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Information technology — 90 mm flexible disk cartridges for information interchange — 21 MBytes formatted capacity — ISO Type 305

*Technologies de l'information — Cartouches à disquette de 90 mm pour
l'échange d'information — Capacité formatée de 21 MB — Type ISO 305*



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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 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.

International Standard ISO/IEC 14169 was prepared by the Japanese Industrial Standards Committee (as Standard JIS X 6228 - 1994) with document support and contribution from ECMA 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.

Annexes A to L form an integral part of this International Standard. Annexes M to T are for information only.

Introduction

This International Standard specifies the characteristics of 90 mm flexible disk cartridges of 21 MBytes formatted capacity, recorded at 31 831 ftprad in the Inner Zone and 47 747 ftprad in the Outer Zone with sector servo tracking on 326 Data Tracks on each side, using 2-7 RLL recording.

This International Standard specifies the physical interchangeability of the unrecorded disk and the format interchangeability of recorded Data Tracks and Servo Tracks.

In reference to ISO/IEC 9983, flexible disk cartridges conforming to this International Standard are designated as ISO Type 305.

Information technology - 90 mm flexible disk cartridges for information interchange - 21 MBytes formatted capacity - ISO Type 305

Section 1 - General

1 Scope

This International Standard specifies the characteristics of 90 mm flexible disk cartridges (FDC) of 21 Mbytes formatted capacity, recorded at 31 831 ftprad in the Inner Zone and 47 747 ftprad in the Outer Zone with sector servo tracking on 326 data tracks on each side, using 2-7 RLL recording.

It specifies the mechanical, physical and magnetic characteristics of the cartridge, so as to provide physical interchangeability between data processing systems.

It also specifies the method of recording, the quality of recorded signals, the track layouts and the track formats of Data Tracks and Servo Tracks.

Such flexible disk cartridges are identified as ISO Type 305.

Together with a standard for volume and file structure, for instance ISO/IEC 9293, this International Standard provides for full data interchange between data processing systems.

2 Conformance

2.1 Flexible disk cartridge

A 90 mm flexible disk cartridge shall be in conformance with this International Standard if it meets all the mandatory requirements specified herein.

2.2 Generating systems

A system generating an FDC for interchange shall be entitled to claim conformance with this International Standard if all recordings on the flexible disk meet the mandatory requirements of this International Standard.

2.3 Receiving systems

A system receiving an FDC for interchange shall be entitled to claim full conformance with this International Standard if it is able to handle any recording made on the flexible disk according to this International Standard.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were 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 standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 683-13: 1986, *Heat-treatable steels, alloy steels and free-cutting steels - Part 13: Wrought stainless steels*.

ISO/IEC 9293:1994, *Information technology - Volume and file structure of disk cartridges for information interchange*.

ISO/IEC 9983:1995, *Information technology - Designation of unrecorded flexible disk cartridges*.

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 Average Signal Amplitude: The Average Signal Amplitude for a track is the arithmetically averaged value of the output voltages measured peak-to-peak over the whole track.

4.2 case: A protective enclosure including a shutter mechanism, identification holes and a write-inhibit hole.

