

Interchangeable magnetic twelve-disk pack for information processing —

Part 2: Specification for 200 Mbytes magnetic twelve-disk pack

[ISO title: Information processing — Interchangeable magnetic
twelve-disk pack (200 Mbytes)]

UDC 681.327.63* 12

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The following BSI references relate to the work on this standard:
Committee reference OIS/4
Draft for comment 78/64033 DC

ISBN 0 580 12228 X

Amendments issued since publication

Amd. No.	Date of issue	Comments

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National foreword

This Part of this British Standard is identical with ISO 5653-1980 “*Information processing — Interchangeable magnetic twelve-disk pack (200 Mbytes)*”, published by the International Organization for Standardization (ISO).

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is especially drawn to the following.

Where the words “International Standard” appear, referring to this standard, they should be read as “British Standard”.

For metric units, the comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Cross-references

International Standard	Corresponding British Standard
ISO/R 80:1968	BS 891 <i>Method for Rockwell hardness test</i> Part 1:1962 <i>Testing of metals</i> (Technically equivalent)
ISO 646:1973	BS 4730:1974 <i>Specification for the United Kingdom 7-bit data code (ISO-7-UK)</i> (Technically equivalent)
ISO 1302:1978	BS 308 <i>Engineering drawing practice</i> Part 2:1972 <i>Dimensioning and tolerancing of size</i> (Technically equivalent)
ISO 2022:1973	BS 4953:1973 <i>Code extension techniques for use with the United Kingdom 7-bit data code</i> (Technically equivalent)

The Technical Committee has reviewed the provisions of ISO 5864:1978, to which reference is made in **5.5.1**, and has decided that they are acceptable for use in conjunction with this standard.

Additional information: availability of test heads. For information as to availability of suitable test heads, referred to in **8.3.1** and **11.4.1**, apply to the Central Enquiries Section, British Standards Institution, enclosing a stamped addressed envelope for reply.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 48, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope and field of application

This International Standard specifies the general, physical, and magnetic characteristics and the pre-initialization for the physical interchange of 200 Mbytes magnetic twelve-disk packs, for use in electronic data processing systems.

NOTE The original design of the subject of this International Standard was made using the Imperial measurement system. Some later developments, however, have been made using the SI measurement system. In the process of conversion into the alternative system, values may have been rounded. Therefore, they are consistent with but not exactly equal to each other. Either system may be used, but the two shall be neither mixed nor reconverted.

2 References

ISO/R 80, *Rockwell hardness test (B and C scales) for steel*.

ISO 646, *7-bit coded character set for information processing interchange*.

ISO 1302, *Technical drawings — Method of indicating surface texture on drawings*.

ISO 2022, *Code extension techniques for use with the ISO 7-bit coded character set*.

ISO 5864, *ISO inch screw threads — Allowances and tolerances*.

Section 1. General description

3 General description

3.1 General figures

A typical twelve-disk pack is represented in Figure 6 to Figure 11:

- Figure 6 shows an exploded view;
- Figure 7 shows a vertical cross-section;
- Figure 8 shows, at an enlarged scale, the relationship between the top cover and the bottom protective disk;
- Figure 9 shows a schematic cross-section of part of the disk pack;
- Figure 10 shows a schematic cross-section of the spindle lock;
- Figure 11 shows an enlarged view of the edge of a disk.

3.2 Main elements

The main elements of this twelve-disk pack are:

- the top cover;
- the hub;
- the spindle lock;
- the protective disks;
- the recording disks;
- the servo surface;
- the bottom cover.

Other elements shown in the drawings are for better understanding of the figures only and are not part of the standard.

3.3 Direction of rotation

The disk pack shall rotate counter-clockwise when viewed from the top.

3.4 Pack capacity

A gross information capacity of 200 million 8-bit bytes is achieved in this 12-disk pack by the use of 19 data disk surfaces. Data are recorded on 808 tracks per data surface. The track spacing gives approximately 15 tracks per millimetre each containing a maximum of 13 030 8-bit bytes of information. The recording density varies between outer and inner tracks and reaches a maximum of 159 bpmm on the innermost track.

