INTERNATIONAL STANDARD

ISO/IEC 10090

First edition
1992-10-15

Information technology — 90 mm optical disk cartridges, rewritable and read only, for data interchange

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Technologies de l'information — Cartouches pour disques optiques de diamètre 90 mm, réinscriptibles et à lecture unique, pour échange de données

ISO/IEC 10090:1992
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Reference number
ISO/IEC 10090:1992(E)

Contents

		Page
Section 1 - General		1
1	Scope	1
2	Conformance	1
3	Normative reference	1
4	Definitions	1
4.1	case	1
4.2	cyclic redundancy check (CRC)	2
4.3	embossed mark	2
4.4	entrance surface	2
4.5	error correction code (ECC)	2
4.6	field	2
4.7	format	2
4.8	groove	2
4.9	interleaving	2
4.10	Kerr rotation	2
4.11	land and groove	2
4.12	mark	2
4.13	optical disk	2
4.14	optical disk cartridge (ODC)	2
4.15	polarization	2
4.16	recording layer	2
4.17	Reed-Solomon code	2
4.18	rewritable optical disk	2
4.19	sector	2
4.20	substrate	2
4.21	track	2
4.22	zone	2
5	Conventions and notations	3
5.1	Representation of numbers	3
5.2	Names	3
6	List of acronyms	3
7	General description of the optical disk cartridge	3

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Printed in Switzerland

8	General requirements	4
8.1	Environments	4
8.1.1	Testing environment	4
8.1.2	Operating environment	4
8.1.3	Storage environment	5
8.1.4	Transportation	5
8.2	Temperature shock	5
8.3	Safety requirements	5
8.4	Flammability	5
9	Reference Drive	5
9.1	Optical system	5
9.2	Optical beam	7
9.3	Read channels	7
9.4	Tracking	7
9.5	Rotation of the disk	7
Section 2 - Mechanical and physical characteristics		8
10	Dimensional and physical characteristics of the case	8
10.1	General description of the case	8
10.2	Reference planes of the case	8
10.3	Dimensions of the case	8
10.3.1	Overall dimensions	8
10.3.2	Location hole	9
10.3.3	Alignment hole	9
10.3.4	Reference surfaces	9
10.3.5	Detents	10
10.3.6	Functional Areas	10
10.3.7	Spindle and head windows	11
10.3.8	Shutter	12
10.3.9	Path for shutter opener and shutter sensor notch	13
10.3.10	Mis-insert protections	13
10.3.11	Gripper slots	14
10.3.12	Label area	14
10.4	Mechanical characteristics	14
10.4.1	Material	14
10.4.2	Mass	15
10.4.3	Edge Distortion	15
10.4.4	Compliance	15
10.4.5	Shutter opening force	15
11	Dimensional, mechanical and physical characteristics of the disk	27
11.1	General description of the disk	27
11.2	Reference axis and plane of the disk	27
11.3	Dimensions of the disk	28
11.3.1	Hub dimensions	28

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10090:1992
https://standards.iteh.ai/catalog/standards/sist/bdd2d3a9-6e71-4e1e-a81e-6e6d65f63e7b/iso-iec-10090-1992

11.3.2	Clamping zone	28
11.4	Mechanical characteristics	29
11.4.1	Material	29
11.4.2	Mass	29
11.4.3	Moment of inertia	29
11.4.4	Imbalance	29
11.4.5	Axial deflection	29
11.4.6	Axial acceleration	29
11.4.7	Radial runout	30
11.4.8	Radial acceleration	30
11.4.9	Tilt	30
11.5	Optical characteristics	30
11.5.1	Index of refraction	30
11.5.2	Thickness of the substrate	30
11.5.3	Birefringence	31
11.5.4	Reflectance	31
12	Interface between cartridge and drive	31
12.1	Clamping method	31
12.2	Clamping force	31
12.3	Capture cylinder (see figure 14)	31
12.4	Disk position in operating condition (see figure 14)	32
Section 3 - Format of information		34
13	Track geometry	34
13.1	Track shape	34
13.2	Direction of rotation	34
13.3	Track pitch	34
13.4	Track number	34
14	Track format	34
14.1	Track layout	34
14.2	Radial alignment	35
14.3	Sector Number	35
15	Sector format	35
15.1	Sector layout	35
15.2	Sector Mark	35
15.3	VFO fields	36
15.4	Address Mark (AM)	36
15.5	ID fields	36
15.6	Postambles (PA)	37
15.7	Offset Detection Field (ODF)	37
15.8	Gap	37
15.9	Sync	37
15.10	Data field	37
15.10.1	User data bytes	38
15.10.2	CRC and ECC bytes	38
15.10.3	Resync bytes	38
15.11	Buffer field	38

