of a case containing an optical disk.

The case is a protective enclosure for the disk. It has access windows covered by a shutter. The windows are automatically uncovered by the drive when the cartridge is inserted into it.

The optical disk is recordable on one side. In the rewritable disk, data can be written onto the disk as marks in the form of amorphous spots in the crystalline recording layer and can be overwritten on it with a focused optical beam, using the phase change effect between amorphous and crystalline states. In the write once disk, data can be irreversibly written onto the disk as marks in the form of crystalline spots in the amorphous recording layer, using phase change effect. The data can be read with a focused optical beam, using phase change effect as the reflective difference between amorphous and crystalline states. The beam accesses the recording layer through the transparent substrate of the disk.

Part of the disk contains read-only data for the drive in the form of pits embossed by the manufacturer. This data can be read using the diffraction of the optical beam by the embossed pits.

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8 General requirements

8.1 Environments

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8.1.1 Test environment

The test environment is the environment where the air immediately surrounding the optical disk cartridge has the following properties:

temperature	: 23 °C ± 2 °C
relative humidity	: 45 % to 55 %
atmospheric pressure	: 60 kPa to 106 kPa
air cleanliness	: Class 100 000 (see annex G)

No condensation on or in the optical disk cartridge shall occur. Before testing, the optical disk cartridge shall be conditioned in this environment for 48 h minimum. It is recommended that, before testing, the entrance surface of the optical disk shall be cleaned according to the instructions of the manufacturer of the disk.

Unless otherwise stated, all tests and measurements shall be made in this test environment.

8.1.2 Operating environment

This International Standard requires that an optical disk cartridge which meets all requirements of this International Standard in the specified test environment provides data interchange over the specified ranges of environmental parameters in the operating environment.

The operating environment is the environment where the air immediately surrounding the optical disk cartridge has the following properties:

temperature	: 5 °C to 55 °C
relative humidity	: 3 % to 85 %
absolute humidity	: 1 g/m^3 to 30 g/m^3
atmospheric pressure	: 60 kPa to 106 kPa
temperature gradient	: 10 °C/h max.
relative humidity gradient	: 10 %/h max.
air cleanliness	: Office environment (see annex P)

No condensation on or in the optical disk cartridge shall occur. If an optical disk cartridge has been exposed to conditions outside those specified in this clause, it shall be acclimatized in an allowed operating environment for at least 2 h before use. (See also annex M.)

8.1.3 Storage environment

The optical disk cartridge without any protective enclosure shall not be stored in an environment outside the range allowed for storage. The storage environment is defined as an environment where the air immediately surrounding the optical disk cartridge has the following properties:

temperature	: -10 °C to 55 °C
relative humidity	: 3 % to 90 %
absolute humidity	: 1 g/m^3 to 30 g/m^3
atmospheric pressure	: 60 kPa to 106 kPa
temperature gradient	: 15 °C/h max.
relative humidity gradient	: 10 %/h max.
air cleanliness	: Office environment (see annex P)

No condensation on or in the optical disk cartridge shall occur.

8.1.4 Transportation

This International Standard does not specify requirements for transportation; guidance is given in annex N.

8.2 Temperature shock

The optical disk cartridge shall withstand a temperature shock of up to 20°C when inserted into, or removed from, the drive.

8.3 Safety requirements

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The cartridge shall satisfy the safety requirements of Standard IEC 950, when used in the intended manner or in any foreseeable use in an information processing system.

8.4 Flammability

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The cartridge and its components shall be made from materials that comply with the flammability class for HB materials, or better, as specified in Standard IEC 950.

9 Reference Drive

The Reference Drive is a drive of which several critical components have well defined properties and which is used to test write, read and overwrite parameters of the disk for conformance to this International Standard. The critical components vary from test to test. This clause gives an outline of all components; components critical for tests in specific clauses only are specified in these clauses.

9.1 Optical system

The basic set-up of the optical system of the Reference Drive used for measuring the overwrite and read parameters are shown in figure 1. Different components and locations of components are permitted, provided that the performance remains the same as that of the set-up in figure 1. The optical system shall be such that the detected light reflected from the entrance surface of the disk is minimized so as not to influence the accuracy of the measurements.