Section 2. Mechanical and physical characteristics

4 General requirements

4.1 Operation and storage environment

4.1.1 Operation

The operating temperature — measured within the disk pack area of the drive — shall be within the range 15 °C (59 °F) to 57 °C (135 °F) at a relative humidity of 8 to 80 %. The wet bulb reading shall not exceed 26 °C (79 °F). Before a disk pack is placed into operation, it shall be conditioned within its covers for a minimum of 2 h in the same environment as that in which the disk drive is operating.

The time of acclimatization is dependent on the difference between the disk pack temperature and the environmental temperature of the disk drive. The minimum time may be calculated using a temperature gradient of 10 °C (18 °F) per hour.

The range specified above does not necessarily apply to the disk drive.

4.1.2 Storage

The storage temperature shall be within the range – 40 °C (– 40 °F) and + 65 °C (+ 150 °F), the wet bulb reading not exceeding 30 °C (86 °F). For wet bulb temperatures between 0,5 °C (33 °F) and 30 °C (86 °F) the disk pack shall be able to withstand a relative humidity of 8 to 80 %.

It is recommended that the pack should not be stored under the extreme conditions of the above range. A temperature gradient of more than 10 °C (18 °F) per hour should be avoided.

The ambient stray magnetic field intensity shall not exceed 4 000 A/m.

4.2 Test conditions

Unless otherwise stated, measurements shall be carried out at 23 ± 3 °C ($73,4 \pm 5$ °F), 40 % to 60 % relative humidity after 24 h of acclimatization. Tests shall be carried out with the disk pack in the upright position, unless otherwise stated.

4.3 Shock and vibration

The disk pack should withstand exposure to shock and/or vibration during normal operator usage and still meet all dimensional and functional requirements of this International Standard. Protection against shock and vibration during transportation and storage shall be subject to agreement between supplier and user.

4.4 Material

Unless otherwise stated, the disk pack shall be constructed from any suitable material in order that the dimensional, inertial and other functional requirements of this International Standard are complied with. The coefficient of thermal expansion of all the recording disks shall be the same.

5 Dimensional characteristics

5.1 Reference plane

Unless otherwise stated, all dimensions are referred to a given reference plane. This is the surface, perpendicular to the axis of the pack, on which the pack rests with its three rest buttons.

5.2 Overall external dimensions

5.2.1 Overall height (see Figure 7)

The overall height of the disk pack with top and bottom cover shall be

$$h_1 \leq 180 \text{ mm (7.09 in.)}$$

5.2.2 Overall diameter (see Figure 7)

The overall diameter of the disk pack with top and bottom cover shall be

$$d_1 \leq 381 \text{ mm (15.0 in.)}$$

5.3 Top cover (see Figure 8)

5.3.1 Outer radius, pack-centreline relationship

When measured with reference to the hub centreline the outside radius of the top cover shall be

$$183,65 \text{ mm (7.230 in.)} > r_1 > 185,42 \text{ mm (7.300 in.)}$$

5.3.2 Vertical distance

The vertical distance of the lower edge of the top cover below the reference plane shall be

$$h_2 = 3,56 \pm 1,47 \text{ mm } (0.140 \pm 0.058 \text{ in}).$$

5.4 Hub (see Figure 9)

5.4.1 Diameter of the flexure pads

The diameter of the three hub flexure pads shall be

$$d_2 = 44,432 \pm 0,005 \text{ mm } (1.749 \text{ 3} \pm 0.000 \text{ 2 in})$$

measured at $20 \pm 0,5 \text{ }^{\circ}\text{C}$ ($68 \pm 1 \text{ }^{\circ}\text{F}$).

5.4.2 Height of the flexure pads

The height of the hub flexure pads shall be

$$h_3 = 1,91 \pm 0,13 \text{ mm } (0.075 \pm 0.005 \text{ in}).$$

5.4.3 Finish of the flexure pads

The finish shall be of class N5, i.e. $0,4 \text{ }\mu\text{m}$ ($16 \text{ }\mu\text{in}$) (arithmetical mean deviation; see ISO 1302.)

5.4.4 Relief of the flexure pads

The hub flexure pads shall be relieved to

$$d_3 = 44,478 \pm 0,015 \text{ mm } (1.751 \text{ 1} \pm 0.000 \text{ 6 in})$$

measured at $20 \pm 0,5 \text{ }^{\circ}\text{C}$ ($68 \pm 1 \text{ }^{\circ}\text{F}$).

