INTERNATIONAL STANDARD

ISO/IEC 14517

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Information technology — 130 mm optical disk cartridges for information interchange — Capacity: 2,6 Gbytes per cartridge

Technologies de l'information — Cartouches de disque optique de 130 mm *pour l'échange d'information — Capacité:* 2,6 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. 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 14517 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 23, *Optical disk cartridges for information interchange*.

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

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Section 1 - General

1 Scope

This International Standard defines a series of related 130 mm optical disk cartridges (ODCs) by using a number of Type designations.

A disk has two sides, called Side A and Side B. Each side can have a nominal capacity of 1,3 Gbytes.

Type R/W provides for data to be written, read and erased many times over the recording surface of the corresponding disk side, using thermo-magnetic and magneto-optical effects.

Type P-ROM provides for a part of the disk surface to be pre-recorded and reproduced by stamping or other means. This part of the disk is read without recourse to the magneto-optical effect. All parts which are not pre-recorded provide for data to meet the requirements of Type R/W.

Type O-ROM provides for the whole of the disk surface to be pre-recorded and reproduced by stamping or other means. The corresponding disk sides are read without recourse to the magneto-optical effect.

Type DOW provides for data to be written and read many times over the recording surface of the corresponding disk side, using the direct overwrite thermo-magnetic and magneto-optical effects requiring a single external magnetic field.

Type P-DOW provides for a part of the disk surface to be pre-recorded and reproduced by stamping or other means. This part of the disk is read without recourse to the magneto-optical effect. All parts which are not pre-recorded provide for data to meet the requirements of Type DOW.

Type WO provides write once, read multiple functionality using the thermo-magnetic and magneto-optical effects.

Type WO-DOW provides write once, read multiple functionality using the direct overwrite thermo-magnetic and magneto-optical effects.

In addition, for each Type, this International Standard provides for cartridges with a sector size of 512 bytes and cartridges with a sector size of 1 024 bytes. All sectors of a disk are 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, 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 magneto-optical characteristics of the disk, enabling processing systems to writedata 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: A claim of conformance shall specify the Type of the ODC. It shall be in conformance with this International Standard if it meets all mandatory requirements specified therein for that Type.

2.2 Generating system: A claim of conformance with this International Standard shall specify which of Types R/W, DOW, P-ROM, P-DOW, O-ROM, WO and WO-DOW 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 Standard for the Type(s) supported.

2.3 Receiving system: A claim of conformance with this International Standard shall specify which Type(s) is(are) 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 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 International 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 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 subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

4 Definitions

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

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

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

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

4.4 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.

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

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

4.7 direct overwrite: a thermo-magnetic recording method using a specially designed media that does not require a separate erase pass.

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

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

4.11 format: The arrangement or layout of information on the disk.

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

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

4.14 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.

4.15 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.

4.16 logical track: Either 31 consecutive sectors for 512-byte sector disks or 17 consecutive sectors for disks with 1 024-byte sector in one or more physical tracks. The first sector of each logical track is assigned sector number 0.

4.17 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 1 - Subdivisions of a sector which are named "mark" are not marks in the sense of this definition.

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

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

4.20 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.

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

4.22 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.

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

Note 2 - 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.

4.24 pre-recorded mark: A mark so formed as to be unalterable by magneto-optical means.

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

Note 3 - It is specified as a maximum power that may be used without damage to the written data. Lower power may be used providing that the signal-to-noise ratio and other requirements of this International Standard are met.

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 which is particularly suited to the correction of errors which occur in bursts or are strongly correlated.

4.28 space: The area between marks along the track.

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

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

4.31 track pitch: The distance between adjacent track centrelines, measured in a radial direction.

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

4.33 write-once functionality: A technique whereby a rewritable MO ODC is restricted to initialization and writing once only; erase is not permitted.

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.
- 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 their output.
- Unless otherwise stated, groups of decimal digits of the form xx ... x/yy ... y indicate that the value xx ... x applies to 1 024-byte sectors and that the value yy ... y applies to 512-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
DOW	Direct overwrite
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
NBSNR	Narrow-Band Signal-to-Noise Ratio
ODC	Optical Disk Cartridge
O-ROM	Optical Read Only Memory
PA	Postamble
PDL	Primary Defect List
PEP	Phase-Encoded Part of the Control Tracks
P-DOW	Partial ROM direct overwrite
P-ROM	Partial Read Only Memory
RLL(1,7)	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
TIA	Time Interval Analyzer
VFO	Variable Frequency Oscillator
WO	Write Once
WO-DOW	Write once direct overwrite
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. Data may be written over existing data by modulating the intensity of the optical beam. 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 or the entire disk may contain 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 h 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 Q).

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