INTERNATIONAL STANDARD

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Information technology — Data interchange on 130 mm magneto-optical disk cartridges — Capacity: 9,1 Gbytes per cartridge

Technologies de l'information — Échange de données sur cartouches de disque optique magnétique de 130 mm — Capacité: 9,1 Gbytes 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 3.

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 International Standard 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 22092 was prepared by ECMA (as ECMA-322) 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.

Annexes A to Q form a normative part of this International Standard. Annexes R to AA are for information only.

Information technology - Data interchange on 130 mm magneto-optical disk cartridges - Capacity: 9,1 Gbytes per cartridge

Section 1 - General

1 Scope

This International Standard specifies the mechanical, physical, and optical characteristics of a 130 mm optical disk cartridge (ODC) that employs thermo-magnetic and magneto-optical effects to enable data interchange between such disks.

This International Standard specifies two Types, viz.

Type R/W provides for data to be written, read and erased many time over the recording surface(s) of the disk.

Type WO provides for data once written to be read a multiplicity of times. Data shall not be erased nor amended. Multisession (incremental write operations) recording may be performed on type WO disks.

The disk shall be of the same Type if recorded on both sides, A and B. Each side shall have a nominal capacity of 4,58 Gbytes, irrespective of the Type. The format specifies two sector sizes and allows for emulation of two further sizes.

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, physical and dimensional characteristics of the cartridge so as to provide mechanical interchangeability 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, the modulation methods used;
- the characteristics of the embossed information on the disk;
- the thermo-magnetic and 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)

An ODC shall be in conformance with this International Standard if it meets all mandatory requirements specified therein.

A claim of conformance with this International Standard shall specify the Type implemented.

2.2 Generating system

A claim of conformance with this International Standard shall specify which of Type(s) of R/W and WO is (are) 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(s) supported.

2.3 Receiving system

A claim of conformance with this International Standard shall specify which Type is implemented.

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 according to 2.1 on the Type(s) specified.

2.4 Compatibility statement

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

3 Normative reference

The following normative document contains 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 edition of the normative document 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.

IEC 60950-1, *Information technology equipment — Safety — Part 1: General requirements*

4 Terms and definitions

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

4.1 asymmetry

The deviation between the centre levels of the signals which give maximum and minimum amplitude.

4.2 band

An annular area within the user zone on the disk having a constant clock frequency.

4.3 case

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

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 emulation

Technique whereby a number of lesser size logical sectors may be recorded into a single larger size physical sector.

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 format

The arrangement or layout of information on the disk.

4.13 hub

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

4.14 interleaving

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

4.15 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 Kerr effect.

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. Recording is performed on both land and groove.

4.17 logical track

A number of logical sectors that are grouped together and defined to constitute a uniquely addressable track to the recording system. The first sector of each logical track is assigned sector number 0.

4.18 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.

4.19 mark edge

The transition between a region with a mark and one without a mark or vice versa, along the track.

4.20 mark edge recording

A recording method which uses a mark edge to represent a Channel bit.

4.21 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.

4.22 optical disk cartridge (ODC)

A device consisting of a case containing an optical disk.

4.23 physical track

The path which is followed by the focus of the optical beam during one revolution of the disk. This path is not directly addressable.

4.24 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.

4.25 pre-recorded mark

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

4.26 read power

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

4.27 recording layer

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

4.28 recording track

Either a land or groove feature of the disk where recording may be performed.

4.29 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.

4.30 space

The area between marks along the track.

4.31 spindle

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

4.32 substrate

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

4.33 track pitch

The distance between land track centrelines to adjacent groove track centerlines, measured in a radial direction.

4.34 write-inhibit hole

A hole in the case which, when detected by the drive to be open, inhibits both write and erase operations.

4.35 write-once functionality

A technique whereby a rewritable MO ODC is restricted to initialization and writing once only.

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 the 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 their output.

Unless otherwise stated, groups of decimal digits of the form xx ... x/yy ... y indicate that the value xx ... x applies to 4 096-byte sectors, yy ... y applies to 2 048-byte sectors.

5.2 Names

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

6 List of acronyms

ALPC	Auto Laser Power Control
AM	Address Mark
CRC	Cyclic Redundancy Code
DDS	Disk Definition Structure
DMA	Defect Management Area
DMP	Defect Management Pointers
ECC	Error Correction Code
EDAC	Error Detection And Correction
ID	Identifier
LBA	Logical Block Address
LSB	Least Significant Byte
MO	Magneto-Optical
MSB	Most Significant Byte
ODC	Optical Disk Cartridge

PA	Postamble
PDL	Primary Defect List
PEP	Phase-Encoded Part of the Control Tracks
RLL	Run Length Limited (code)
R-S	Reed-Solomon (code)
R/W	Rewritable
R-S/LDC	Reed-Solomon Long Distance Code
SCSI	Small Computer System Interface
SDL	Secondary Defect List
SFP	Standard Formatted Part of the Control Tracks
SM	Sector Mark
SWF	Sector Written Flag
TA	Transition Area
TIA	Time Interval Analyzer
VFO	Variable Frequency Oscillator
WO	Write Once
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 consists of two sides assembled together with their recording layers on the inside.

The optical disk may be recordable on both sides. 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 focused optical beam, using the thermo-magnetic effect. The data can be read with a focused optical beam, using the magneto-optical effect. The beam accesses the recording layer through the transparent substrate of the disk.

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

The entire disk may be used for write once recording of data using the thermo-magnetic effect. This data can be read using the magneto-optic effect.

8 General requirements

8.1 Environments

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 A)

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 hours minimum. It is recommended that, before testing, the entrance surface of the disk 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 Standard in the specified test environment provides data interchange over the specified ranges of environmental parameters in the operating environment. (See also annex R.)