5.4.5 Vertical distance of flexure pads from the reference plane

The vertical distance of the flexure pads from the reference plane shall be

$$h_4 = 1,40 \pm 0,30 \text{ mm } (0.055 \pm 0.012 \text{ in}).$$

5.4.6 Radial compliance of flexure pads

The radial compliance of each flexure pad shall be $0,1 \pm 0,2 \text{ }\mu\text{m}$ ($40 \pm 8 \text{ }\mu\text{in}$) per $4,5 \text{ N}$ (1 lbf) radial force located at the collet flexure pad with d_2 expanded to $44,450 \text{ 0} \pm 0,002 \text{ 5 mm}$ ($1.750 \text{ 0} \pm 0.000 \text{ 1 in}$).

5.4.7 Rest buttons

5.4.7.1 Location

The three rest buttons shall be equally spaced on a circle of diameter

$$d_4 = 139,70 \pm 0,13 \text{ mm } (5.500 \pm 0.005 \text{ in}).$$

5.4.7.2 Diameter and shape

The diameter of the rest buttons shall be

$$d_5 = 11 \pm 1 \text{ mm } (0.43 \pm 0.04 \text{ in}).$$

Their rest surface shall be spherical with a radius

$$r_2 = 110 \pm 15 \text{ mm } (4.33 \pm 0.59 \text{ in}).$$

5.4.7.3 Roughness and hardness

The finish of the rest surfaces shall be of class N 4, i.e. $0,2 \text{ }\mu\text{m}$ ($8 \text{ }\mu\text{in}$) arithmetical mean deviation; see ISO 1302. The hardness shall be 55 to 60 HRC (Rockwell scale C); see ISO/R 80.

5.5 Spindle lock (see Figure 10)

5.5.1 Thread of the spindle lock

The thread of the spindle lock shall be a double lead thread of type 24 UNF-2A; see ISO 5864.

5.5.2 Diameter of the lower part of the spindle lock

The diameter of the lower part of the spindle lock shall be

$$d_6 = 9,37 \pm 0,13 \text{ mm } (0.369 \pm 0.005 \text{ in}).$$

5.5.3 Minimum full thread length

The full thread length of the spindle lock shall be

$$h_5 \geq 7,14 \text{ mm } (0.281 \text{ in})$$

from the lower end of the spindle lock.

5.5.4 *Chamfer*

The lower end of the spindle lock shall be chamfered from an inner diameter

$$d_7 = 8,00 \pm 0,13 \text{ mm } (0.315 \pm 0.005 \text{ in})$$

and an angle

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

5.5.5 *Location of the shoulder of the spindle lock*

The shoulder of the spindle lock shall be at a distance from the reference plane of

$$h_6 = 13,51 \begin{smallmatrix} + 0,23 \\ - 0,30 \end{smallmatrix} \text{ mm } (0,532 \begin{smallmatrix} + 0,09 \\ - 0,012 \end{smallmatrix} \text{ in}).$$

5.5.6 *Length of the lower part of the spindle lock*

The length of the lower part of the spindle lock shall be

$$h_7 = 19,15 \pm 0,076 \text{ mm } (0.754 \pm 0.003 \text{ in})$$

from the shoulder of the spindle lock.

5.5.7 *Maximum diameter of the lower part of the spindle lock*

The diameter of the lower part of the spindle lock with the safety balls expanded shall be

$$d_8 = 10,7 \pm 0,1 \text{ mm } (0.421 \pm 0.004 \text{ in}).$$

The safety balls shall not expand before the lockshaft pin is at a distance of

$$h_8 \leq 15,14 \text{ mm } (0.596 \text{ in})$$

from the shoulder of the spindle lock. The safety balls shall cease to expand when the lockshaft pin is at a distance of

$$h_9 \geq 12,98 \text{ mm } (0.511 \text{ in}).$$

from the shoulder of the spindle lock.

The diameter with relaxed balls shall be

$$d_9 \leq 9,53 \text{ mm } (0.375 \text{ in}).$$

5.5.8 *Location of the safety balls*

The centres of the safety balls shall be at a vertical distance of

$$h_{10} = 9,00 \pm 0,32 \text{ mm } (0.354 \pm 0.013 \text{ in})$$

from the spindle lock shoulder.