- 4.3 Data Sector:** A sector comprising a Sector Identifier and a Data Block.
- 4.4 Data Track:** A track on which data are recorded on Data Sectors.
- 4.5 direction of rotation:** The direction of rotation shall be counter-clockwise when looking at Side 0.
- 4.6 disk:** A flexible disk which accepts and retains, on the specified side or sides, magnetic signals intended for input/output and storage purposes.
- 4.7 Error Correcting Code (ECC):** A mathematical procedure yielding bits used for the detection and correction of errors.
- 4.8 Error Detecting Code (EDC):** A mathematical procedure yielding bits used for the detection of errors.
- 4.9 flux transition frequency:** The number of flux transition per second (ftps).
- NOTE 1 - In this International Standard, the frequencies to be used in the Outer Zone are indicated by the subscript OZ, those to be used in the Inner Zone are indicated by the subscript IZ (see 11.3.1.1).
- 4.10 hub:** A centring and referencing device attached to the disk which allows torque to be transmitted to the disk. The hub is attached to the centre of the disk. It ensures centring of the disk on the drive shaft in a unique angular position.
- 4.11 index:** The signal generated in the index transducer of the drive by the drive spindle once per revolution.
- 4.12 Inner Zone:** The inner subdivision of the recording area of a surface of the disk.
- 4.13 input bit:** Bits which represent input data.
- 4.14 Line of Access of the head:** The straight line described by the centre of the gap of the read/write head when positioned from Track -004 to Track 328.
- 4.15 liner:** Suitable material between the case and the disk to provide cleaning action and protection from abrasion.
- 4.16 Master Standard Reference Flexible Disk Cartridge:** A flexible disk cartridge selected as the standard for Reference Fields, signal amplitudes, resolution, peak shift, and overwrite. Tracks 000 and 325 are declared as Reference Tracks.
- The reference tracks are calibrated at 600 rpm.
- NOTE 2 - This Master Standard has been established at the Reliability Centre for Electronic Components of Japan (RCJ), 1-1-12 Hachiman-cho, Higashikurume-shi, Tokyo 203, Japan.
- 4.17 Outer Zone:** The outer subdivision of the recording area of a surface of the disk.
- 4.18 peak value:** The zero to crest value of the output voltage of the read head.
- 4.19 Primary Identification hole:** A through-hole provided on the case to identify the FDC specified by this International Standard.
- 4.20 Reference Field:** The Typical Field of the Master Standard Reference Flexible Disk Cartridge. There are two Reference Fields, one for each side.
- 4.21 Secondary Identification hole:** An identification hole provided on Side 0 of the case to identify the FDCs specified by this International Standard.
- 4.22 Secondary Standard Reference Flexible Disk Cartridge:** A flexible disk cartridge the performance of which is known and stated in relation to that of the Master Standard Reference Flexible Disk Cartridge.
- NOTE 3 - Secondary Standard Reference Flexible Disk Cartridges can be ordered under part number JRM 6228 from the Reliability Centre for Electronic Components of Japan (RCJ), 1-1-12 Hachiman-cho, Higashikurume-shi, Tokyo 203, Japan until the year 2004. (see annex T).
- It is intended that these be used for calibrating tertiary reference disks for use in routine calibration.
- 4.23 Sector Block:** A block consisting of a Servo Sector followed by either two or three Data Sectors, and a Sector Block Gap.

- 4.24 sector servo:** A method of position control, whereby head positioning information is recorded at the beginning of each Sector Block.
- 4.25 Servo Sector:** A sector which has a Servo Identifier and servo data.
- 4.26 Servo Track:** A track on which Servo Sectors are permanently recorded.
- 4.27 shutter:** A device which uncovers the head windows upon insertion of the cartridge into a drive, and automatically covers them upon removal from the drive.
- 4.28 Side:** Side 0 is the side engaged by the spindle. Side 1 is the opposite side.
- 4.29 Standard Reference Amplitude:** The Standard Reference Amplitudes (SRA_s) are the Average Signal Amplitudes derived from the reference tracks of the Master Standard Reference Flexible Disk Cartridge using the Test Recording Current.
- There are four SRAs, two for each side (see 11.3.1.1):
- SRA1 is the Average Signal Amplitude from a recording written using $3f_{OZ}$ at Track 000.
- SRA2 is the Average Signal Amplitude from a recording written using $8f_{IZ}$ at Track 325.
- 4.30 Standard Reference Current:** The current that produces the Reference Field.
- 4.31 Test Recording Current:** The current the relationship of which to the Standard Reference Current is defined for each zone and for each flux transition frequency.
- 4.32 Typical Field:** In the plot of the Average Signal Amplitude against the Recording Field at a specified recording density, the minimum field that causes an Average Signal Amplitude equal to 95% of the maximum Average Signal Amplitude.
- 4.33 write-inhibit hole:** A through-hole with a sliding cover, provided on the case to inhibit writing on the disk when the hole is uncovered.

