

INTERNATIONAL
STANDARD

ISO/IEC
17345

First edition
2005-02-01

**Information technology — Data
interchange on 130 mm rewritable and
write once read many ultra density
optical (UDO) disk cartridges — Capacity:
30 Gbytes per cartridge (first generation)**

*Technologies de l'information — Échange de données sur cartouches
de disques de 130 mm de diamètre, de densité ultra-optique (UDO),
pour réécriture et pour «write once read many» — Capacité: 30 Go par
cartouche (première génération)*

Reference number
ISO/IEC 17345:2005(E)



© ISO/IEC 2005

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO/IEC 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

	Page
Foreword	ix
Section 1 — General	1
1 Scope.....	1
2 Conformance	2
2.1 Optical disk.....	2
2.2 Generating system.....	2
2.3 Receiving system.....	2
2.4 Compatibility statement	2
3 Normative references	2
4 Terms and definitions	2
5 Conventions and notations.....	5
5.1 Representation of numbers	5
5.2 Names.....	6
6 Acronyms.....	6
7 General description	7
8 General requirement	7
8.1 Environments	7
8.1.1 Test environment	7
8.1.2 Operating environment.....	8
8.1.3 Storage environment	8
8.1.4 Transportation.....	8
8.2 Temperature shock	8
8.3 Safety requirements.....	8
8.4 Flammability	8
9 Reference Drive	9
9.1 Optical system.....	9
9.2 Optical beam.....	10
9.3 Read Channel	10
9.4 Tracking	10
9.5 Rotation of the disk.....	10
Section 2 — Mechanical and physical characteristics.....	11
10 Dimensional and physical characteristics of the case	11
10.1 General description of the case	11
10.2 Relationship of Sides A and B	11
10.3 Reference axes and case reference planes.....	11
10.4 Case drawings.....	11
10.5 Dimensions of the case	11
10.5.1 Overall dimensions	11
10.5.2 Location hole	12
10.5.3 Alignment hole	12
10.5.4 Surfaces on Case Reference Planes P	13
10.5.5 Insertion slots and detent features	14
10.5.6 Gripper slots	14
10.5.7 Write-inhibit holes	14
10.5.8 Media identification sensor holes	15
10.5.9 Head and motor window.....	16

10.5.10	Shutters	16
10.5.11	Slots for shutter opener.....	16
10.5.12	Slots to prevent insertion into a MO-drive.....	17
10.5.13	User label areas	17
10.6	Mechanical characteristics.....	17
10.6.1	Materials	17
10.6.2	Mass.....	17
10.6.3	Edge distortion	17
10.6.4	Compliance	18
10.6.5	Shutter opening force	18
10.7	Drop test.....	18
10.8	Electro-static discharge test	18
11	Dimensional, mechanical, and physical characteristics of the disk.....	30
11.1	General description of the disk.....	30
11.2	Reference axis and plane of the disk	30
11.3	Dimensions of the disk	30
11.3.1	Hub dimensions.....	30
11.3.2	Cover layer dimensions	31
11.4	Mechanical characteristics.....	32
11.4.1	Material	32
11.4.2	Mass.....	32
11.4.3	Moment of inertia.....	32
11.4.4	Imbalance	32
11.4.5	Axial deflection	32
11.4.6	Axial acceleration	33
11.4.7	Radial runout	33
11.4.8	Radial acceleration.....	33
11.4.9	Tilt	33
11.4.10	Axial damping	34
11.5	Optical characteristics	34
11.5.1	Index of refraction	34
11.5.2	Thickness	34
11.5.3	Birefringence	34
11.5.4	Reflectance	34
12	Interface between cartridge and drive.....	35
12.1	Clamping method	35
12.2	Clamping force	35
12.3	Capture cylinder	35
12.4	Disk position in operating condition	36
Section 3 — Format of information	38	
13	Track and Header geometry	38
13.1	Track and Header shape	38
13.2	Wobble groove.....	39
13.3	Mirror Area	39
13.4	Direction of spiral	39
13.5	Track pitch	39
13.6	Physical Track number	39
14	Track format.....	41
14.1	Physical Track layout.....	41
14.2	Physical Block Address (PBA).....	41
14.3	Sectors with Mirror Area.....	44
14.4	Radial alignment.....	44
15	Sector format	44
15.1	Sector layout.....	44
15.2	IDL, IDG	46
15.2.1	Address Mark (AM).....	46
15.2.2	ID	46

