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Information technology — Data interchange on 90 mm optical disk cartridges — Capacity: 1,3 Gbytes per cartridge

Technologies de l'information — Échange de données sur cartouches de disque optique de 90 mm — Capacité: 1,3 Go 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

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.

ISO/IEC 17346 was prepared by Ecma International (as ECMA-351) 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.

Information technology — Data interchange on 90 mm optical disk cartridges — Capacity: 1,3 Gbytes per cartridge

Section 1 — General

1 Scope

This International Standard defines the characteristics of 90 mm Optical Disk Cartridges (ODC) with a capacity of 1,3 GB per cartridge. It specifies only Type R/W for 2 048–byte sectors of such cartridges.

Type R/W provides for data to be written, read and erased many times over the entire recording surface of the disk using the thermo-magnetic and magneto-optical effects. It is also referred to as "fully rewritable". This International Standard provides for 2 048-byte sectors only. All sectors on a disk are of the same size.

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 interchange ability between data processing systems;
- the format of the information on the disk, both embossed and user-written; 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 magneto-optical characteristics of the disk, enabling 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.

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 (ODC)

A claim of conformance with this International Standard shall specify the Type of the ODC. It shall be in conformance if it meets all mandatory requirements specified herein for that Type.

2.2 Generating system

A claim of conformance with this International Standard shall specify which Type is supported. A system generating an ODC for interchange shall be in conformance with this International Standard if it meets the mandatory requirements of this International Standard for the Type specified.

2.3 Receiving system

A claim of conformance with this International Standard shall specify which Type is supported. A system receiving an ODC for interchange shall be in conformance with this International Standard if it is able to process any recording made on the cartridge in accordance with 2.1 on the Type specified.

2.4 Compatibility statement

A claim of conformance with this International Standard shall include a statement listing any other International Standard supported by the system for which conformance is claimed. This statement shall specify the number of the Standard(s), the ODC type(s) supported (where appropriate) and whether support includes reading or both reading and writing.

3 Normative references

The following referenced documents are indispensable for the application 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.

ECMA-287, *Safety of electronic equipment (2002)*

4 Terms and definitions

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

4.1
band
Part of the Data Zone comprising a fixed number of consecutive physical tracks.

4.2
case
The housing for an optical disk that protects the disk and facilitates disk interchange.

4.3
Channel bit
The smallest element for the representation of data on a disk. It is recorded as either a space or a mark. Twelve Channel bits are used to represent eight input bits.

4.4
clamping zone
The annular part of the disk within which the clamping force is applied by the clamping device.

4.5
control track
A track containing the information on media parameters and format necessary for writing, reading and erasing the remaining tracks on the optical disk.

4.6
Cyclic Redundancy Check (CRC)
A method for detecting errors in data.

4.7
defect management
A method for handling the defective areas on the disk.

4.8
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.

4.9
embossed mark
A mark so formed as to be unalterable by magneto-optical means.

4.10
entrance surface
The surface of the disk on to which the optical beam first impinges.

4.11
Error Correction Code (ECC)
An error-detecting code designed to correct certain kinds of errors in data.

4.12
field
A subdivision of a sector.

4.13
format
The arrangement or layout of information on the disk.

4.14
fully rewritable disk
An optical disk in which the data in specified areas can be rewritten by an optical beam.

4.15
groove
See 4.19.

4.16
hub
The central feature on the disk which interacts with the spindle of the disk drive to provide radial centering and the clamping force.

4.17
interleaving
The process of allocating the physical sequence of units of data so as to render the data more immune to burst errors.

4.18
Kerr rotation
The rotation of the plane of polarization of an optical beam upon reflection from the recording layer, as caused by the magneto-optical effect.

4.19
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.

4.20
logical track
Seventeen consecutive sectors for disks with 2 048-byte sectors in one or more physical tracks. The first sector of each logical track is assigned sector number 0.

4.21
logical ZCAV
A disk format requiring Zoned Constant Angular Velocity operation and with tracks *n* in the Data Zone all being logical tracks.

4.22
mark
A feature of the recording layer which may take the form of a magnetic domain, a pit, or any other type or form that can be sensed by the optical system. The pattern of marks represents the data on the disk.

NOTE Subdivisions of a sector which are named “mark” are not marks in the sense of this definition.

4.23
optical disk
A disk that will accept and retain information in the form of marks in a recording layer, that can be read with an optical beam.

4.24
optical disk cartridge (ODC)
A device consisting of a case containing an optical disk.

4.25
physical track
The path which is followed by the focus of the optical beam during one revolution of the disk.

4.26
physical track group
A fixed number of consecutive physical tracks in the Data Zone.

4.27
pitch
The distance between adjacent physical track centrelines, measured in a radial direction.

4.28
polarization
The direction of polarization of an optical beam is the direction of the electric vector of the beam.

NOTE The plane of polarization is the plane containing the electric vector and the direction of propagation of the beam. The polarization is right-handed when to an observer looking in the direction of propagation of the beam, the end-point of the electric vector would appear to describe an ellipse in the clockwise sense.

4.29
read power
The optical power, incident at the entrance surface of the disk, used when reading.

NOTE It is specified as a maximum power that may be used without damage to the written data. Lower power may be used provided that the signal-to-noise ratio and other requirements of this International Standard are met.

4.30
recording layer
A layer of the disk on or in which data is written during manufacture and/or use.

4.31
Reed-Solomon code
An error detection and/or correction code which is particularly suited to the correction of errors which occur in bursts or are strongly correlated.

4.32
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.

4.33
space
The area between marks along the track.

4.34
spindle
The part of the disk drive which contacts the disk and/or hub.

4.35
substrate
A transparent layer of the disk, provided for mechanical support of the recording layer, through which the optical beam accesses the recording layer.

4.36
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.

Letters and digits in parentheses represent numbers in hexadecimal notation.

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 logical tracks.

5.2 Names

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

6 List of acronyms

AM	Address Mark
CRC	Cyclic Redundancy Check
DDS	Disk Definition Structure
DMA	Defect Management Area
ECC	Error Correction Code
FA1	Functional Area 1
FA2	Functional Area 2
ID	Identifier
LSB	Least Significant Byte

MO	Magneto-Optical
MSB	Most Significant Byte
ODC	Optical Disk Cartridge
PA	Postamble
PDL	Primary Defect List
RLL(1,7)	Run Length Limited (code)
R/W	Rewritable
SDL	Secondary Defect List
SM	Sector Mark
TIA	Time Interval Analyzer
VFO	Variable Frequency Oscillator
ZCAV	Zoned Constant Angular Velocity

7 General description of the optical disk cartridge

The optical disk cartridge which 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. Data can be written onto the disk as marks in the form of magnetic domains in the recording layer and can be erased from it with a focussed optical beam, using the thermo-magnetic effect. Data may be directly written over existing data by modulating the intensity of the optical beam. The data can be read with a focussed optical beam, using the magneto-optical effect. The beam accesses the recording layer through the transparent substrate of the disk.

8 General requirements

8.1 Environments

8.1.1 Testing 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 J)

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 Q.1)
magnetic field strength at the recording layer for any condition under which a beam is in focus:	36 000 A/m max. (see Annex Q.2)
magnetic field strength at the recording layer during any other condition:	48 000 A/m max.

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 O).

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 Q.1)
magnetic field strength at the recording layer:	48 000 A/m max.

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 P.

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

The cartridge shall satisfy the safety requirements of Standard ECMA-287, when used in the intended manner or in any foreseeable use in an information processing system.

8.4 Flammability

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 ECMA-287.