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 byte to the left, and with the most significant bit in each byte to the left.
- Negative values of numbers in binary notation are given in TWO's complement.
- In each field the data is processed so that the most significant byte (byte 1) is processed first. Within each byte the least significant bit, numbered B_1 , is processed last, the most significant bit, numbered B_8 , is processed first. This order of processing applies also to the data input to the Error Detecting and Correcting circuits and to their output.

5.2 Names

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

6 Acronyms

ECC	Error Correcting Code
EDC	Error Detecting Code
FFT	Fast Fourier Transform
LED	Light Emitting Diode
SRA	Standard Reference Amplitude
SVDT	Servo data
SVIDA	Servo Identifier A
SVIDB	Servo Identifier B
2-7 RLL	2-7 Run Length Limited (code)

7 General description

7.1 Drawings

In the enclosed drawings:

- Figure 11 shows Side 0 and enlarged cross-sections through the Location and Secondary Identification holes;
- Figure 12 shows Side 1;
- Figure 13 shows at a larger scale the top part of Side 0 without shutter;
- Figures 14, 15 show the disk with hub;
- Figure 16 shows the interface between the cartridge and the drive.

7.2 Main elements

The main elements of the flexible disk cartridge are

- the disk,
- the liner,
- the case.

7.3 Description

The case is of a substantially square form. It includes a central hole on one side, head windows covered by a shutter on both sides, identification holes and a write-inhibit hole.

The liner is provided between the case and the disk. It comprises two layers of material between which the disk lies. The disk has a central hole with a metal hub attached.

7.4 Marking of the FDC

It is recommended that the case be clearly marked with the ISO Type No. ISO 305 of the FDC.

Section 2 - Environments, mechanical and physical characteristics

8 General requirements

8.1 Environment, transportation and safety

8.1.1 Testing environment

Tests and measurements made on the cartridge to check the requirements of this International Standard shall be carried out under the following conditions:ISO

temperature:	23 °C ± 2 °C
relative humidity:	40 % to 60 %
conditioning before testing:	24 h min.

For the tests specified in 11.3 the temperature and relative humidity shall be measured in the air immediately surrounding the cartridge drive. For all other tests the temperature and the relative humidity shall be measured in the air immediately surrounding the cartridge. The stray magnetic field at any point on the disk surface, including that resulting from the concentrating effect of the magnetic head, shall not exceed 4 000 A/m.

8.1.2 Operating environment

Cartridges used for data interchange shall be capable of operating under the following conditions:

temperature:	10 °C to 51,5 °C
relative humidity:	20 % to 80 %
wet bulb temperature:	less than 29 °C

The temperature and the relative humidity shall be measured in the air immediately surrounding the cartridge. It is recommended that the rate of change of the temperature should not exceed 20 °C per h.

There shall be no deposit of moisture on or in the cartridge.

The stray magnetic field at any point on the disk surface, including that resulting from the concentrating effect of the magnetic head, shall not exceed 4 000 A/m.

8.1.3 Storage environment

During storage the cartridges shall be kept within the following conditions:

temperature:	4 °C to 53 °C
relative humidity:	8 % to 90 %

The ambient stray magnetic field shall not exceed 4 000 A/m. There shall be no deposit of moisture on or in the cartridge.

NOTE 4 - Cartridges which have been stored at temperatures and humidities exceeding the operating conditions may exhibit degraded performance characteristics. Such cartridges should be subjected to a conditioning period of not less than 24 h within the operating environment prior to use.

8.1.4 Transportation

Responsibility for ensuring that adequate precautions are taken during the transportation shall be with the sender. The cartridge shall be in a protective package free from dust or extraneous matter. It is recommended that a sufficient space exists between cartridge and outer surface of the final container, so that risk of erasure due to stray magnetic fields will be negligible.

It is recommended that the following conditions are not exceeded:

temperature:	- 40 °C to 60 °C
maximum rate of temperature change:	20 °C per h
relative humidity:	8 % to 90 %

There should be no deposit of moisture on or in the cartridge.