5.5.9 *Hole for the penetration of the lockshaft pin*

The diameter of the hole for the penetration of the drive spindle lockshaft pin into the spindle lock shall be

$$d_{10} = 5,16 \begin{smallmatrix} + 0,13 \\ - 0,02 \end{smallmatrix} \text{ mm } (0.203 \begin{smallmatrix} + 0,005 \\ - 0,001 \end{smallmatrix} \text{ in}).$$

5.5.10 *Depth of penetration of the lockshaft pin*

The clearance for the penetration of the drive spindle lockshaft pin into the spindle lock shall extend to a distance of

$$h_{11} \leq 11,81 \text{ mm } (0.465 \text{ in})$$

from the shoulder.

5.5.11 *Removal of the top cover*

It shall be possible to remove the top cover when the lockshaft has penetrated into the spindle lock to a distance of

$$h_{12} \leq 12,71 \text{ mm } (0.500 \text{ in})$$

from the shoulder.

5.5.12 *Hardness*

The hardness in the thread area of the spindle lock shall be 55 to 60 HRC (Rockwell scale C); see ISO/R 80.

5.6 Bottom protective disk (see Figure 9)**5.6.1 Diameter**

The diameter of the bottom protective disk shall be

$$d_{11} = 360,37 \pm 0,25 \text{ mm } (14.188 \pm 0.010 \text{ in}).$$

5.6.2 Thickness

The thickness of the bottom protective disk shall be

$$e_1 = 1,30 \pm 0,08 \text{ mm } (0.051 \pm 0.003 \text{ in}).$$

5.7 Disk supports (see Figure 9)

The radius of all disk supports shall be

$$r_3 \leq 90,9 \text{ mm } (3.58 \text{ in}).$$

5.8 Recording disks**5.8.1 Diameter** (see Figure 9)

The diameter of all recording disks shall be

$$d_{12} = 356,25 \pm 0,15 \text{ mm } (14.025 \pm 0.006 \text{ in}).$$

5.8.2 Thickness (see Figure 11)

The thickness of all recording disks shall be

$$e_2 = 1,905 \pm 0,025 \text{ mm } (0.075 \pm 0.001 \text{ in}).$$

5.8.3 Disk edge chamfer (see Figure 11)

For a distance of

$$0 < b \leq 1,3 \text{ mm } (0.05 \text{ in}).$$

from the outside edge of the disk, the disk contour shall be relieved within the extended boundaries of the disk surfaces.

5.8.4 Top protective disk (see Figure 9)**5.8.5 Diameter**

The diameter of the top protective disk shall be

$$d_{12} = 356,25 \pm 0,25 \text{ mm } (14.025 \pm 0.010 \text{ in}).$$

5.8.6 Thickness

The thickness of the top protective disk shall be

$$e_3 = 1,27 \pm 0,05 \text{ mm } (0.05 \pm 0.002 \text{ in}).$$

5.8.7 Location of the disks (see Figure 9)

The disks shall be located with regard to the reference plane as described in 5.8.8 to 5.8.10.

5.8.8 Bottom protective disk

The vertical distance between the reference plane and the lower surface of the bottom protective disk shall be

$$h_{13} = 0,56 \text{ to } 1,41 \text{ mm } (0.022 \text{ to } 0.056 \text{ in}).$$

5.8.9 Recording disks

The vertical distances above the reference plane to the recording disks shall be

$$h_{14} = 10,478 \pm 0,203 \text{ mm } (0.412 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{15} = 20,003 \pm 0,203 \text{ mm } (0.787 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{16} = 29,258 \pm 0,203 \text{ mm } (1.162 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{17} = 39,053 \pm 0,203 \text{ mm } (1.537 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{18} = 48,578 \pm 0,203 \text{ mm } (1.912 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{19} = 58,103 \pm 0,203 \text{ mm } (2.287 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{20} = 67,628 \pm 0,203 \text{ mm } (2.662 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{21} = 77,153 \pm 0,203 \text{ mm } (3.037 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{22} = 86,678 \pm 0,203 \text{ mm } (3.412 \text{ 5} \pm 0.008 \text{ in}),$$

$$h_{23} = 96,203 \pm 0,203 \text{ mm } (3.787 \text{ 5} \pm 0.008 \text{ in}).$$

5.8.10 *Top protective disk*

The distance between the reference plane and the lower surface of the top protective disk shall be

$$h_{24} = 105,982 \pm 0,432 \text{ mm } (4.172 \text{ 5} \pm 0.017 \text{ in}).$$

5.9 *Location of the lowest element*

The lowest element of the disk pack shall not extend outside an annular space defined by a distance below the reference plane of

$$h_{25} \leq 7,6 \text{ mm } (0.30 \text{ in})$$

and inner and outer radii of

$$r_4 = 78,0 \text{ mm } (3.07 \text{ in}),$$

$$r_5 = 96,5 \text{ mm } (4.84 \text{ in}).$$

5.10 *Height without covers*

The overall height of the disk pack, without covers, above the reference plane shall be

$$h_{26} \leq 123,0 \text{ mm } (4.84 \text{ in}).$$

5.11 *Hub/disk relationship*

5.11.1 *Axial position limits of disk surfaces*

With the disk pack revolving at any rotational frequency from 2 500 to 3 700 min^{-1} , the axial runout of the recording disks and the top and bottom protective disks (defined by stacking dimension h_{13} through h_{24} in Figure 9) shall remain within the axial position limits (plus and minus tolerances) given for each surface in 4.10. This requirement shall apply to the annular area of all disk surfaces between an outer radius of 175,08 mm (6.893 in) minimum and an inner radius of 98,42 mm (3.875 in) maximum.

5.11.2 *Axial runout of disks*

The axial runout of any disk at any rotational frequency up to the maximum allowable rotational frequency (see 6.3) shall not exceed

$$0,15 \text{ mm } (0.006 \text{ in}) \text{ for the recording disks,}$$

$$0,51 \text{ mm } (0.020 \text{ in}) \text{ for the protective disks,}$$

total indicator reading.

5.11.3 *Acceleration of axial runout*

With the disk pack revolving at $3\,600 \pm 72 \text{ min}^{-1}$, the acceleration of the axial runout of the recording disk surfaces (measured with a high frequency cut-off defined by the flat response/high frequency asymptote intercept of 5,0 kHz and a high frequency fall-off of 18 dB per octave) shall not exceed a peak acceleration from the base line of $\pm 102 \text{ m/s}^2$ ($\pm 4\,000 \text{ in/s}^2$) in the annular area between an outer radius of 175,08 mm (6.893 in) minimum and an inner radius of 98,42 mm (3.875 in) maximum.

5.11.4 *Horizontal runout of disks*

The horizontal runout shall not exceed a total indicator reading of 0,25 mm (0.010 in) for the recording disks, and 0,51 mm (0.020 in) for the top and bottom protective disks with respect to the centreline of the disk pack hub.

5.11.5 *Angular shift between disks and hub*

After the disk pack has experienced a positive or negative acceleration during normal operation, the angular shift between disks and hub shall remain equal to zero.

5.12 *Location of magnetic surfaces*

The area of the magnetic surface of the recording disks shall extend from an inner diameter of 190,5 mm (7.50 in) maximum to an outer diameter of 352,0 mm (13.86 in) minimum.

6 Physical characteristics

6.1 Moment of inertia

The moment of inertia of the disk pack without covers shall not exceed

107 gm² (365.6 lbin²).

6.2 Balance

The disk pack shall be dynamically balanced. Residual unbalance shall be less than 100 gmm (0.14 ozin) when measured at 3 600 min⁻¹ in each of two planes parallel to the disk surface at 5,84 ± 1,3 mm (0.23 ± 0.05 in) above the upper surface of the top protective disk and below the lower surface of the bottom protective disk, respectively.

6.3 Maximum rotational frequency

The disk pack shall be capable of withstanding the effect of stress at a rotational frequency of 3 700 min⁻¹ counter-clockwise as viewed from the top.

6.4 Locking pull

The disk pack shall be held to the disk drive spindle by a force of 1 700 to 2 000 N (380 to 450 lbf), exerted by the downward pull of the disk drive lockshaft on the disk pack spindle lock.

6.5 Ambient air

6.5.1 Filtered air

The filtered air in the immediate area of the disk pack shall be of air cleanliness class 100 (see Annex A).