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10090:1992
https://standards.iteh.ai/catalog/standards/sist/bdd2d3a9-6e71-4e1e-a81e-6e6d65f63e7b/iso-iec-10090-1992

16	Recording code	**38**
17	Format of the Information Zone	**39**
17.1	General description of the Information Zone	**39**
17.2	Division of the Information Zone	**39**
17.2.1	Initial Zone	**40**
17.2.2	Acquire Zone	**40**
17.2.3	Test Zones	**40**
17.2.4	Control Zones	**41**
17.2.5	Data Zone	**41**
17.2.6	Buffer Zone	**41**
18	Format of the Data Zone	**41**
18.1	Defect Management Areas (DMAs)	**42**
18.2	Disk Definition Sector (DDS)	**43**
18.3	Rewritable Zone	**45**
18.3.1	Location	**45**
18.3.2	Partitioning	**45**
18.4	Embossed Zone	**45**
18.4.1	Location	**45**
18.4.2	Partitioning	**46**
18.4.3	Parity Sectors	**46**
19	Defect management in the Rewritable Zone	**46**
19.1	Initialization of the disk	**47**
19.2	Certification	**47**
19.2.1	Slipping Algorithm	**47**
19.2.2	Linear Replacement Algorithm	**47**
19.3	Disks not certified	**47**
19.4	Write procedure	**48**
19.5	Primary Defect List (PDL)	**48**
19.6	Secondary Defect List (SDL)	**48**
Section 4 - Characteristics of embossed information		**50**
20	Method of testing	**50**
20.1	Environment	**50**
20.2	Use of the Reference Drive	**51**
20.2.1	Optics and mechanics	**51**
20.2.2	Read power	**51**
20.2.3	Read channels	**51**
20.2.4	Tracking	**51**
20.3	Definition of signals	**51**
21	Signals from grooves	**53**
21.1	Cross-track signal	**53**
21.2	Cross-track minimum signal	**53**
21.3	Push-pull signal	**53**
21.4	Divided push-pull signal	**54**

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10090:1992
https://standards.iteh.ai/catalog/standards/sist/bdd2d3a9-6e71-4e1e-a81e-6e6d65f63e7b/iso-iec-10090-1992

21.5	On-track signal	54
21.6	Phase depth	55
21.7	Track location	55
22	Signals from Headers	55
22.1	Sector Mark	55
22.2	VFO1 and VFO2	55
22.3	Address Mark, ID field and Postamble	55
23	Signals from embossed Recording fields	56
Section 5 - Characteristics of the recording layer		56
24	Method of testing	56
24.1	Environment	56
24.2	Reference Drive	56
24.2.1	Optics and mechanics	56
24.2.2	Read power	56
24.2.3	Read channel	56
24.2.4	Tracking	57
24.3	Write conditions	57
24.3.1	Write pulse	57
24.3.2	Write power and pulse width	57
24.3.3	Write magnetic field	58
24.4	Erase conditions	58
24.4.1	Erase power	58
24.4.2	Erase magnetic field	58
24.5	Definition of signals	58
25	Magneto-optical characteristics	59
25.1	Figure of merit	59
25.2	Imbalance of the magneto-optical signal	59
26	Write characteristics	59
26.1	Resolution	59
26.2	Narrow-band signal-to-noise ratio	59
26.3	Cross-talk	60
27	Erase characteristics	60
Section 6 - Characteristics of user data		61
28	Method of testing	61
28.1	Environment	61
28.2	Reference Drive	61
28.2.1	Optics and mechanics	61
28.2.2	Read power	61
28.2.3	Read amplifiers	61
28.2.4	Analog-to-binary converters	61
28.2.5	Error correction	62
28.2.6	Tracking	62
29	Minimum quality of a sector	62
29.1	Headers	62

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10090:1992
https://standards.iteh.ai/catalog/standards/sist/bdd2d3a9-6e71-4e1e-a81e-6e6d65f63e7b/iso-iec-10090-1992

29.1.1	Sector Mark	**62**
29.1.2	ID fields	**62**
29.2	User-written data	**62**
29.3	Embossed data	**62**
30	Data interchange requirements	**62**
30.1	Tracking	**62**
30.2	User-written data	**63**
30.3	Embossed data	**63**
30.4	Quality of disk	**63**