8.1.5 Safety

The flexible disk cartridge and its components shall satisfy the requirements of IEC 950.

8.2 Materials

8.2.1 Case

The case may be constructed from any suitable material such that it meets the requirements of 9.7.

8.2.2 Liner

The material of the liner shall be able to retain dust or debris without damage to the disk.

8.2.3 Disk

The disk may be constructed from any suitable material (e.g. bi-axially oriented polyethylene terephthalate) coated on both sides with a flexible layer of magnetic material (e.g. metal particles).

8.2.4 Hub

The hub shall be made of any suitable material (e.g. stainless steel alloy according to ISO 683-13, type 8).

9 Dimensional characteristics

9.1 Case

The dimensions of the cartridge are referred to two Reference Axes X and Y. They are two lines in space intersecting at right angles. The plane they define is the Reference Plane XY of the cartridge (figures 11 and 12).

9.1.1 Shape

The case has a rectangular form, its sides shall be

$$l_1 = 94,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_2 = 90,0 \text{ mm} \begin{smallmatrix} + 0,4 \\ - 0,1 \end{smallmatrix} \text{ mm}$$

The radius of three of its corners shall be

$$r_1 = 2,0 \text{ mm} \pm 1,0 \text{ mm}$$

The angle of its fourth corner shall be

$$\omega = 45^\circ \pm 2^\circ$$

9.1.2 Thickness (figure 12)

In the area extending 8,5 mm from each of the two edges as shown in figure 12, the thickness of the case shall be

$$e_1 = 3,3 \text{ mm} \pm 0,2 \text{ mm}$$

When the cartridge is inserted in the test gauge specified in annex A, a force of 0,2 N maximum, applied to the centre of the back edge shall cause the cartridge to pass through the gauge.

The edge radius shall be

$$r_2 = 0,40 \text{ mm} \pm 0,25 \text{ mm}$$

9.1.3 Hub access hole (figure 11)

On Side 0 there shall be a hub access hole, the diameter of which shall be

$$d_1 = 26,50 \text{ mm min.}$$

The position of the centre of this hole shall be defined by

$$l_3 = 40,00 \text{ mm} \pm 0,15 \text{ mm}$$

$$l_4 = 31,00 \text{ mm} \pm 0,15 \text{ mm}$$

9.1.4 Locating holes (figures 11 and 13)

9.1.4.1 Primary Locating hole

The centre of the Primary Locating hole shall be at the intersection of Reference Axes X and Y.

Its diameter shall be

$$d_2 = 3,6 \text{ mm} \pm 0,1 \text{ mm}$$

The dimensions of its section (see cross-section A-A in figure 11) shall be

$$d_3 = 1,5 \text{ mm min.}$$

$$l_8 = 0,2 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_9 = 1,0 \text{ mm min.}$$

$$l_{10} = 2,5 \text{ mm min.}$$

9.1.4.2 Secondary Locating hole

The centre of the Secondary Locating hole shall be on Reference Axis X, its distance from Reference Axis Y shall be

$$l_5 = 80,0 \text{ mm} \pm 0,2 \text{ mm}$$

It shall have a substantially rectangular shape. Its short axis shall be (see cross-section B-B in figure 11)

$$l_6 = 3,6 \text{ mm} \pm 0,1 \text{ mm}$$

Its long axis shall be

$$l_7 = 4,4 \text{ mm} \pm 0,2 \text{ mm}$$

The dimensions d_3 , l_8 , l_9 and l_{10} of the cross-section of the Secondary Locating hole are as specified in 9.1.4.1.

9.1.5 Label area

9.1.5.1 Side 0 (figure 11)

The locations and dimensions of the label area of Side 0 shall be defined by

$$l_{11} = 3,5 \text{ mm min.}$$

$$l_{12} = 76,5 \text{ mm max.}$$

$$l_{14} = 60,0 \text{ mm min.}$$

9.1.5.2 Side 1 (figure 12)

The locations and dimensions of the label area of Side 1 shall be defined by

$$l_{11} = 3,5 \text{ mm min.}$$

$$l_{12} = 76,5 \text{ mm max.}$$

$$l_{13} = 20,0 \text{ mm min.}$$

9.1.6 Head windows (figure 13)

The locations and dimensions of the two head windows are specified by the same set of dimensions.

