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ISO/IEC 9529-1

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Information processing systems — Data interchange on 90 mm (3,5 in) flexible disk cartridges using modified frequency modulation recording at 15 916 ftprad, on 80 tracks on each side —

Part 1:
Dimensional, physical and magnetic characteristics

Systèmes de traitement de l'information — Échange de données sur cartouches à disquette de 90 mm (3,5 in) *utilisant un enregistrement à modulation de fréquence modifiée à* 15 916 ftprad *sur 80 pistes sur chaque face —*

Partie 1: Caractéristiques dimensionnelles, physiques et magnétiques

Reference number
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for worldwide standardization as a whole. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for approval before their acceptance as International Standards. They are approved in accordance with procedures requiring at least 75 % approval by the national bodies voting.

International Standard ISO/IEC 9529-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

Introduction

ISO/IEC 9529 specifies the characteristics of 90 mm (3,5 in) flexible disk cartridges recorded at 15 916 ftprad using modified frequency modulation recording on, 80 tracks on each side.

ISO/IEC 9529-2 specifies the track layout, the track format and the characteristics of the recorded signals.

ISO/IEC 9529-1 and ISO/IEC 9529-2, together with the labelling scheme specified in ISO 9293, provide for full data interchange between data processing systems.

In accordance with ISO/IEC 9983 [1], flexible disk cartridges conforming to this part of ISO/IEC 9529 should be designated as "ISO Type 302".

1) ISO/IEC 9983 : 1989, *Information processing systems — Designation of unrecorded flexible disk cartridges.*

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Information processing systems — Data interchange on 90 mm (3,5 in) flexible disk cartridges using modified frequency modulation recording at 15 916 ftprad, on 80 tracks on each side —

Part 1:
Dimensional, physical and magnetic characteristics

1 Scope

This part of ISO/IEC 9529 specifies the dimensional, physical and magnetic characteristics of the cartridge, so as to provide physical interchangeability between data processing systems.

NOTE — Numeric values in the SI and/or Imperial measurement system in this part of ISO/IEC 9529 may have been rounded off and therefore are consistent with, but not exactly equal to, each other. Either system may be used, but the two should be neither intermixed nor reconverted. The original design was made using SI units.

2 Conformance

A 90 mm (3,5 in) flexible disk cartridge shall be in conformance with this part of ISO/IEC 9529 if it meets all mandatory requirements specified herein.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9529. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 9529 are encouraged to investigate the possibility of applying the most recent editions of the standards listed 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 9293:1987, *Information processing - Volume and file structure of flexible disk cartridges for information interchange.*

4 Definitions

For the purpose of ISO/IEC 9529 the following definitions apply.

4.1 recording disk: A flexible disk which accepts and retains, on the specified side or sides, magnetic signals intended for input/output and storage purposes.

4.2 hub: A centring and referencing device attached to the centre of the disk which allows torque to be transmitted to the disk. It ensures centring of the disk on the drive shaft in a unique angular position.

4.3 shutter: A device which uncovers the head windows upon insertion, and automatically covers them upon removal from the drive.

4.4 liner: Suitable material positioned between the case and the disk to provide cleaning action and protection from abrasion.

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

4.6 Master Standard Reference Flexible Disk Cartridge: A reference flexible disk cartridge selected as the standard for reference fields, signal amplitudes, resolution, peak shift and overwrite. Track 00 and Track 79 on both sides are declared as reference tracks.

The reference tracks are calibrated at 300 r/min.

NOTE - This Master Standard has been established by the Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, D-3300 Braunschweig, Germany, F.R.

4.7 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 - Secondary Standard Reference Flexible Disk Cartridges can be ordered from PTB Lab. 1.41 under Part Number RM 9529 until 1997.
It is intended that these be used for calibrating tertiary cartridges for use in routine calibration.

4.8 Typical Field: In the plot of average signal amplitude against recording field at the specified track and flux transition density, the Typical Field is the minimum field which causes an average signal amplitude equal to 95% of the maximum Average Signal Amplitude.

4.9 Reference Field: The Reference Field is the typical field of the Master Standard Reference Flexible Disk Cartridge. There are two Reference Fields, one for each side.

4.10 Test Recording Current: The Test Recording Current is the current between 148% and 152% of the current which produces the Reference Field at Test Frequency 1f on Track 00. There are two Test Recording Currents, one for each side.

4.11 Standard Reference Amplitude: The Standard Reference Amplitudes (SRAs) 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.

SRA_{1f} is the Average Signal Amplitude from a recording written using Test Frequency 1f at Track 00.
SRA_{2f} is the Average Signal Amplitude from a recording written using Test Frequency 2f at Track 79.

4.12 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.

4.13 in-contact: An operating condition in which the magnetic surface of the disk is in physical contact with the magnetic heads.

4.14 side: Side 0 is the side engaged by the spindle. Side 1 is the opposite side.

4.15 direction of rotation: The direction of rotation shall be counter-clockwise when looking at Side 0.

4.16 Index: The Index is the point on a track which determines the beginning and the end of the track.

4.17 line of access: The straight line described by the centre of the gap of the read/write head as it is positioned from Track 00 to Track 79.

4.18 formatting: Writing the proper control information establishing the physical cylinders and the addresses of physical records on the surfaces of the flexible disk.

4.19 initialization: Writing any information initially required to be on the flexible disk cartridge, e.g. the Volume Label, prior to the commencement of general processing use.

5 General description

5.1 Drawings

In the enclosed drawings

- Figure 1 shows Side 0 and enlarged cross-sections through the location holes;
- Figure 2 shows Side 1;
- Figure 3 shows at a larger scale the upper part of Side 0 without shutter;
- Figure 4 shows the disk with hub; and
- Figure 5 shows the interface between the cartridge and the drive.

5.2 Main Elements

The main elements of the flexible disk cartridge are

- the recording disk;
- the liner;
- the case.

5.3 Description

The cartridge is of a substantially square form. It includes a central hole on one side, head windows on both sides, a write-inhibit hole and an identification 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.

6 General requirements

6.1 Environment and Transportation

6.1.1 Testing environment

Tests and measurements made on the cartridge to check the requirements of ISO/IEC 9529 shall be carried out under the following conditions:

temperature	: 23 °C ± 2 °C (73 °F ± 4 °F)
relative humidity	: 40% to 60%
conditioning before testing	: 24 h minimum

For the tests specified in 9.3 the temperature and relative humidity shall be measured in the air immediately surrounding the cartridge drive. For all other tests the temperature and 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 recording head, shall not exceed 4 000 A/m (50 Oe).