Annexes

A - Edge distortion test	**64**
B - Compliance test	**65**
C - Track deviation measurement	**67**
D - CRC for ID fields	**71**
E - Format of the Data field of a sector	**72**
F - Contents of the Control Zones	**76**
G - Guidelines for sector replacement	**84**
H - Measurement of the figure of merit	**84**
J - Read power, write power and erase power	**85**
K - Test method for measuring the adsorbent force of the hub	**86**
L - Derivation of the operating climatic environment	**88**
M - Air cleanliness class 100 000	**92**
N - Position of the cartridge relative to the reference planes	**93**
P - Transportation	**94**
Q - Office environment	**94**
R - Relaxation by zones of the requirements for signals	**95**

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10090:1992
https://standards.iteh.ai/catalog/standards/sist/bdd2d3a9-6e71-4e1e-a81e-6e6d65f63e7b/iso-iec-10090-1992

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 JTC1. 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.

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International Standard ISO/IEC 10090 was prepared by the European Computer Manufacturers Association (as Standard ECMA-154) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC1, *Information technology* in parallel with its approval by national bodies of ISO and IEC.

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

Introduction

This International Standard specifies the characteristics of 90 mm optical disk cartridges (ODCs) of the type providing for data to be written, read and erased many times using the thermo-magnetic and magneto-optical effects.

A part or all of the optical disk may be pre-recorded and be reproduced by stamping or other means. This information is read without recourse to the magneto-optical effect.

This International Standard together with a standard for volume and file structure provides for full data interchange between data processing systems. Interchange involves the ability to write, read and erase data without introducing any error.

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ISO/IEC 10090:1992
https://standards.iteh.ai/catalog/standards/sist/bdd2d3a9-6e71-4e1e-a81e-6e6d65f63e7b/iso-iec-10090-1992

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Information technology - 90 mm optical disk cartridges, rewritable and read only, for data interchange

Section 1 - General

1 Scope

This International Standard specifies

- the conditions for conformance testing and the Reference Drive;
- 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, both embossed and user-written;
- 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.

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2 Conformance

A 90 mm optical disk cartridge is in conformance with this International Standard if it meets all mandatory requirements specified herein.

Annex R specifies the zones of the disk in which the requirements for the signal characteristics given in the body of this International Standard shall be met, and the zones in which a relaxation of these requirements is permitted.

A drive claiming conformance with this International Standard shall be able, in the operating environment, to write on any optical disk cartridge which is in conformance with this International Standard, and to read from any optical disk cartridge which is in conformance with this International Standard.

A drive shall not claim conformance if it cannot accept the full range of media conforming to this International Standard but only a specific sub-set of it.

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.

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

4 Definitions

For the purpose of this International Standard the following definitions apply.

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

4.2 cyclic redundancy check (CRC): A method for detecting errors in data.

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

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

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

4.6 field: A subdivision of a sector.

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

4.8 groove: See 4.11.

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

4.10 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.

4.11 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.

4.12 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.

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

4.13 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.

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

4.15 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.

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

4.17 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.

4.18 rewritable optical disk: An optical disk in which data in specified areas can be written, erased and rewritten by an optical beam.

4.19 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.

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

4.21 track: The path which is to be followed by the focus of the optical beam during one revolution of the disk.

4.22 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 ZEROs and ONEs.
- 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.

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5.2 Names

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

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6 List of acronyms

AM	Address Mark
CCS	Continuous Composite Servo (tracking method)
CRC	Cyclic Redundancy Check
DDS	Disk Definition Sector
DMA	Defect Management Area
ECC	Error Correction Code
FA1	Functional Area 1
FA2	Functional Area 2
ID	Identifier
LSB	Least Significant Byte
MSB	Most Significant Byte
ODC	Optical Disk Cartridge
ODF	Offset Detection Field
PA	Postamble
PDL	Primary Defect List
RLL(2,7)	Run Length Limited (code)
SDL	Secondary Defect List
SM	Sector Mark
VFO	Variable Frequency Oscillator

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. 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.

Part of the disk or the entire disk may contain read-only data 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.

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 M)

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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.

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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 50 °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)
Magnetic field strength at the recording layer for any condition under which a beam is in focus	: 32 000 A/m max.
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 L).

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 50 °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)
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.

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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.

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8.3 Safety requirements

The cartridge shall satisfy the safety requirements of IEC 950, 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 IEC 950.

9 Reference Drive

The Reference Drive is a drive several critical components of which have well defined properties and which is used to test write, read and erase 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 write, read and erase parameters is 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.