INTERNATIONAL STANDARD

ISO/IEC 10885

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Information technology — 356 mm optical disk cartridge for information interchange — Write once

Technologies de l'information — Cartouches de disques optiques de 356 mm *pour l'échange d'informations — Cartouches non réinscriptibles*

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Contents

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 10885 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Sub-Committee SC 23, *Optical disk cartridges for information interchange*.

Annexes A, C, D, E, F, G, H, J, K, L, M, N, P, Q and R form an integral part of this International Standard. Annex B is for information only.

Information technology — 356 mm optical disk cartridge for information interchange — Write once

1 Scope

This International Standard specifies the characteristics of 356 mm optical disk cartridges of the type providing for information to be written once and read many times.

ISO 10885 specifies

- definitions of essential concepts,
- the environment in which the characteristics shall be tested,
- the environments in which the cartridge shall be operated and stored,
- the mechanical, physical and dimensional characteristics of the case and of the optical disk,
- the optical characteristics and the recording characteristics for recording the information once and for reading it many times, so as to provide physical interchangeability between data processing systems.
- the format for the physical disposition of the tracks and sectors, the error correction codes, the modulation methods used for recording and the quality of the recorded signals.

Together with a standard for volume and file structure, ISO/IEC 10885 provides for full data interchange between data processing systems.

2 Conformance

A 356 mm optical disk cartridge is in conformance with this International Standard if it meets all the mandatory requirements herein.

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 edition of the standard listed below. Members of IEC and ISO maintain registers of currently valid international standards.

ISO/IEC 646:1991 *Information Technology - ISO 7-bit coded character set for information interchange.*

4 Definitions

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

4.1 General

4.1.1 caddy: An enclosure which protects the optical disk and carrier from contamination and damage due to physical handling. The caddy may include space for physical labelling, write-inhibit features and provisions for automatic handling.

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

4.1.3 optical disk: A disk containing information in the form of marks in a recording layer that can be read with an optical beam.

4.1.4 optical disk carrier: A framework which captures and holds an optical disk except when the optical disk is mounted on the disk drive spindle. The carrier provides the interface with the equipment for handling of an optical disk. The carrier and the optical disk are permanently mated and as a sub-assembly interchangeable with any caddy, disk drive or library equipment.

4.1.5 optical disk cartridge: A device consisting of a case containing an optical disk.

4.1.6 perimeter ring: An outside diameter feature of the optical disk to provide an interface to the carrier and to handling devices of an optical disk drive.

4.2 Disk

4.2.1 air-sandwich disk: A disk which consists at least of a substrate with a recording layer and a cover separated by two annular spaces providing an enclosed air gap for the recording layer.

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

4.2.3 coversheet: A transparent covering placed at a pre-determined distance from the recording surface to protect the optical disk from surface contamination and to cause surface contaminants to be out of focus.

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

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

4.2.6 hub: The central feature on the disk which interacts with the spindle of the disk drive to provide radial centring and clamping force and, in some cases, axial location.

4.2.7 protective layer: A transparent layer on the disk provided for mechanical protection of the recording layer, through which the optical beam accesses the recording layer. A suitable substrate can simultaneously function as the protective layer.

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

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

4.2.10 tilt: The angle which the normal to the entrance surface makes with the normal to the disk reference plane.

4.3 Optics

4.3.1 actual write power: The actual write power is two times the recording beam power exiting the objective lens for a time averaged measurement of 50 percent duty cycle optical pulses where the pulse length is measured at one half the peak power.

4.3.2 baseline reflectance: The reflectance of an unwritten, non-grooved area of a disk through the protective layer.

4.3.3 birefringence: The property of a material which causes incident light waves of different polarizations to be refracted differently by the material.

4.3.4 cross-talk level: The ratio of the level of a spurious signal generated by an adjacent track to the level of the signal of that track.

4.3.5 mark: A feature on the disk which may take the form of a physical change (for example a hole, a pit or a bubble), a magnetic change (Kerr effect) or other change (for example phase change) that can be sensed by the optical system.

4.3.6 narrow band signal-to-noise ratio: The ratio of the root mean square (RMS) voltage of a signal at a specified frequency to the RMS voltage of the noise in a specified bandwidth, expressed in decibels.

4.3.7 noise floor: The noise spectrum in a specified bandwidth.

4.3.8 optical retardation: The change, after passage through a birefringent material, of the phase between two orthogonally, linearly polarized plane waves associated with a given propagation direction.

4.3.9 read power: The incident power specified at the entrance surface that can be used to read the data on the disk without damaging the recording layer.

4.3.10 write power: The incident power specified at the entrance surface used to produce marks.