6.5.2 Pressure

The static pressure in the immediate area of the disk pack shall be 25 Pa (0.1 inH₂O) minimum above the environment of the drive.

6.6 Thermal time constant

The thermal time constant is the time required to reduce an initial temperature difference between the pack and the drive by 2/3. The disk pack thermal time constant shall not exceed 1 min when measured with the disk pack rotating at 3 600 ± 72 min⁻¹ and within the specified operating environment and conditions.

6.7 Electrical earthing

The disk pack shall provide a discharge path from the magnetic media to the drive spindle through the hub mechanism.

6.8 Physical characteristics of magnetic surfaces

6.8.1 Surface roughness

The finished magnetic surface shall have a surface roughness less than 0,038 µm (1.5 µin), arithmetic average, with a maximum deviation in height of 0,38 µm (15 µin) from average, when measured with a 2,5 µm (0.000 1 in) stylus and a 750 µm (0.03 in) cut-off range.

6.8.2 Durability of magnetic surfaces

6.8.2.1 Resistance to chemical cleaning fluid

The magnetic surface of recording disks shall not be adversely affected by a 91 % solution of isopropyl alcohol (made from reagent grade isopropyl alcohol mixed with 9 % distilled or deionized water by volume) when used for cleaning.

6.8.2.2 Coating adhesion

The nature of the coating shall be such as to ensure wear resistance under operating conditions and maintenance of adhesion and abrasive wear resistance.

6.8.2.3 Abrasive wear resistance

The coating shall be able to withstand operational wear.

Section 3. Magnetic characteristics

7 Track and recording information — Data surfaces

7.1 General geometry, surfaces and heads

Head and surface details shall be as in Figure 12 and Figure 18.

Track locations shall be referred to a Cartesian co-ordinate system, axes X and Y , with its origin on the axis of rotation of the disk pack.

7.2 Track geometry

7.2.1 Number of tracks

There shall be 815 discrete concentric tracks per data surface.

7.2.2 Width of tracks

The recorded track width on the data surface shall be

$$0,051 \pm 0,004 \text{ mm } (0.002 \text{ 00} \pm 0.000 \text{ 15 in}).$$

The method of testing whether the head to be used meets this requirement is given in Annex B.

7.2.3 Track location

The centreline of any track shall lie within

$$\pm 0,003 \text{ mm } (0.000 \text{ 12 in})$$

of its corresponding data track centreline as defined in 11.1.5.3.

The incremental head movement and its tolerance are defined by the servo track information and shall correspond to the servo track spacing (see 11.1.5.4).

7.2.4 Location of the lines of access

There shall be two groups of heads each having a line of access A and B respectively. These lines of access shall be parallel to the X axis and shall have the ordinate

$$Y_A = + 7,772 \text{ mm } (0.306 \text{ in}),$$

$$Y_B = + 7,772 \text{ mm } (0.306 \text{ in}).$$

7.2.5 Recording offset angle

At the instant of writing or reading a magnetic transition, the transition shall have an angle not exceeding $\pm 30'$

with respect to the line of access.

7.2.6 Identification of data tracks

For the purposes of testing data tracks, the identifying system specified in 7.2.6.1 to 7.2.6.4 is used.

7.2.6.1 Data track identification

Data track identification shall be a three-digit decimal number (000 to 814) which numbers data tracks consecutively starting at the outermost data track of each data surface.

7.2.6.2 Data surface identification

The data surfaces shall be numbered from 00 to 18 to correspond with the head numbers (see Figure 12).

7.2.6.3 Cylinder

A cylinder is the set of data tracks on the data surfaces having the same data track identification.

7.2.6.4 Data track address

A five-digit decimal number shall be used for data track address with the three most significant digits defining the cylinder address and the remaining two digits defining the data surface address.

8 Test conditions and equipment — Data surfaces

8.1 General conditions

8.1.1 Rotational frequency

The rotational frequency shall be $3\,600 \pm 36 \text{ min}^{-1}$ in any test period. Rotation shall be counter-clockwise when viewed from above.

8.1.2 *Temperature*

The temperature of the air entering the disk pack area shall be

$27 \pm 2\text{ }^{\circ}\text{C}$ ($81 \pm 4\text{ }^{\circ}\text{F}$).