9.1.6.1 Location

The location of the head windows shall be defined by

$$l_{15} = 12,3 \text{ mm min.}$$

$$l_{16} = 11,5 \text{ mm min.}$$

$$l_{17} = 35,5 \text{ mm} \pm 0,2 \text{ mm}$$

9.1.6.2 Dimensions

The width of the head windows shall be

$$l_{18} = 9,00 \text{ mm} \pm 0,20 \text{ mm}$$

The radius of their corners shall be

$$r_3 = 0,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$r_4 = 0,5 \text{ mm} \pm 0,1 \text{ mm}$$

9.1.7 Write-inhibit hole (figures 11 and 12)

The write-inhibit hole is intended for use either with a mechanical switch or with an optical detector so that only when the hole is covered is writing on the disk possible. When covered, the closure device shall not extend outside the Reference Plane nor shall it deflect by more than 0,3 mm from the Reference Plane inside the case under the action of a force of 3 N.

Also when covered, the light transmittance of the write-inhibit hole area shall not exceed 1 %, when measured with an optical system such as described in annex B.

NOTE 5 - The position of write-inhibit hole is reversed compared with that of the cartridges specified by ISO 8860, ISO 9529 and ISO/IEC 10994 ; and it agrees with the position specified in ISO/IEC 13422.

9.1.7.1 Location

The centre of the write-inhibit hole shall be specified by l_5 and

$$l_{19} = 67,75 \text{ mm} \pm 0,25 \text{ mm}$$

9.1.7.2 Dimensions

The dimensions of the write-inhibit hole shall be

$$l_{49} = 3,5 \text{ mm min.}$$

$$l_{50} = 4,0 \text{ mm min.}$$

9.1.8 Identification holes (figures 11 to 13)

The Identification holes are provided to distinguish between the FDC according to this International Standard from those specified by ISO 8860, ISO 9529, ISO/IEC 10994 and ISO/IEC 13422.

NOTE 6 - As the Secondary Identification hole is not a through-hole, it is recommended that the Identification holes be detected by mechanical means.

9.1.8.1 Primary Identification hole

The position of the centre of the Primary Identification hole shall be on Reference Axis Y. Its distance from Reference Axis X shall be specified by l_{19} .

The dimensions of the Primary Identification hole shall be

$$l_{20} = 3,5 \text{ mm min.}$$

$$l_{21} = 4,0 \text{ mm min.}$$

9.1.8.2 Secondary Identification hole

The position of the centre of the Secondary Identification hole shall be

$$l_{60} = 7,50 \text{ mm} \pm 0,15 \text{ mm}$$

$$l_{61} = 69,0 \text{ mm} \pm 0,2 \text{ mm}$$

Its diameter shall be

$$d_{10} = 3,5 \text{ mm min.}$$

The dimensions of its section (see cross-section C-C in figure 11) shall be specified by l_8 and

$$l_{62} = 2,5 \text{ mm min.}$$

9.1.9 Profile of the shutter edge of the case (figures 11 and 13)

The edge on which the shutter is mounted shall have a profile defined by the following dimensions:

$$l_{22} = 80,0 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{23} = 76,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{24} = 68,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{25} = 64,50 \text{ mm} \pm 0,35 \text{ mm}$$

$$l_{26} = 57,00 \text{ mm} \pm 0,35 \text{ mm}$$

$$\begin{aligned}
 l_{27} &= 55,5 \text{ mm} \pm 0,6 \text{ mm} \\
 l_{28} &= 3,5 \text{ mm min.} \\
 l_{29} &= 17,5 \text{ mm} \pm 0,2 \text{ mm} \\
 l_{30} &= 17,00 \text{ mm} \pm 0,15 \text{ mm} \\
 l_{31} &= 15,50 \text{ mm} \pm 0,25 \text{ mm} \\
 l_{45} &= 12,50 \text{ mm} \pm 0,25 \text{ mm} \\
 \alpha &= 45^\circ \pm 2^\circ \\
 \beta &= 135^\circ \pm 2^\circ
 \end{aligned}$$

9.1.10 Shutter (figures 12 and 13)

The shutter shall slide upon insertion of the cartridge into the drive so as to uncover the head windows, and close automatically upon removal. The maximum resistance force at the fully open position shall be 1 N, and the minimum resistance force at the fully closed position shall be 0,2 N.

The path along which the shutter can slide is defined by l_{25} and l_{28} .

In the open position of the shutter, the distance from its leading edge to the Reference Axis Y shall be

$$l_{32} = 53,75 \text{ mm} \pm 1,25 \text{ mm}$$

The width of the windows of the shutter shall be

$$l_{33} = 12,0 \text{ mm} \pm 0,2 \text{ mm}$$

NOTE 7 - It is a requirement that the drive shall provide a mechanism whereby correct insertion of the cartridge into the drive causes the shutter to slide so as to uncover the head windows.

9.2 Liner

No part of the liner shall protrude by more than 0,2 mm into the head access windows.

9.3 Disk (figures 14 and 15)

9.3.1 Diameter

The diameter of the disk shall be

$$d_4 = 85,8 \text{ mm} \pm 0,2 \text{ mm}$$

9.3.2 Thickness

The thickness of the disk shall be

$$e_2 = 0,067 \text{ mm} \pm 0,008 \text{ mm}$$

9.4 Hub (figures 14 and 15)

The hub shall have a central part and a flange.

9.4.1 Dimensions

The diameter of the central part shall be

$$d_5 = 25,00 \text{ mm} \begin{matrix} + 0,00 \\ - 0,15 \end{matrix} \text{ mm}$$

The diameter of the flange shall be

$$d_6 = 29,50 \text{ mm max.}$$

The distance from the surface of the central part of the hub to the surface of Side 0 of the disk shall be

$$l_{34} = 1,36 \text{ mm} \pm 0,10 \text{ mm}$$

when measured at a radius r_7

$$r_7 = 14 \text{ mm nominal}$$

9.4.2 Hub orientation holes (figures 14 and 15)

The hub shall have two orientation holes. The first one at its centre, the second off-centre.

9.4.2.1 Primary Orientation hole

The Primary Orientation hole shall have a square form defined by

$$l_{35} = 4,0 \text{ mm min.}$$

The position of the centre of rotation of the disk is defined by

$$l_{36} = 1,995 \text{ 5 mm}$$

measured from two sides of the hole. The centre of rotation shall be within 0,5 mm of the geometric centre of the disk. The radius of the four corners of this hole shall be

$$r_5 = 1,0 \text{ mm} \pm 0,3 \text{ mm}$$

The angles of two sides of the hole which are in contact with the spindle shaft shall be

$$\delta = 90^\circ \begin{matrix} + 1^\circ \\ - 0^\circ \end{matrix}$$

9.4.2.2 Secondary Orientation hole

The position and dimensions of the sides of the rectangular Secondary Orientation hole are referred to two radial Reference Lines A and B that are perpendicular to each other. Their positions shall be specified by

$$\gamma = 15^\circ \pm 3^\circ$$

The length of the sides of this hole shall be

$$l_{37} = 8,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{38} = 4,5 \text{ mm min.}$$

These sides shall be parallel to Reference Lines A and B, respectively, at a distance:

$$l_{39} = 2,0 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{40} = 10,00 \text{ mm} \pm 0,15 \text{ mm}$$

The radius of one corner of this hole shall be

$$r_6 = 2,0 \text{ mm} \pm 0,1 \text{ mm}$$

The radius of the three other corners shall be

$$r_5 = 1,0 \text{ mm} \pm 0,3 \text{ mm}$$

9.5 Optional handling notches (figures 11 and 12)

Two handling notches are permitted. If present they shall satisfy the following requirements. Their centres shall be on a line parallel to, and lying above, Reference Axis X at a distance

$$l_{41} = 7,50 \text{ mm} \pm 0,15 \text{ mm}$$

Their dimensions shall be

$$l_{42} = 3,0 \text{ mm min.}$$

$$l_{43} = 4,2 \text{ mm} \pm 0,2 \text{ mm}$$

Their depth below the Reference Plane XY shall be

$$l_{44} = 2,0 \text{ mm min.}$$

9.6 Interface between cartridge and drive (figure 16)

When the cartridge is inserted into the drive, the drive spindle engages the cartridge as shown in figure 16. The hub is held against the drive spindle by means of a magnetic attraction force. When in this position the distance between the hub surface on Side 0 and Reference Plane XY shall be

$$l_{46} = 0,3 \text{ mm nominal}$$

The inside dimensions of the case with the centre plate on Side 1 shall be

$$d_7 = 7,0 \text{ mm min.}$$

$$e_3 = 1,3 \text{ mm} \pm 0,1 \text{ mm}$$

with the exception of the annular zone defined by l_{47} and l_{48} where the thickness shall be

$$e_4 = 2,5 \text{ mm max.}$$

l_{47} shall be sufficiently large to ensure that the circumference of the disk shall not touch the inside edges of the case. The value of l_{47} specified below is a recommended value therefore it is stated without tolerance.

$$l_{47} = 22,6 \text{ mm}$$

$$l_{48} = 21,7 \text{ mm} \pm 0,2 \text{ mm}$$

9.7 Compliance

When the cartridge is constrained in the manner described in annex C, the cartridge shall be in contact with posts P1 to P4.

10 Physical characteristics

10.1 Flammability

The disk, case and liner components shall be made from materials that, if ignited from a match flame, do not continue to burn in a still carbon dioxide atmosphere.

10.2 Coefficient of linear thermal expansion of the disk

The coefficient of thermal expansion of the disk shall be

$$(17 \pm 8) \times 10^{-6} \text{ per degree Celsius}$$

The range from maximum value to minimum value on the disk surface shall be

$$8 \times 10^{-6} \text{ per degree Celsius max.}$$

10.3 Coefficient of linear hygroscopic expansion of the disk

The coefficient of hygroscopic expansion of the disk shall be

$$(0 \text{ to } 15) \times 10^{-6} \text{ per percent of relative humidity.}$$

The range from maximum value to minimum value on the disk surface shall be

$$5 \times 10^{-6} \text{ per percent of relative humidity max.}$$

10.4 Torque

10.4.1 Starting torque

The starting torque, without the heads loaded, shall not exceed 0,006 Nm (see annex M).

10.4.2 Running torque

The torque necessary to turn the disk, without the heads loaded, shall be in the range 0,000 5 Nm to 0,002 5 Nm (see annex M).

Section 3 - Requirements for the unrecorded disk

11 Magnetic recording characteristics

11.1 Recording area

On each side the magnetic properties specified shall be uniform in the recording area, which shall be the area limited by two radii:

20,6 mm max.

42,0 mm min.

11.2 Track geometry

11.2.1 Number of tracks

In the recording area there shall be 342 concentric tracks of which 326 contain user data on each side of the disk.

11.2.2 Track number

The track number shall be a three-digit number identifying the tracks consecutively, starting at the outermost track (figure 9).

11.2.2.1 Data Tracks

Data Tracks shall be numbered from -004, the outermost Data Track, to 328, the innermost Data Track.

11.2.2.2 Servo Tracks

Servo Tracks shall be numbered from -10,5, the outermost Servo Track, to 330,5, the innermost Servo Track.

11.2.3 Width of Data Tracks

The width of a recorded track shall be

0,044 mm $\pm$ 0,003 mm

The method of measuring effective track width is given in D.1 of annex D.