4.4 Format

4.4.1 band: An annular area of the optical disk recording zone.

4.4.2 format: The arrangement or layout of the data on a data medium.

4.4.3 track: A 360-degree segment of the path which is to be followed by the read beam during reading or the write beam during writing.

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

4.5 Errors

4.5.1 cyclic redundancy check (CRC): A method to detect errors in data.

4.5.2 defect management: In real time, refers to automated programs for altering read or write power, focus or tracking when difficulties are detected, and for the decision to abandon sectors of high error content. In batch mode, refers to guidelines for disk rewrite or retirement.

NOTE: Disk retirement is retention of a disk which can be read but not written.

4.5.3 error correction code (ECC): An error-detecting code designed to correct certain kinds of errors in data.

4.5.4 error detection and correction (EDAC): A family of methods in which redundancy is added to data in known fashion and is written with the data. Upon readback, a decoder removes the redundancy and uses the redundant information to detect and correct erroneous channel symbols.

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

4.5.6 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.

5 Abbreviations and acronyms

AM	Address mark
BSM	Bad sector map
CRC	Cyclic redundancy check
EDAC	Error detection and correction
ECC	Error correction code
ID	Inside diameter
IDENT	Identification

OD	Outside diameter
PAD	Tracking pad
RLL	Run length limited (code)
RPM	Revolutions per minute
R-S/LDC	Reed-Solomon long distance code
VFO	Variable frequency oscillator

6 Conventions

a) In the sector headers, character data are recorded according to the IRV of ISO/IEC 646.

b) All other data are stored as binary integers.

c) Multiple-byte binary data are stored least significant byte first.

d) Numbers in hexadecimal notation are shown in parentheses.

7 General description

The 356 mm optical disk cartridge specified by this International Standard is two sided and of the type in which the information is written once and read many times. Such a 356 mm optical disk cartridge comprises three parts: an optical disk, a carrier, and a caddy. The carrier is for capture and equipment handling of the optical disk. The optical disk and carrier sub-assembly are contained in the caddy to provide protection from contaminants and to provide protection during human handling. (see figure 1).

A coherent light beam is used to write data to, or to read data from, the disk. This International Standard accommodates optical disks having either a 90 µm thick protective layer or a 1,2 mm thick protective layer.

8 Environment

8.1 Testing environment

Unless otherwise specified, tests and measurements made on the ODC to check the requirements of this International Standard shall be carried out in an environment where the air immediately surrounding the ODC is within the following conditions.

Temperature	23 °C ± 2 °C
Relative humidity	45 % to 55 %
Atmospheric pressure	75 kPa to 110 kPa
Air cleanliness	Class 100 000 (see annex A)
Conditioning before testing	48 h minimum

Before testing, the ODC shall be conditioned in this environment for 48 h minimum. No condensation on or in the ODC shall occur.

8.2 Operating environment

Optical disk cartridges used for data interchange shall be operated in an environment where the air immediately surrounding the optical disk and carrier is within the following conditions when the drive has reached its stable operating conditions.

Temperature	10 °C to 50 °C
Relative humidity	10 % to 80 %
Wet bulb temperature	29 °C maximum
Atmospheric pressure	75 kPa to 110 kPa
Temperature gradient	10 °C/h maximum

Temperature gradient	10 °C/h maximum
Relative humidity gradient	10 %/h maximum
Air cleanliness	Class 100 000 (see annex A)

No condensation on or in the ODC shall be allowed to occur.

If an ODC has been exposed during storage and/or transportation to conditions outside those specified above, it shall be acclimatized in the operating environment for at least 2 h before use. In the operating environment an ODC shall be capable of withstanding a thermal shock of up to 20 °C when inserted into, or removed from, the drive.

8.3 Storage environment

Storage environment is the ambient condition to which the ODC without any additional protective enclosure is exposed when stored.

8.3.1 Short-term storage

For a time of six consecutive weeks the optical disk cartridge within its specified shipping package shall not be exposed to the environmental conditions outside those given below.

Temperature	-20 °C to +55 °C
Relative humidity	5 % to 90 %
Wet bulb temperature	29 °C maximum
Atmospheric pressure	75 kPa to 110 kPa
Temperature gradient	20 °C/h maximum
Relative humidity gradient	20 %/h maximum

No condensation on or in the optical disk assembly shall be allowed to occur.

8.3.2 Long-term storage

For a storage period longer than six consecutive weeks the optical disk cartridge shall not be exposed to environmental conditions outside those given below.