15.3	Blank field	47
15.4	Quadrature Wobble Marks (QWM).....	47
15.5	Gap	47
15.6	Guard.....	48
15.7	Verify and Protect (VAP).....	48
15.8	VFO1, VFO2	49
15.9	Sync.....	49
15.10	Data field	49
15.10.1	User data bytes	50
15.10.2	CRC and ECC bytes	50
15.10.3	Control bytes	50
15.10.4	Resync bytes	50
15.10.5	Reference byte	50
15.11	Postamble (PA).....	50
15.12	Buffer.....	50
15.13	Transition Area (TA).....	50
16	Recording codes	51
16.1	Preformatted Header.....	51
16.2	Data field	51
17	Formatted Zone	52
17.1	General description of the Formatted Zone	52
17.2	Division of the Formatted Zone	52
17.2.1	Lead-in Zone.....	56
17.2.2	Read Focus Offset (RFO) Zones.....	56
17.2.3	Read Reference Zones	56
17.2.4	Manufacturer Zones	57
17.2.5	SDI Zones.....	57
17.2.6	DDS Zones	57
17.2.7	PDL3 Zone.....	58
17.2.8	Write Power Calibration Zone	58
17.2.9	User Zones.....	58
17.2.10	Lead-out Zone	58
17.3	Drive test data patterns	58
17.4	SDI Zones usage	59
17.4.1	SDI amendment	59
17.4.2	LBA Control bytes in SDI sectors	60
17.4.3	Parametric conditions	60
17.4.4	Specific Disk Information	60
17.5	DDS Zones Usage	60
17.5.1	DDS Amendment.....	61
17.5.2	LBA Control bytes in DDS sectors	62
17.5.3	DDS information	62
18	Layout of the User Zones	62
18.1	General description of the User Zones	62
18.2	Divisions of the User Zones.....	62
18.3	User Area	62
18.4	Defect Management Area (DMA)	65
18.4.1	Primary Defect List (PDL) Areas.....	65
18.4.2	Secondary Defect List (SDL) Area.....	65
18.4.3	SDL Duplicate Pages (SDLDP) Area	65
18.4.4	Primary Spares Area (PSA).....	65
18.4.5	Secondary Spares Area (SSA).....	66
18.5	Disk Definition Structure (DDS).....	66
19	Defect Management in the Rewritable (RW) and Write Once Read Many (WORM) Zones	68
19.1	Initialization of the disk	68
19.2	Certification	68
19.2.1	Slipping Algorithm	68
19.2.2	Linear Replacement Algorithm.....	69

19.3	Disk not certified	69
19.4	Write procedure	69
19.5	Primary Defect List (PDL) format and content	70
19.6	Secondary Defect List (SDL) format and content	71
Section 4 — Characteristics of embossed information.		73
20	Embossed information — Method of testing.....	73
20.1	Environment.....	73
20.2	Use of the Reference Drive.....	73
20.2.1	Optics and mechanics	73
20.2.2	Read power	73
20.2.3	Read Channel.....	73
20.2.4	Tracking.....	73
20.2.5	Axial focus offset optimization	73
20.3	Definition of signals	73
21	Signals from grooves and lands	75
21.1	Ratio of groove to land signal.....	75
21.2	Ratio of groove/land to Mirror Area signal	75
21.3	Push-pull signal.....	75
21.4	Divided push-pull signal	75
21.5	Wobble signal	75
21.6	Phase depth	76
21.7	Track location	76
22	Signals from Headers	76
22.1	Reference reflectance I_{top}	76
22.2	Address Mark and ID signals	77
22.3	QWM signals	77
22.4	Timing mean and jitter	77
Section 5 — Characteristics of the recording layer.		78
23	Method of testing.....	78
23.1	Environment.....	78
23.2	Reference Drive	78
23.2.1	Optics and mechanics	78
23.2.2	Read power	78
23.2.3	Read Channel.....	78
23.2.4	Tracking.....	78
23.2.5	Signal detection for testing purposes	78
23.3	Write conditions	79
23.3.1	Write pulse and power waveform	79
23.3.2	Write pulse power.....	79
23.3.3	Write pulse timing	79
23.3.4	Write pulse power and pulse timing determination.....	79
23.4	Erase power for Type RW media	80
23.5	Read power damage.....	80
24	Phase Change characteristics	80
24.1	Mark polarity	80
24.2	Rewrite cycles for Type RW media.....	80
25	Write characteristics	81
25.1	Resolution	81
25.2	Narrow-Band Signal-to-Noise Ratio (NBSNR)	81
25.3	Cross-talk ratio	82
25.4	Timing mean	82
25.4.1	Timing mean for 2T marks and spaces	82
25.4.2	Timing mean for 3T to 9T marks and spaces	82
25.5	Timing jitter	82
25.5.1	Timing jitter for 2T marks and spaces.....	83
25.5.2	Timing jitter for 3T to 9T marks and spaces	83

25.6	Asymmetry	83
25.6.1	Asymmetry (3T-2T)	83
25.6.2	Asymmetry (9T-3T)	83
26	Erase power determination for Type RW media	83
26.1	Cross-Erase for Type RW Media	83
Section 6 — Characteristics of user data		85
27	User Data – Method of testing	85
27.1	Environment	85
27.2	Reference Drive	85
27.2.1	Optics and mechanics	85
27.2.2	Read power	85
27.2.3	Read Channel	85
27.2.4	Mark quality	85
27.2.5	Channel bit clock	86
27.2.6	Binary-to-digital converters	86
27.2.7	Error correction	86
27.2.8	Tracking	86
28	Minimum quality of a sector	86
28.1	Headers ID	86
28.2	User-written data	86
28.2.1	Recording field	86
28.2.2	Byte errors	87
28.2.3	Timing mean	87
28.2.4	Timing jitter	87
28.2.5	Asymmetry	87
28.3	Wobble signal	87
29	Data interchange requirements	87
29.1	Tracking	87
29.2	User-written data	87
29.3	Quality of disk	87
Annex A (normative) Air cleanliness class 100 000		88
Annex B (normative) Edge distortion test		90
Annex C (normative) Compliance test		92
Annex D (normative) Cartridge electro-static discharge test		95
Annex E (normative) Test method for measuring the adsorbent force of the hub		96
Annex F (normative) CRC for ID fields		98
Annex G (normative) Data field scrambler implementation		99
Annex H (normative) Interleave, CRC, ECC, Resync, and Reference for the Data field		101
Annex I (normative) Drive Information Record (DIR) usage		106
Annex J (normative) Determination of the Resync and Reference patterns		108
Annex K (normative) Specific Disk Information		110
Annex L (normative) Read Channel for measuring analog signals and jitter		123
Annex M (normative) Timing mean and timing jitter measuring procedure		124
Annex N (normative) Implementation Independent Mark Quality Determination (IIMQD) for the interchange of recorded media		125
Annex O (normative) Definition of the write pulse shape		127
Annex P (normative) Asymmetry measuring definition		128

Annex Q (normative) Enhanced Selective Inter-Symbol Interference Cancellation (ESISIC algorithm)	129
Annex R (normative) Requirements for interchange	131
Annex S (informative) Office environment	133
Annex T (informative) Derivation of the operating climatic environment	134
Annex U (informative) Transportation	139
Annex V (informative) Track deviation measurement	140
Annex W (informative) Measurement of the vertical birefringence of the cover layer	144
Annex X (informative) Quadrature Wobble offset control	145
Annex Y (informative) Start Position Shift (SPS) implementation	148
Annex Z (informative) Sector retirement guidelines	149
Annex AA (informative) Guidelines for the use of Type WORM ODCs	150
Annex BB (informative) Media type identification in existing and future standards	151
Annex CC (informative) Laser power calibration for evaluation of media power parameters	152

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 17345 was prepared by Ecma International (as ECMA-350) 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 130 mm rewritable and write once read many ultra density optical (UDO) disk cartridges — Capacity: 30 Gbytes per cartridge (first generation)

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-optical Phase Change effects to enable data interchange between such disks.

This International Standard specifies two types:

- Type RW (rewritable) provides for data to be written, read and erased many times over the recording surfaces of the disk.
- Type WORM (write once read many) provides for data once written to be read a multiplicity of times. This type uses a write once read many times recording material. (Written marks cannot be erased and attempted modifications of the written marks are detectable.) Multisession (incremental write operations) recording may be performed on type WORM disks.

The disk is two-sided with a nominal capacity of 15,0 GB per side and the cartridge (two sides) provides a nominal capacity of 30,0 GB.

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 and the modulation methods used;
- the characteristics of the embossed information on the disk;
- the thermo-optical characteristics of the disk, enabling processing systems to write data onto the disk; and
- 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

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 (RW or WORM) implemented.

2.2 Generating system

A claim of conformance with this International Standard shall specify which type(s) 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(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 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), and whether support includes reading only or both reading and writing.

3 Normative references

The following referenced document is 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 (2002), *Safety of electronic equipment*

4 Terms and definitions

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

4.1 asymmetry
the deviation between the centre levels of signals generated by two distinct repeating mark and space length patterns

4.2 band
an annular area 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 Case Reference Plane
a plane defined for each side of the case, to which the dimensions of the case are referred