11.2.4 Data Track location

11.2.4.1 Nominal locations

The nominal radius (R_{n_D}) of the centrelines of the Data Tracks shall be calculated by using the formula:

$$R_{n_D} = x - 0,046\,875\,n_D$$

where

n_D is the track number, $n_D = -004$ to 328

$x = 39,875$ mm for Side 0

$x = 38,375$ mm for Side 1

11.2.4.2 Track location tolerance

For testing purposes the centrelines of the recorded tracks shall be within 0,050 mm of the nominal positions, when measured in the testing environment (8.1.1). The nominal distance between centrelines of adjacent tracks shall be 0,046 875 mm, and its tolerance shall be $\pm 0,010$ mm.

11.2.4.3 Line of Access of the heads

The Line of Access of the heads shall be a line parallel to a radial line and spaced 0,35 mm from it (see 12.3).

11.2.4.4 Zone of tracks

The tracks of the disk are grouped into two zones: an Outer Zone and an Inner Zone. The innermost track of the Outer Zone constitutes the boundary between the two zones. On Side 0, it is Track 112, on Side 1, it is Track 080.

11.3 Functional testing

For the purposes of the following tests the same drive unit shall be used for writing and reading operations, both for the disk under test and for the Secondary Standard Reference Flexible Disk Cartridge.

The in-contact condition shall be used.

Unless otherwise specified, tests shall be performed on both sides.

11.3.1 Test conditions

The magnetic properties of both surfaces are defined by the testing requirements given below.

11.3.1.1 Flux transition frequency

Two test frequencies, expressed in flux transitions per second (ftps), shall be used in each zone. In the Outer Zone:

$$8f_{OZ} = 3\,000\,000\text{ ftps} \pm 3\,000\text{ ftps}$$
$$3f_{OZ} = 1\,125\,000\text{ ftps} \pm 1\,125\text{ ftps}$$

In the Inner Zone:

$$8f_{IZ} = 2\,000\,000\text{ ftps} \pm 2\,000\text{ ftps}$$
$$3f_{IZ} = 750\,000\text{ ftps} \pm 750\text{ ftps}$$

The frequency(ies) to be used is(are) specified for each test.

11.3.1.2 Test Recording Currents

The Test Recording Currents shall have the following relationships to the Standard Reference Current at $8f_{IZ}$ on Track 325.

Side 0	tracks	-004 to 112 and 219 to 328	: (130 ± 2) %
Side 0	tracks	113 to 218	: (180 ± 2) %
Side 1	tracks	-004 to 080 and 203 to 328	: (130 ± 2) %
Side 1	tracks	081 to 202	: (180 ± 2) %

11.3.1.3 Erasure

Erasure shall be performed using the d.c. equivalent to the quiescent value I_q of the Test Recording Current before recording the data, unless otherwise specified.

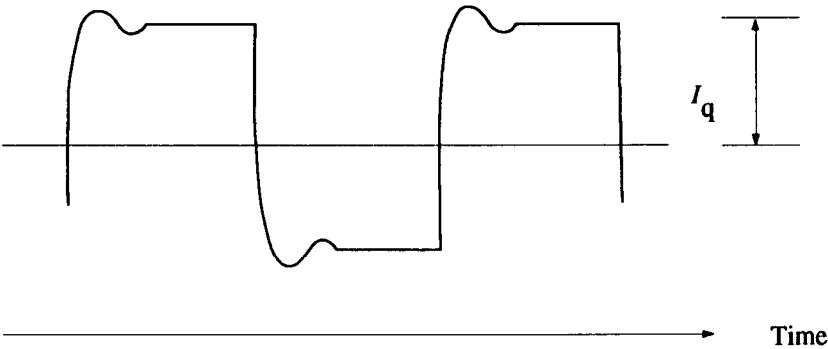


Figure 1 • Quiescent value of the Test Recording Current

11.3.1.4 Rotational speed of the disk

The rotational speed of the disk shall be 600 rpm ± 6 rpm. The direction of rotation shall be counter-clockwise as seen from Side 0 of the flexible disk cartridge.

11.3.2 Typical Field

The Typical Field of the disk under test shall be (100 ± 20) % of the Reference Field. It shall be measured using $8f_{IZ}$ on Track 325. Traceability to the Reference Field is provided by the calibration factors supplied with each Secondary Standard Reference Flexible Disk Cartridge.