6.1.2 Operating environment

Cartridges used for data interchange shall be operated under the following conditions:

temperature	: 10 °C to 51.5 °C (50 °F to 125 °F)
relative humidity	: 20% to 80%
wet bulb temperature	: less than 29 °C (85 °F)

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 (36 °F) per hour, and that the temperature and relative humidity conditions when reading a cartridge are not at the opposite extreme to the conditions when it was recorded.

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 recording head, shall not exceed 4 000 A/m (50 Oe).

6.1.3 Storage environment

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

temperature : 4 °C to 53 °C (39 °F to 127 °F)
relative humidity : 8% to 90%

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

The ambient stray magnetic field shall not exceed 4 000 A/m (50 Oe).

NOTE - Cartridges which have been stored at temperatures and humidities outside 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.

6.1.4 Transportation

Responsibility for ensuring that adequate precautions are taken during 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 (– 40 °F to 140 °F)
maximum rate of
temperature change : 20 °C (36 °F) per hour
relative humidity : 8% to 90%

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

6.2 Materials

6.2.1 Case

The case shall be constructed from any suitable material such that it meets the requirements of annex A.

6.2.2. Liner

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

6.2.3. Disk

The disk shall be constructed from any suitable material (for example bi-axially oriented polyethylene terephthalate) coated on both sides with a flexible layer of magnetic material.

6.2.4. Hub

The hub shall be made from any suitable material (for example stainless steel alloy according to ISO 683-13, type 8).

7. Dimensional characteristics

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.

7.1 Case

7.1.1 Shape (see figure 1)

The case has a rectangular form, its sides shall be

$l_1 = 94{,}0 \text{ mm} \pm 0{,}3 \text{ mm}$ (3,700 in ± 0,012 in)

$l_2 = 90{,}0 \text{ mm} \begin{smallmatrix} +0{,}4 \\ -0{,}1 \end{smallmatrix} \text{ mm}$ (3,540 in $\begin{smallmatrix} +0{,}016 \\ -0{,}004 \end{smallmatrix}$ in)

The radius of three of its corners shall be

$r_1 = 2{,}0 \text{ mm} \pm 1{,}0 \text{ mm}$ (0,079 in ± 0,040 in)

The angle of its fourth corner shall be

$\omega = 45° \pm 2°$

7.1.2 Thickness (see figure 2)

In the area extending 8,5 mm (0,335 in) from each of the two edges as shown in figure 2, the thickness of the case shall be

$e_1 = 3{,}3 \text{ mm} \pm 0{,}2 \text{ mm}$ (0,130 in ± 0,008 in)

When the cartridge is inserted in the test gauge specified in annex D, a force of 0,2 N (0,69 ozf) maximum, applied to the centre of the back edge shall cause the cartridge to pass through the gauge.

The edge radius shall be

$r_2 = 0{,}40$ mm ± 0,25 mm (0,150 in ± 0,010 in)

7.1.3 Hub access hole (see figure 1)

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

$d_1 = 26{,}50$ mm min. (1,043 in min.)

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

$l_3 = 40{,}00$ mm ± 0,15 mm (1,575 in ± 0,006 in)
$l_4 = 31{,}00$ mm ± 0,15 mm (1,220 in ± 0,006 in)

7.1.4 Locating holes (see figures 1 and 3)

7.1.4.1 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

$d_2 = 3{,}6$ mm ± 0,1 mm (0,142 in ± 0,004 in)

The dimensions of its section (see cross-section A-A in figure 1) shall be

d_3 = 1,5 mm min. (0,059 in min.)
l_8 = 0,2 mm ± 0, 1 mm (0,010 in ± 0,004 in)
l_9 = 1,0 mm min. (0,039 in min.)
l_{10} = 2,5 mm min. (0,098 in min.)

7.1.4.2 Secondary locating hole

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

$l_5 = 80{,}0$ mm ± 0,2 mm (3,150 in ± 0,008 in)

It shall have a substantially rectangular shape. Its short axis shall be (cross-section B-B in figure 1)

$l_6 = 3{,}6$ mm ± 0,1 mm (0,142 in ± 0,004 in)

Its long axis shall be

l_7 = 4,4 mm ± 0,2 mm (0,173 in ± 0,008 in)

The dimensions d_3, l_8, l_9 and l_{10} of the cross-section of the secondary locating hole are as specified in 7.1.4.1.

7.1.5 Label area

7.1.5.1 Side 0 (see figure 1)

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

l_{11} = 3,5 mm min. (0,138 in min.)
l_{12} = 76,5 mm max. (3,012 in max.)
l_{14} = 60,0 mm min. (2,362 in min.)

7.1.5.2 Side 1 (see figure 2)

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

l_{11} = 3,5 mm min. (0,138 in min.)
l_{12} = 76,5 mm max. (3,012 in max.)
l_{13} = 20,0 mm min. (0,787 in min.)

7.1.6 Head windows (see figure 3)

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

7.1.6.1 Location

The location of the head windows shall be defined by

l_{15} = 12,3 mm min. (0,485 in min.)
l_{16} = 11,5 mm min. (0,45 in min.)
l_{17} = 35,5 mm ± 0,2 mm (1,400 in ± 0,008 in)

7.1.6.2 Dimensions

The width of the head windows shall be

l_{18} = 9,00 mm ± 0,20 mm (0,354 in ± 0,008 in)

The radius of their corners shall be

r_3 = 0,5 mm ± 0,1 mm (0,020 in ± 0,004 in)

The radius of their upper edge shall be

r_4 = 8,85 mm min. (0,348 in min.)

7.1.7 Write-inhibit hole (see figure 2)

7.1.7.1 Location

The centre of the write-inhibit hole shall be on Reference Axis Y. Its distance from Reference Axis X shall be

l_{19} = 67,75 mm ± 0,25 mm (2,667 in ± 0,010 in)

7.1.7.2 Dimensions

The dimensions of the write-inhibit hole shall be

l_{20} = 3,5 mm min. (0,138 in min.)
l_{21} = 4,0 mm min. (0,157 in min.)

7.1.7.3 Use

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 (0,012 in) from the Reference Plane inside the case under the action of a force of 3 N (0,67 lbf).

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

7.1.8 Identification hole (see figures 1 and 2)

The identification hole is provided to distinguish between the flexible disk cartridge specified by this part of ISO/IEC 9529 and that specified by ISO 8860-1.

NOTE - As no specification is given in ISO 8860-1 for the opacity of the case, it is recommended that detection of the identification hole is by mechanical means.

7.1.8.1 Location

The position of the centre of the identification hole shall be specified by l_5 and l_{19}.

7.1.8.2 Dimensions

The dimensions of the identification hole shall be

l_{49} = 3,5 mm min. (0,138 in min.)
l_{50} = 4,0 mm min. (0,157 in min.)

7.1.9 Profile of the shutter edge of the case (see figures 1 and 3)

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

l_{22} = 80,0 mm ± 0,2 mm (3,150 in ± 0,008 in)
l_{23} = 76,0 mm ± 0,3 mm (2,990 in ± 0,012 in)
l_{24} = 68,0 mm ± 0,3 mm (2,680 in ± 0,012 in)
l_{25} = 64,50 mm ± 0,35 mm (2,540 in ± 0,014 in)
l_{26} = 57,00 mm ± 0,35 mm (2,240 in ± 0,014 in)
l_{27} = 55,5 mm ± 0,6 mm (2,180 in ± 0,025 in)
l_{28} = 3,5 mm min. (0.137 in min.)
l_{29} = 17,5 mm ± 0,2 mm (0,690 in ± 0,008 in)
l_{30} = 17,00 mm ± 0,15 mm (0,669 in ± 0,006 in)
l_{31} = 15,50 mm ± 0,25 mm (0,610 in ± 0,010 in)
l_{45} = 12,50 mm ± 0,25 mm (0,492 in ± 0,010 in)
α = 45° ± 2°
β = 135° ± 2°
ω = 45° ± 2°

7.1.10 Shutter (see figures 2 and 3)

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 Reference Axis Y shall be

l_{32} = 53,75 mm ± 1,25 mm (2,116 in ± 0,050 in)

The width of the windows of the shutter shall be

l_{33} = 12,0 mm ± 0,2 mm (0,472 in ± 0,008 in)

NOTE - 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.

7.2 Liner

No part of the liner shall protrude by more than 0,2 mm (0,008 in) into the head access windows.

7.3 Disk (see figure 4)

7.3.1 Diameter

The diameter of the disk shall be

$d_4 = 85{,}8$ mm $\pm$ 0,2 mm (3,378 in $\pm$ 0,008 in)

7.3.2 Thickness

The thickness of the disk shall be

$e_2 = 0{,}080$ mm $\pm$ 0,008 mm (0,003 1 in $\pm$ 0,000 3 in)

7.4 Hub (see figure 4)

The hub shall have a central part and a flange.

7.4.1 Dimensions

The diameter of the central part shall be

$d_5 = 25{,}00\ \text{mm}\ {}^{+\,0{,}00}_{-\,0{,}15}$ mm (0,984 in $^{+\,0{,}000}_{-\,0{,}006}$ in)

The diameter of the flange shall be

$d_6 = 31{,}15$ mm max. (1,226 in max.)

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

$l_{34} = 1{,}36$ mm $\pm$ 0,10 mm (0,053 5 in $\pm$ 0,004 0 in)

when measured at a radius r_7

$r_7 = 14$ mm nominal (0,55 in nom)

7.4.2 Hub orientation holes (see figure 4)

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

7.4.2.1 First orientation hole

The first orientation hole shall have a square form defined by

l_{35} = 4,00 mm min. (0,15 in min.)

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

l_{36} = 1,995 5 mm (0,078 56 in)

measured from two sides of the hole. This centre of rotation shall be within 0,5 mm (0,02 in) of the geometric centre of the disk.

The radius of the four corners of this hole shall be

r_5 = 1,0 mm ± 0,3 mm (0,040 in ± 0,012 in)

7.4.2.2 Second orientation hole

The position and dimensions of the sides of the rectangular second orientation hole are referred to two radial lines A and B that are perpendicular to each other. Their positions shall be specified by

$\gamma = 15° \pm 3°$

The length of the sides of this hole shall be

l_{37} = 8,0 mm ± 0,3 mm (0,315 in ± 0,012 in)
l_{38} = 4,5 mm min. (0,177 in min.)

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

l_{39} = 2,0 mm ± 0,2 mm (0,079 in ± 0,008 in)
l_{40} = 10,00 mm ± 0,15 mm (0,393 in ± 0,006 in)

The radius of one corner of this hole shall be

r_6 = 2,0 mm ± 0,1 mm (0,079 in ± 0,004 in)

The radius of the three other corners shall be

r_5 = 1,0 mm ± 0,3 mm (0,040 in ± 0,012 in)

7.5 Optional Handling Notches (see figures 1 and 2)

Two handling notches are permitted. If present they shall satisfy the following requirements.

Their centres shall be on a line parallel to, and above, Reference Axis X at a distance

l_{41} = 7,50 mm ± 0,15 mm (0,295 in ± 0,006 in)

Their dimensions shall be

l_{42} = 3,0 mm min. (0,118 in min.)
l_{43} = 4,2 mm ± 0,2 mm (0,165 in ± 0,008 in)

Their depth below the Reference Plane shall be

l_{44} = 2,0 mm min. (0,08 in min.)

7.6 Interface between Cartridge and Drive (see figure 5)

When the cartridge is inserted into the drive, the drive spindle shall engage the cartridge as shown in figure 5. 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 plane XY shall be

l_{46} = 0,3 mm nominal (0,012 in nom)

The inside dimensions of the case on Side 1 shall be

e_3 = 1,3 mm ± 0,1 mm (0,051 in ± 0,004 in)

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

e_4 = 2,5 mm max. (0,098 in 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 mm (0,890 in)
l_{48} = 21,7 mm ± 0,2 mm (0,854 in ± 0,008 in)
d_7 = 7,0 mm min. (0,275 in min.)

7.7 Compliance

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

8. Physical characteristics

8.1 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.

8.2 Coefficient of linear thermal expansion of the disk

The coefficient of thermal expansion of the disk shall be

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

8.3 Coefficient of linear hygroscopic expansion of the disk

The coefficient of hygroscopic expansion of the disk shall be

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

8.4 Torque

8.4.1 Starting torque

The starting torque, without the heads loaded, shall not exceed 0,006 N•m (0,85 ozf•in).

8.4.2 Running torque without heads loaded

The torque necessary to turn the disk shall be in the range 0,000 5 N•m to 0,002 5 N•m (0,071 ozf•in to 0,354 ozf•in) when the cartridge is in operation at a speed of 300 r/min ± 3 r/min.

9. Magnetic characteristics

9.1 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:

42,0 mm min. (1,65 in min.)
20,6 mm max. (0,81 in max.)

9.2 Track geometry

9.2.1 Number of tracks

In the recording area there shall be 80 discrete concentric tracks on each side of the disk. The distance between centrelines of adjacent tracks shall be 0,187 5 mm (0,007 38 in).

9.2.2. Width of tracks

The width of a recorded track shall be

0,115 mm ± 0,008 mm (0,004 5 in ± 0,000 3 in)

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

9.2.3 Track location

9.2.3.1 Nominal locations

The nominal radius (Rn) of the centrelines of all tracks shall be calculated by using the formula:

$$Rn = x - 0{,}1875\ n\ (x - 0{,}007\ 38\ n)$$

where n is the track number, n = 00 to 79.

x = 39,500 0 mm (1,5551 in) for Side 0;
x = 38,000 0 mm (1,4961 in) for Side 1.

9.2.3.2 Track location tolerance

For testing purposes, the centrelines of the recorded tracks shall be within ± 0,020 mm (± 0,000 8 in) of the nominal positions, when measured in the testing environment (6.1.1).

9.2.3.3 Line of access of the read/write heads

The line of access of the read/write heads is a line parallel to a radial line and spaced 0,35 mm (0,013 8 in) from it (see ISO/IEC 9529-2 subclause 3.3).

9.2.4 Track number

The track number shall be a two-digit decimal number (from 00 to 79) for each side. It identifies the tracks consecutively, starting at the outermost track (00).

9.3 Functional testing

9.3.1 Test conditions

Drive unit	:	The same drive unit shall be used for writing and reading operations, for both the disk under test, and RM9529 (or a tertiary cartridge see 4.7)
Rotational speed	:	300 r/min ± 3 r/min
Test frequencies	:	$1f$ = 250 000 ftps ± 250 ftps $2f$ = 500 000 ftps ± 500 ftps The frequency (ies) to be used is (are) specified in each test.

Recording current	:	The Test Recording Current for the side being tested.
Recording/Reading condition	:	In - Contact
Extent of the tested area	:	The tests shall be performed on both sides of the disk.
Correction factors	:	The values obtained when using the RM9529 (or a tertiary cartridge - see 4.7) shall be corrected by the calibration factors provided with the RM9529 (and established for a tertiary cartridge - if used)

9.3.2 Surface tests

The magnetic properties are defined by the test requirements given below.

9.3.2.1 Typical field

The typical field of the disk under test shall be within ± 20% of the Reference Field. It shall be measured using 1*f* on Track 00.

9.3.2.2 Average Signal Amplitude

Record: on Track 00 using 1*f*, and
on Track 79 using 2*f*.
Read back and compare with RM9529 recorded under the same conditions.
The Average Signal Amplitude shall be
On Track 00, less than 130% of SRA-1*f*
On Track 79, more than 80% of SRA-2*f*

9.3.2.3 Resolution

After recording on track 79, the ratio:

$$\frac{\text{Average Signal Amplitude using } 2f}{\text{Average Signal Amplitude using } 1f}$$

shall be greater than 80% of the same ratio for the Master Standard Reference Flexible Disk Cartridge.

9.3.2.4 Peak shift

The average peak shift measured on the disk cartridge under test, using the method specified in annex E, shall be within the range from 63% to 137% of that of the Master Standard Reference Flexible Disk Cartridge.
This test shall be performed on Track 79.

9.3.2.5 Overwrite

The overwrite ratio

$$\frac{\text{Residual Signal Amplitude at 1f after overwrite using } 2f}{\text{Signal Amplitude after first recording using } 1f}$$

shall be less than 125 % of the value of the same ratio for the Master Standard Reference Flexible Disk Cartridge when measured according to annex F.

9.3.2.6 Modulation

Modulation shall be

$$\frac{\text{Maximum mean} - \text{Minimum mean}}{\text{Maximum mean} + \text{Minimum mean}} \times 100\%$$

The maximum mean shall be the average value of the amplitude - modulated output voltage in that part of the track with the maximum amplitudes, and the minimum mean shall be that in the respective part with the minimum amplitudes. Output voltage shall be measured peak-to-peak; averaging shall be done over about 2 000 consecutive flux transitions.

On Track 00 using 1*f*, and on Track 79 using 2*f*, modulation shall be less than 10%.

9.3.3 Track quality tests

These tests shall apply to all 80 tracks at the defined positions.

9.3.3.1 Missing pulses

Write a track with 2*f* and measure the Average Signal Amplitude. Any read signal which, when measured base-to-peak, is less than 45% of half the Average Signal Amplitude of the track, shall be a missing pulse.

9.3.3.2 Extra pulse

Write a track with 2*f* and measure the Average Signal Amplitude. Erase the track for one revolution with a direct current equivalent to the quiescent value of the Test Recording Current. Any read signal which, when measured base-to-peak, exceeds 20% of half the Average Signal Amplitude shall be an extra pulse.

9.3.4 Rejection criterion

9.3.4.1 Defective track

A track on which one or more missing or extra pulses, or both, are detected in the same position(s) on consecutive passes shall be a defective track. The applicable number of consecutive passes shall be a matter for agreement between the interested parties.

9.3.4.2 Requirement for tracks

As initially received from the medium supplier, the cartridge shall have no defective tracks.

9.3.4.3 Rejected cartridge

A cartridge which does not meet the requirement of 9.3.4.2 shall be rejected.

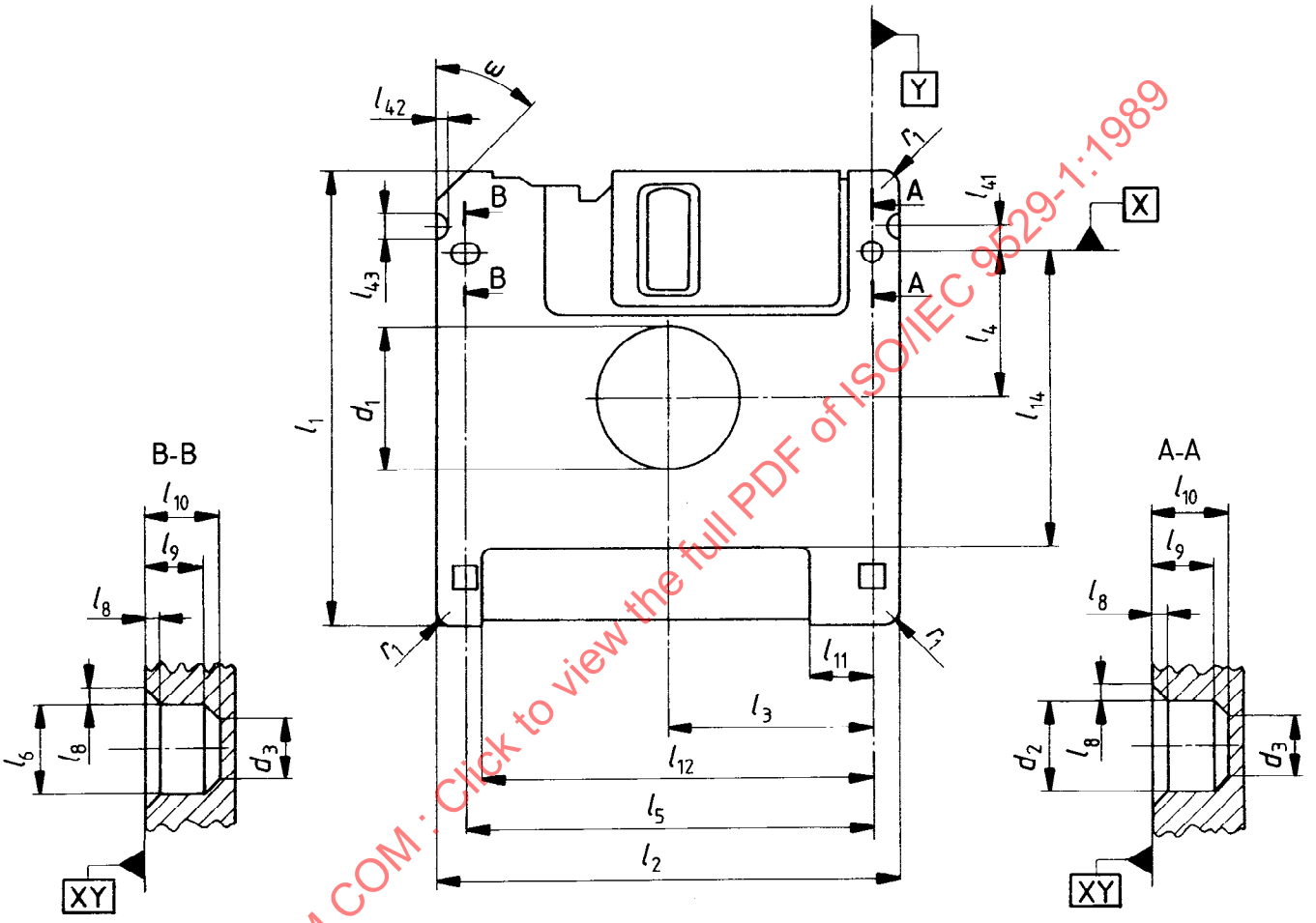

Figure 1 - Side 0

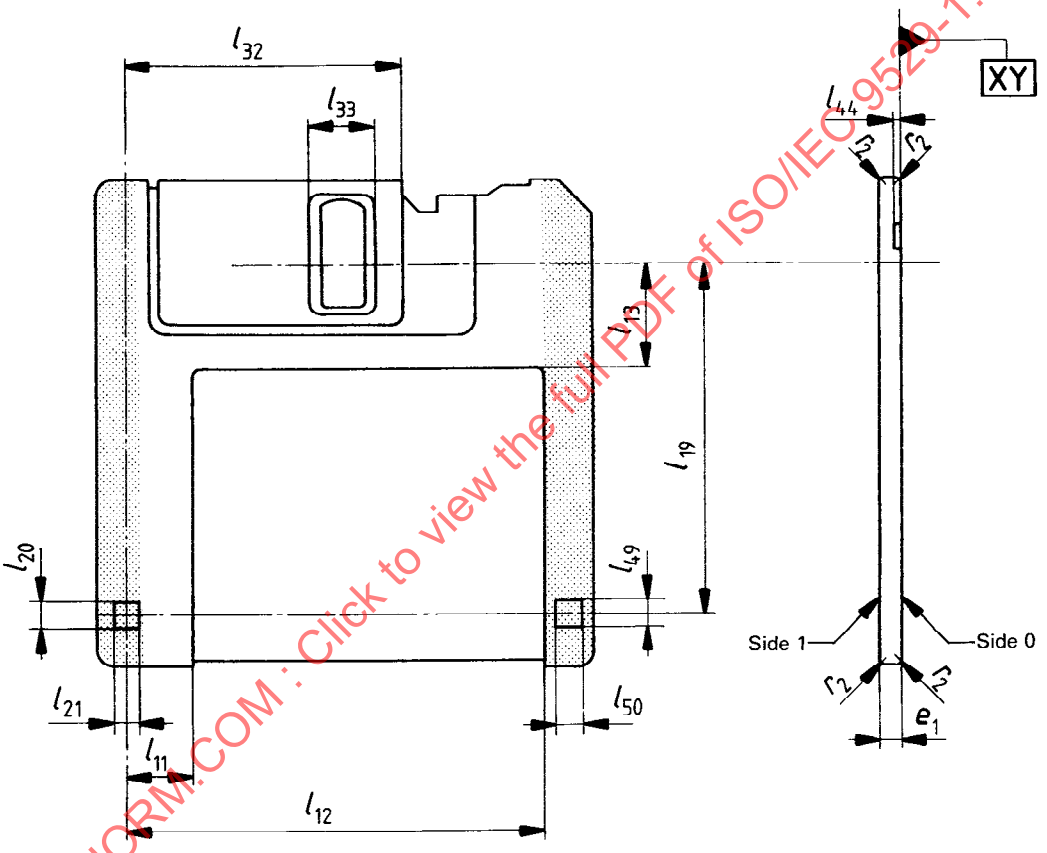

Figure 2 - Side 1

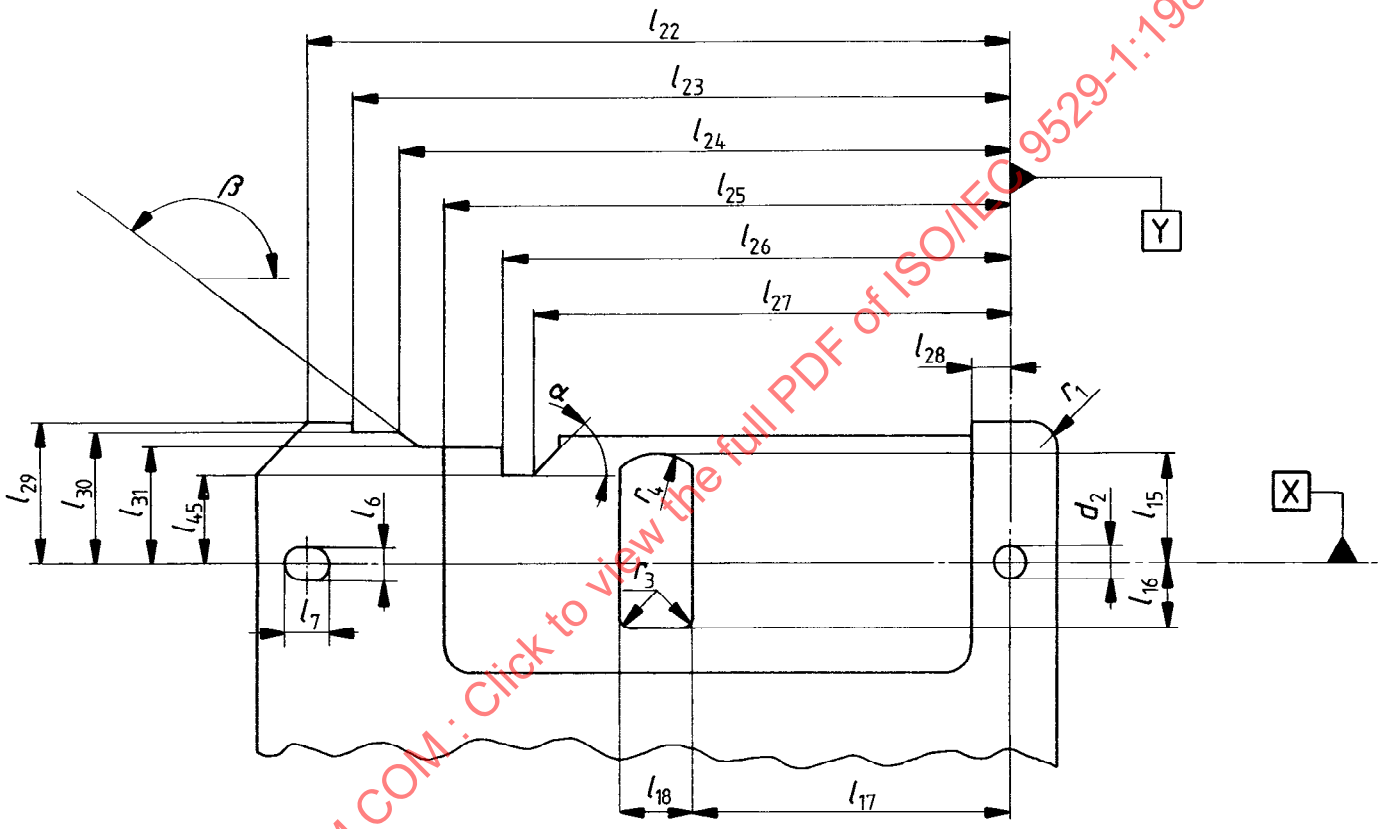

Figure 3 - Side 0

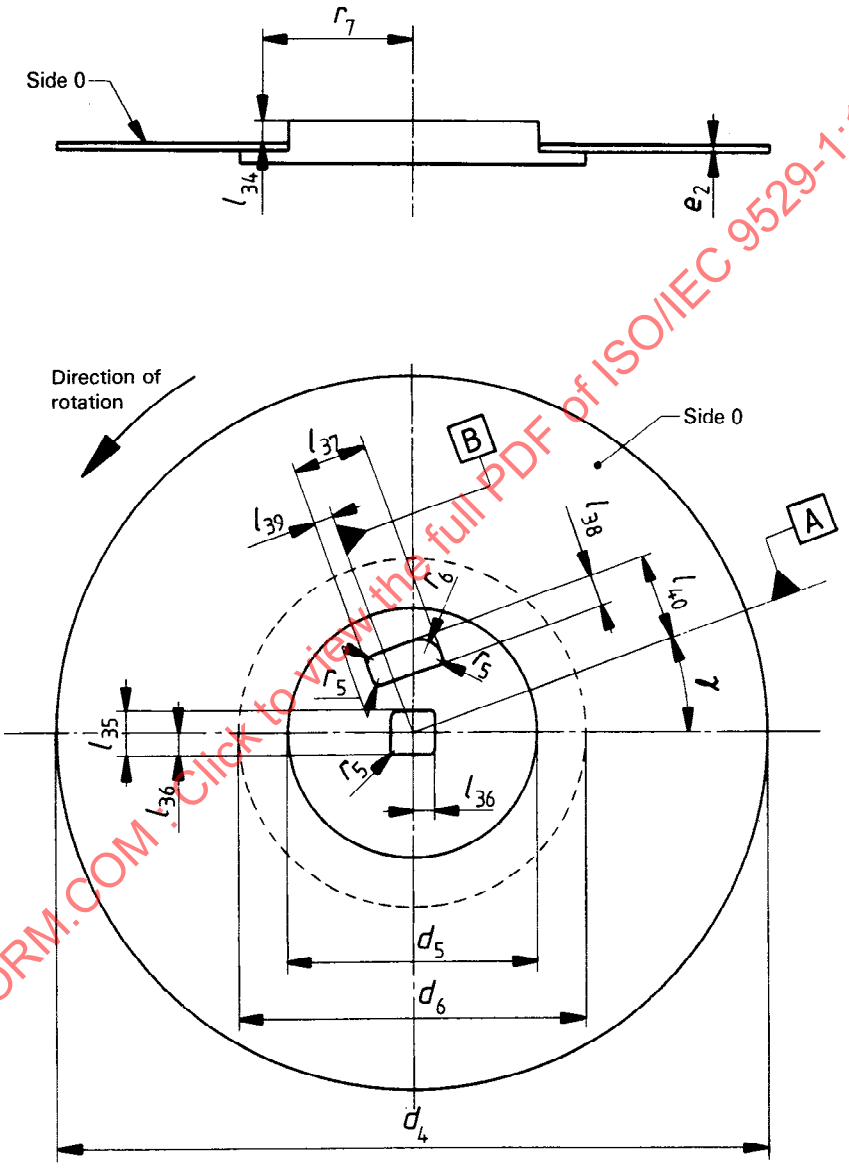

Figure 4 - Disk with hub

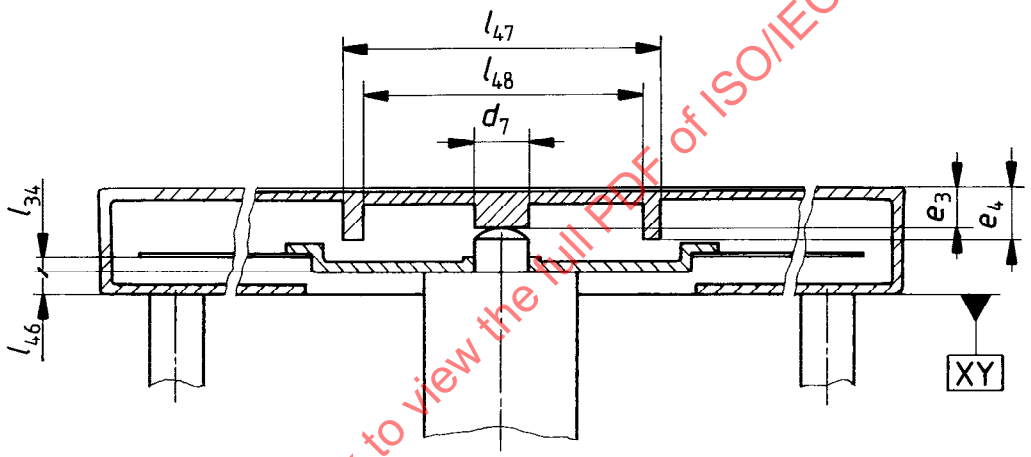

Figure 5 - Cartridge-drive interface

Annex A

(normative)

Test for compliance

A.1 The purpose of this test is to determine whether the cartridge will maintain the proper plane of operation within the drive. This is achieved by supporting the cartridge at defined reference zones and applying forces opposite to the supports.

A.2 The location of the four zones a, b, c, d (see figure A.1) is defined by

l_5 = 80,0 mm ± 0,2 mm (3,150 in ± 0,008 in)
lx = 62,0 mm ± 0,2 mm (2,440 in ± 0,008 in)

Two of these zones, a and b, coincide with the primary and the secondary location holes, respectively.