Temperature	-10 °C to 50°C
Relative humidity	10 % to 90 %
Wet bulb temperature	29 °C maximum
Atmospheric pressure	75 kPa to 110 kPa
Temperature gradient	15 °C/h maximum
Relative humidity gradient	10 %/h maximum
Air Cleanliness	Class 100 000 (see annex A)

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

8.3.3 Transportation

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

9 Safety requirements

9.1 Safety

The cartridge and its components shall not constitute any safety or health hazard when used in its intended manner or in any foreseeable use in an information processing system.

9.2 Flammability

The cartridge and its components shall be made from materials which, if ignited from a match flame, do not continue to burn in a still, carbon dioxide atmosphere.

10 Dimensional and mechanical characteristics of the caddy

10.1 General (see figure 1)

The caddy contains the 356 mm optical disk which is captured within the carrier. The caddy provides the optical disk and carrier sub-assembly protection from contaminants and during human handling.

The caddy shall enclose the carrier and optical disk at all times when they are external to a disk drive or an automated library storage equipment.

Any caddy shall be interchangeable with any carrier.

The caddy shall be a rigid, protective enclosure of rectangular shape and include a means for positioning and retaining the carrier and optical disk.

The caddy shall have write protect tabs that interface with the carrier and the tabs shall also be accessible for manual enable or inhibit (see figure 2).

The caddy shall have an access door for automated unload and load of the carrier and optical disk (see figure 3).

The caddy shall have a window for viewing the label on the end of the carrier and the caddy shall have areas provided for manufacturer labels (see figure 2).

The caddy shall provide drive/backup roller surfaces for disk drive cartridge load and unload operations (see figure 8).

10.2 Caddy drawings

The caddy is represented schematically in the following drawings:

Figure 1	shows a typical optical disk cartridge
Figure 2	shows the caddy bottom surface
Figure 3	shows the caddy top surface
Figure 4	shows the caddy write protect tabs
Figure 5	shows the caddy overall dimensions
Figure 6	shows the caddy door opener force location
Figure 7	shows the caddy window location
Figure 8	shows the caddy autoload drive surfaces

10.3 Relationship of sides and interface with carrier

10.3.1 Relationship of sides

The caddy shall be interchangeable with any carrier and shall accept a carrier with either Side A up or Side B up.

10.3.2 Interface with carrier

The caddy shall mechanically retain the carrier and optical disk sub-assembly. The caddy shall allow the carrier and optical disk sub-assembly to be loaded and unloaded through the caddy door.

10.3.3 Write protect features (see figure 4)

The caddy shall have write-protect features to interface with the carrier. Side A of the optical disk shall be down and write-protected under the following conditions:

a) The letter "A" is correctly seen on the carrier label when viewed through the caddy window.

b) The left write protect tab is positioned so that the arrow on the tab is in alignment with the arrow on the caddy.

c) The carrier write protect feature blocks the write protect holes in the carrier (see 11.11).

d) The write protect mode selected shall remain with the carrier when loaded into a disk drive and the caddy is removed from the disk drive.

e) The caddy write protect tabs shall be automatically moved into the position that is consistent with the carrier write protect mode when the carrier and optical disk sub-assembly is reloaded into a caddy.

10.4 Materials

The caddy shall be constructed from any suitable materials such that it meets the requirements of this International Standard.

10.5 Mass

The total mass of the empty caddy shall be less than 1,5 kg.

10.6 Caddy dimensions

10.6.1 Overall dimensions of the caddy (see figure 5)

The length, width, and height of the caddy shall be:

L_1 = 443,76 mm ± 1,50 mm

L_2 = 421,84 mm ± 0,64 mm

L_3 = 25,40 mm ± 0,51 mm

10.6.2 Opening force of the caddy door (see figure 6)

The caddy door shall be opened by a force applied at the following locations:

L_4 = 35,81 mm ± 3,2 mm

L_5 = 12,70 mm ± 1,5 mm

The opening force shall be:

F_1 = 7,50 N min.

10.6.3 Location of the caddy window (see figure 7)

The location of the caddy window from caddy side shall be:

L_6 = 151,0 mm ± 0,64 mm

The width of the window shall be:

L_7 = 101,0 mm min.

The location of the window from the caddy top or bottom surface shall be:

L_8 = 6,35 mm ± 0,25 mm

The height of the window shall be:

L_9 = 12,50 mm min.

10.6.4 Caddy write protect tabs (see figure 4)

A caddy write protect tab shall be enabled when an arrow on the tab is in alignment with an arrow on the caddy. The write protect conventions are specified in 10.3.3.

10.6.5 Caddy autoload drive surfaces (see figure 8)

The drive roller surface location on the top and bottom caddy surfaces from the caddy side shall be: