Information technology — Data interchange on 90 mm optical disk cartridges — Capacity: 2,3 Gbytes per cartridge

Technologies de l'information — Échange de données sur cartouches de disque optique de 90 mm — Capacité: 2,3 Go par cartouche
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreword</td>
<td>vii</td>
</tr>
<tr>
<td>1</td>
<td>Section 1 - General</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Scope</td>
<td>1</td>
</tr>
<tr>
<td>2.1</td>
<td>Optical disk Cartridge (ODC)</td>
<td>1</td>
</tr>
<tr>
<td>2.2</td>
<td>Generating system</td>
<td>1</td>
</tr>
<tr>
<td>2.3</td>
<td>Receiving system</td>
<td>2</td>
</tr>
<tr>
<td>2.4</td>
<td>Compatibility statement</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Normative references</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Terms and definitions</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Conventions and notations</td>
<td>5</td>
</tr>
<tr>
<td>5.1</td>
<td>Representation of numbers</td>
<td>5</td>
</tr>
<tr>
<td>5.2</td>
<td>Names</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Abbreviations and acronyms</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>General description of the optical disk cartridge</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>General requirements</td>
<td>6</td>
</tr>
<tr>
<td>8.1</td>
<td>Environments</td>
<td>6</td>
</tr>
<tr>
<td>8.2</td>
<td>Temperature shock</td>
<td>8</td>
</tr>
<tr>
<td>8.3</td>
<td>Safety requirements</td>
<td>8</td>
</tr>
<tr>
<td>8.4</td>
<td>Flammability</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>Reference Drive</td>
<td>8</td>
</tr>
<tr>
<td>9.1</td>
<td>Optical system</td>
<td>8</td>
</tr>
<tr>
<td>9.2</td>
<td>Optical beam</td>
<td>9</td>
</tr>
<tr>
<td>9.3</td>
<td>Read channels</td>
<td>10</td>
</tr>
<tr>
<td>9.4</td>
<td>Tracking</td>
<td>10</td>
</tr>
<tr>
<td>9.5</td>
<td>Rotation of the disk</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Section 2 - Mechanical and physical characteristics</td>
<td>11</td>
</tr>
<tr>
<td>10.1</td>
<td>Dimensional and physical characteristics of the case</td>
<td>11</td>
</tr>
<tr>
<td>10.2</td>
<td>General description of the case (see Figure 2)</td>
<td>11</td>
</tr>
<tr>
<td>10.3</td>
<td>Reference planes of the case</td>
<td>11</td>
</tr>
<tr>
<td>10.4</td>
<td>Dimensions of the case</td>
<td>11</td>
</tr>
<tr>
<td>10.4</td>
<td>Mechanical characteristics</td>
<td>11</td>
</tr>
<tr>
<td>11</td>
<td>Dimensional, mechanical and physical characteristics of the disk</td>
<td>31</td>
</tr>
<tr>
<td>11.1</td>
<td>General description of the disk</td>
<td>31</td>
</tr>
<tr>
<td>11.2</td>
<td>Reference axis and plane of the disk</td>
<td>31</td>
</tr>
<tr>
<td>11.3</td>
<td>Dimensions of the disk (see Figure 13)</td>
<td>31</td>
</tr>
<tr>
<td>11.4</td>
<td>Mechanical characteristics</td>
<td>32</td>
</tr>
<tr>
<td>11.5</td>
<td>Optical Characteristics</td>
<td>34</td>
</tr>
<tr>
<td>12</td>
<td>Interface between cartridge and drive</td>
<td>36</td>
</tr>
<tr>
<td>12.1</td>
<td>Clamping method</td>
<td>36</td>
</tr>
<tr>
<td>12.2</td>
<td>Clamping force</td>
<td>36</td>
</tr>
<tr>
<td>12.3</td>
<td>Capture cylinder (see Figure 14)</td>
<td>36</td>
</tr>
<tr>
<td>12.4</td>
<td>Disk position in operating condition (see Figure 14)</td>
<td>36</td>
</tr>
</tbody>
</table>
Section 3 - Format of information

13 Geometry of physical tracks ................................................................. 38
13.1 Physical track shape ........................................................................ 38
13.2 Direction of track spiral ................................................................. 39
13.3 Physical track pitch ......................................................................... 39
14 Track format ......................................................................................... 39
14.1 Logical Track number ..................................................................... 39
14.2 Logical Track layout ....................................................................... 39
14.3 Clock frequencies and periods ....................................................... 40
14.4 Radial alignment ............................................................................. 40
14.5 Sector number ................................................................................ 41
15 Sector format ...................................................................................... 41
15.1 Sector layout .................................................................................. 41
15.2 Sector Mark (SM) .......................................................................... 42
15.3 VFO fields ....................................................................................... 42
15.4 Address Mark (AM) ....................................................................... 43
15.5 ID fields ........................................................................................ 43
15.6 Postambles (PA) ............................................................................ 44
15.7 Gap ............................................................................................... 45
15.8 Sync .............................................................................................. 45
15.9 Data field ....................................................................................... 45
15.10 VCO lock pattern field (VLP) ....................................................... 46
15.11 Buffer field .................................................................................. 46
16 Recording code .................................................................................. 46
17 Format of the Information Zone ......................................................... 47
17.1 General description of the Information Zone ................................... 47
17.2 Division of the Information Zone .................................................... 47
18 Format of the Data Zone ................................................................... 51
18.1 Buffer tracks and Test tracks in the Data Zone ............................... 51
18.2 Defect Management Areas (DMAs) .............................................. 51
18.3 Disk Definition Structure (DDS) .................................................. 55
18.4 Partitioning ................................................................................... 55
18.5 Logical block address ..................................................................... 55
19 Defect management ......................................................................... 57
19.1 Initialization of the disk ................................................................. 57
19.2 Certification ................................................................................... 57
19.3 Disks not certified ......................................................................... 58
19.4 Write procedure ............................................................................ 58
19.5 Primary Defect List (PDL) ............................................................ 58
19.6 Secondary Defect List (SDL) ......................................................... 59

Section 4 - Characteristics of embossed information

20 Method of testing .............................................................................. 60
20.1 Environment .................................................................................. 60
20.2 Use of the Reference Drive ........................................................... 60
20.3 Definition of signals ....................................................................... 61
21 Signals from grooves ........................................................................ 62
21.1 Divided push-pull signal .............................................................. 62
21.2 Phase depth .................................................................................. 63
21.3 Track location ................................................................................ 63
22 Signals from Headers ......................................................................... 63
22.1 Sector Mark ................................................................................... 64
22.2 VFO1 and VFO2 ............................................................................ 64
22.3 Address Mark, ID field and Postamble ........................................ 64
22.4 Timing jitter .................................................................................. 64
22.5 Asymmetry .......................................................................................................................... 65
23 Signals from embossed Recording fields .............................................................................. 65
23.1 Signal amplitude .................................................................................................................. 65
23.2 Timing jitter ....................................................................................................................... 65
Section 5 - Characteristics of the recording layer and user data .................................................. 66
24 Method of testing .................................................................................................................... 66
24.1 Environment ....................................................................................................................... 66
24.2 Reference Drive .................................................................................................................. 66
24.3 Write conditions .................................................................................................................. 67
24.4 Erase conditions ................................................................................................................ 69
24.5 Definition of signals .......................................................................................................... 70
25 Magneto-optical characteristics ............................................................................................. 70
25.1 Figure of merit .................................................................................................................... 70
25.2 Imbalance of the magneto-optical signal .......................................................................... 70
26 Write characteristics .............................................................................................................. 71
26.1 Resolution .......................................................................................................................... 71
26.2 Narrow-band signal-to-noise ratio (NBSNR) .................................................................... 72
26.3 Cross-talk ratio ................................................................................................................ 73
26.4 Timing jitter ....................................................................................................................... 73
26.5 Media thermal interaction ................................................................................................ 73
27 Erase power determination ................................................................................................... 74
Section 6 - Characteristics of user data ....................................................................................... 75
28 Method of testing .................................................................................................................... 75
28.1 Environment ....................................................................................................................... 75
28.2 Reference Drive .................................................................................................................. 75
29 Minimum quality of a sector .................................................................................................. 76
29.1 Headers ............................................................................................................................. 76
29.2 User-written data ............................................................................................................... 76
30 Data interchange requirements ............................................................................................... 77
30.1 Tracking ............................................................................................................................. 77
30.2 User-written data ............................................................................................................... 77
30.3 Quality of disk ................................................................................................................... 77
Annex A (normative) Edge distortion test .................................................................................... 78
Annex B (normative) Compliance test ....................................................................................... 79
Annex C (normative) CRC for ID fields ..................................................................................... 81
Annex D (normative) Interleave, CRC, ECC, Resync for the data field ..................................... 82
Annex E (normative) Contents of the Control Zone ................................................................ 87
Annex F (normative) Determination of the Resync patterns .................................................... 94
Annex G (normative) Measurement of the figure of merit ........................................................ 99
Annex H (normative) Read Channel for measuring NBSNR and jitter ................................... 100
Annex I (normative) Implementation Independent Mark Quality Determination (IIMQD) for the interchange of recorded media .......................................................... 103
Annex J (normative) Air cleanliness class 100 000 .................................................................. 104
Annex K (normative) Position of the cartridge relative to the reference planes ......................... 105
Annex L (normative) Relaxation by zones of the requirements for signals ............................... 106
Annex M (normative) Test method for measuring the adsorbent force of the hub .................. 107
Annex N (informative) Track deviation measurement ................................................................. 109
Annex O (informative) Derivation of the operating climatic environment .................................................. 113
Annex P (informative) Transportation ........................................................................................................ 118
Annex Q (informative) Office environment .................................................................................................. 119
Annex R (informative) Values to be implemented in existing and future standards .................................. 120
Annex S (informative) Measurement of the vertical birefringence of the substrate .................................. 121
Annex T (informative) Sector retirement guidelines ................................................................................... 123
Annex U (informative) Laser power calibration for evaluation of media power sensitivity .................... 124
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 22533 was prepared by Ecma (as ECMA-353) and was adopted, under a special fast-track procedure, by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 23, Digital storage media for information interchange, in parallel with its approval by national bodies of ISO and IEC.
Information technology — Data interchange on 90 mm optical disk cartridges — Capacity: 2,3 Gbytes per cartridge

Section 1 - General

1 Scope

This International Standard defines the characteristics of 90 mm Optical Disk Cartridges (ODC) with a capacity of 2,3 GB per Cartridge. The Standard specifies only Type R/W for 2 048-byte sectors of such cartridge.

Type R/W provides for data to be written, read and erased many times over the entire recording surface of the disk using the thermo-magnetic and magneto-optical effects. It is also referred to as "fully rewritable". This International Standard provides for 2 048-byte sectors only. All sectors on a disk are of 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 and physical characteristics of the cartridge, so as to provide mechanical interchange ability 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 method used;
— 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.

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)

A claim of conformance with this International Standard shall specify the Type of the ODC. It shall be in conformance if it meets all mandatory requirements specified herein for that Type.

2.2 Generating system

A claim of conformance with this International Standard shall specify which Type is 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 specified.
2.3 Receiving system

A claim of conformance with this International Standard shall specify which Type is 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 in accordance with 2.1 on the Type specified.

2.4 Compatibility statement

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

3 Normative references

The following referenced documents are 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.