A.3 The test device (see figure A.2) consists of a plate on which four posts are fixed so as to correspond to the four zones a, b, c, d. Posts P1, P2 correspond to the zones a and b, respectively. Posts P3, P4 correspond to zones c and d respectively. A fifth post (P5) is mounted in the middle of the plate and corresponds to the drive spindle.

The dimensions of these posts are as follows (see figure A.3):

Posts P1, P2

d_8 = 6,00 mm ± 0,01 mm (0,236 0 in ± 0,000 4 in)
d_9 = 3,00 mm ± 0,01 mm (0,118 0 in ± 0,000 4 in)
h_1 = 1,00 mm max. (0,040 in max.)
h_2 = 2,00 mm max. (0,080 in max.)

Post P5

d_{10} = 12,70 mm ± 0,01 mm (0,500 0 in ± 0,000 4 in)
d_{11} = 3,98 mm ± 0,01 mm (0,156 0 in ± 0,000 4 in)

h_3 = $2{,}20\ \text{mm}\ ^{+0{,}03}_{-0{,}00}\ \text{mm}$ (0,086 0 in $^{+0{,}001\ 2}_{-0{,}000\ 0}$ in)

r = 2,5 mm ± 0,3 mm (0,10 in ± 0,01 in)

Posts P3, P4

d_{12} = 6,00 mm ± 0,01 mm (0,236 0 in ± 0,000 4 in)

After assembly the upper annular surfaces of posts P1 to P4 shall lie between two horizontal planes spaced 0,02 mm (0,000 79 in) apart.

A.4 The cartridge is laid on these four posts and a vertical, downward force of 0,6 N (0,134 9 lbf) is exerted on each of the four zones.

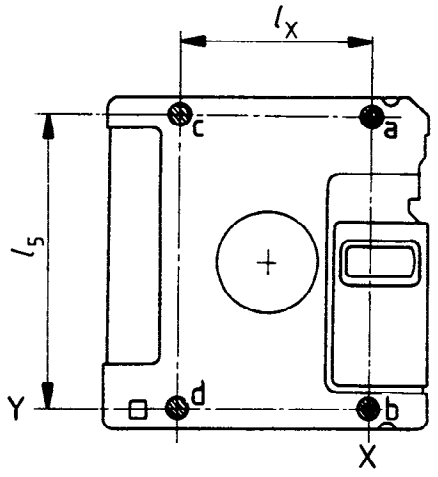

Figure A.1 - Location of zones

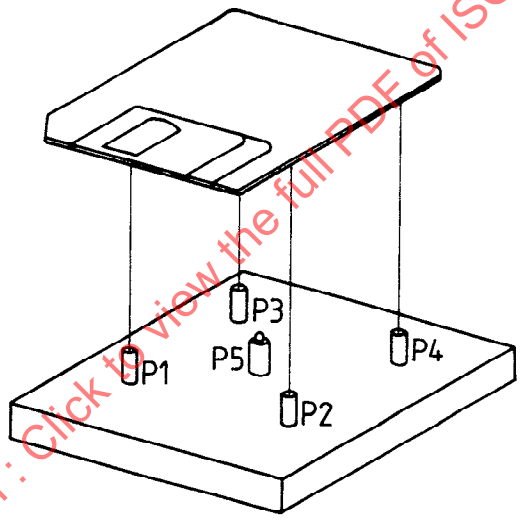

Figure A.2 - Test device

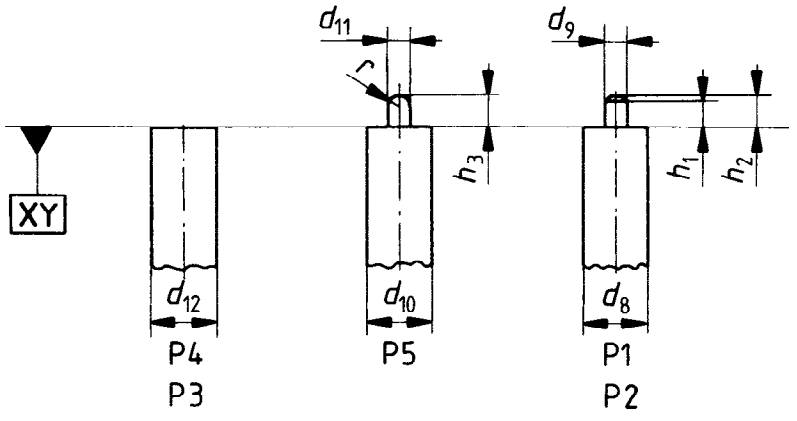

Figure A.3 - Dimensions of posts

Annex B

(normative)

Measurement of light transmittance

B.1 Introduction

The following description outlines the general principle of the measuring equipment and the measuring method to be applied when measuring the radiation (light) transmittance of the write-inhibit hole and the opacity of its cover.

For the purpose of this part of ISO/IEC 9529 "light transmittance" is defined by convention as the relationship between the reading obtained from the test device with the sample inserted and the reading obtained when no sample is present. The transmittance value is expressed as the percentage ratio of the two readings. The essential elements of the measuring equipment are

- the radiation source;
- the photo diode;
- the optical path;
- the measuring circuitry.

B.2 Description of the measuring equipment

B.2.1 Radiation Source

An infra-red light-emitting diode (LED) with the following parameters shall be used:

Wavelength at peak emission $\lambda peak$ = 940 nm ± 10 nm
Half-power band width b = ± 50 nm
z

B.2.2 Radiation receiver

A flat silicon photo diode shall be used as the radiation receiver. It shall be operated in the short circuit mode. The active area of the diode shall be equal to, or at the most 20% larger than, the open area of the aperture. This condition guarantees a linear dependency of the short circuit diode current on the light intensity.

B.2.3 Optical path (see figure B.1)

The optical axis of the set up shall be perpendicular to the case (Side 1).

The distance from the emitting surface of the LED to the case shall be

$$l_1 = \frac{3{,}5}{2 \tan \alpha}$$

Where 3,5 mm is the minimum value of dimension l_{20} (see figure 2).
α is the angle where the relative intensity of the LED is equal to, or greater than, 95% of the maximum intensity in the optical axis.

The aperture shall have a thickness of 1, 2 to 1,4 mm and a diameter given by

$$D = (2 L_2 \tan \alpha) \text{ mm}$$
$$L_2 = (L_1 + 1{,}5) \text{ mm}$$

Its surfaces shall be matt black. The whole device should be enclosed within a light-tight casing.

B.2.4 Measuring circuitry

Figure B.2 shows the recommended circuitry with the following components:

E : regulated power supply with variable output voltage
R : Current-limiting resistor
LED : light-emitting diode
Di : Si photo diode
A : operational amplifier
R_{f0}, R_{f1} : feedback resistors
S : gain switch
V : voltmeter

The forward current of the LED and consequently its radiation power can be varied by means of the power supply E. Di is working in the short circuit mode. The output voltage of the operational amplifier is given by

$$V_0 = I_k R_f$$

and is therefore a linear function of the light intensity. I_k is the short circuit current of Di

R_{f0} and R_{f1} shall be low-temperature drift resistors with an accuracy of 1%. The following ratio applies:

$$\frac{R_{f0}}{R_{f1}} = \frac{1}{50}$$

B.3 Measuring method

The measurements shall be taken with the case in a fixed position.

- S is set to position 0, with the write-inhibit hole open in front of the photo diode. The voltmeter is set to full-scale reading (100% transmittance) by varying the output voltage of E.

- The write-inhibit hole is then covered. S is set to position 1. Full deflection of the voltmeter now represents 2% transmittance.

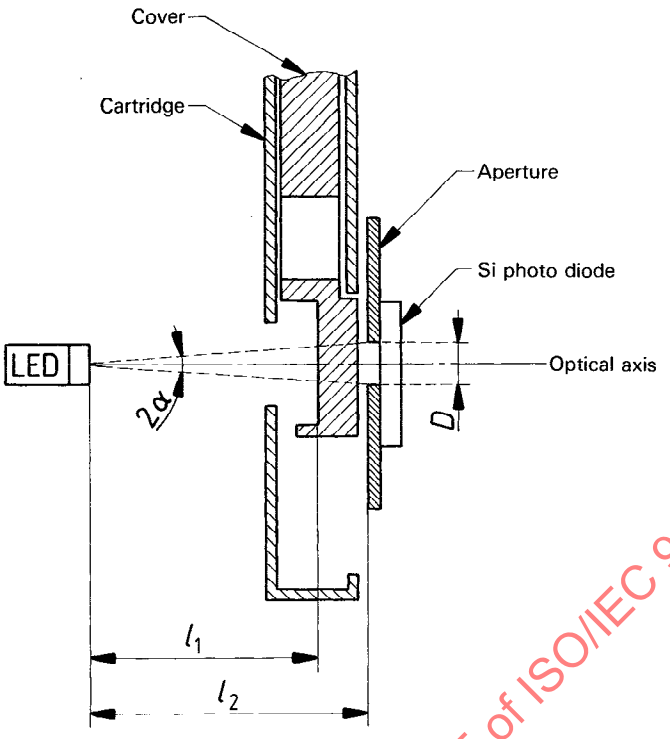

Figure B.1 - Measuring device

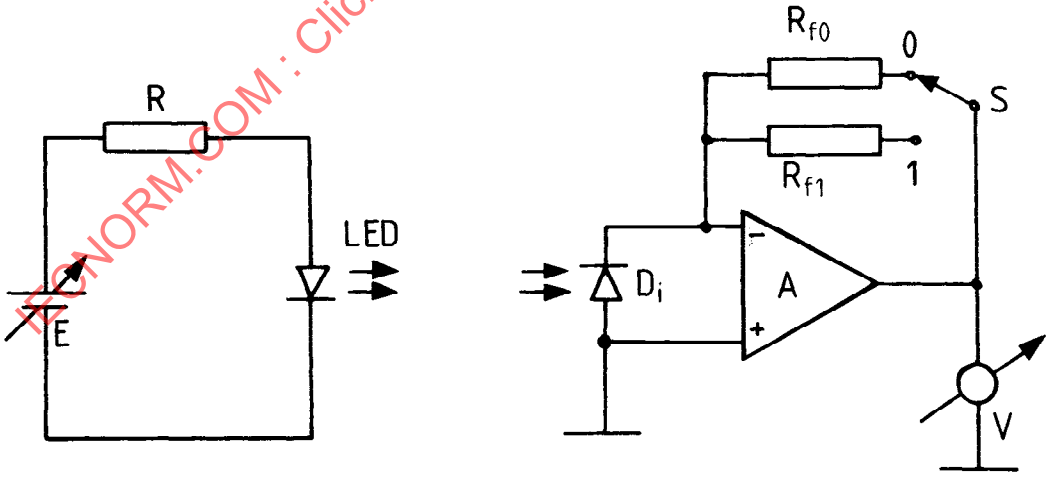

Figure B.2 - Electronic circuitry