8.1.3 *Relative humidity*

The relative humidity of the air entering the disk pack shall be between 30 and 70 %.

8.1.4 *Conditioning*

Before starting measurements, the disk pack shall be conditioned for 24 h in the same environment as that in which the test equipment is operating.

8.2 *Standard reference data surface*

8.2.1 *Characteristics*

The standard reference data surface shall be characterized at the innermost and outermost track. When recorded at $1f$ (see 8.8), using a data test head, the track average amplitude (see 8.7) shall be:

3,8 mV at track 000,

2,2 mV at track 814.

When recorded at $2f$ (see 8.8), using a data test head, the track average amplitude (see 8.7) shall be

3,0 mV at track 000,

1,7 mV at track 814.

8.2.2 *Secondary standard reference data surface*

This shall be a surface whose output is related to the standard reference data surface via calibration factors C_{D1} at $1f$ and C_{D2} at $2f$.

$$C_D = \frac{\text{Standard reference data surface output}}{\text{Secondary standard reference data surface output}}$$

To qualify as a secondary standard reference data surface, the calibration factor C_D for such disks shall satisfy

$$0,90 \leq C_D \leq 1,10$$

at both measured tracks and at both frequencies.

8.3 *Data test head*

8.3.1 *Description*

Disk measurement shall be taken with a suitable test head¹⁾. The test head shall be calibrated to the standard reference data surface and used for amplitude and data testing of the data surfaces.

8.3.2 *Gap width*

The width of the recording gap (measured optically) shall be

$50,0 \pm 2,5\text{ }\mu\text{m}$ ($1\text{ }970 \pm 100\text{ }\mu\text{in}$).

8.3.3 *Gap length*

The length of the recording gap shall be

$2,54 \pm 0,51\text{ }\mu\text{m}$ ($100 \pm 20\text{ }\mu\text{in}$).

8.3.4 *Offset angle*

The angle between the read gap in the ferrite core and the line of access shall be

$0^{\circ} \pm 30'$.

8.3.5 *Flying height*

When flying over track 814, the test head shall have a flying height at the gap of

$0,89 \pm 0,05\text{ }\mu\text{m}$ ($35 \pm 2\text{ }\mu\text{in}$).

¹⁾ Information on suitable test heads may be obtained from the Secretariat of ISO/TC 97, or from the ISO Central Secretariat.

8.3.6 Inductance

The total head inductance shall be $23 \pm 2,3 \mu\text{H}$ measured in air at 1 MHz. Each leg shall have an inductance of $6 \pm 0,6 \mu\text{H}$.

8.3.7 Resonant frequency

As measured at the head cable connector, the resonant frequency of the head shall be

$$10,7 \pm 1,3 \text{ MHz.}$$

8.3.8 Resolution

The test head resolution shall lie between 73 % and 83 % at track 000, and between 71 % and 81 % at track 814. Resolution is defined as

$$\frac{2f \text{ amplitude}}{1f \text{ amplitude}} \times 100 \%$$

8.3.9 Head loading force

The net head loading force shall be such as to achieve the flying height given in 8.3.5 and shall be within the limits

$$3,4 \pm 0,4 \text{ N (0.76} \pm 0.09 \text{ lbf).}$$

8.3.10 Calibration factor

The data test head calibration factors C_{H1} at 1f and C_{H2} at 2f shall satisfy

$$0.90 \leq C_H \leq 1,10.$$

C_H is defined by

$$C_H = \frac{\text{Standard reference data surface output}}{\text{Actual head voltage measured}}$$

when measured on a standard reference data surface, or by

$$C_H = \frac{\text{Standard reference data surface output}}{(\text{Actual head voltage measured}) \times C_D}$$

when measured on a secondary standard reference data surface.

8.3.11 Overwrite capability

The overwrite capability of the head shall meet the following requirement.

Write with 1f on track 000 of a standard reference data surface and measure the average amplitude of the 1f signal with a frequency-selective voltmeter. Without DC erase, overwrite once at 2f and measure the average amplitude of the residual 1f signal.

The ratio:

$$\frac{\text{Average amplitude of selectively measured 1f signal after overwrite with 2f}}{\text{Average amplitude of selectively measured 1f signal before overwrite with 2f}}$$

shall be -48 ± 3 .