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Information processing — Interchangeable magnetic twelve-disk pack (100 Mbytes)

Traitement de l'information — Chargeur magnétique interchangeable à douze disques (100 mégaoctets)

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FOREWORD

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Information processing — Interchangeable magnetic twelve-disk pack (100 Mbytes)

1 SCOPE AND FIELD OF APPLICATION

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This International Standard specifies the general, physical, and magnetic characteristics and the pre-initialization for the physical interchange of 100 Mbytes magnetic twelve-disk packs, for use in electronic data processing systems.

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SECTION ONE : GENERAL DESCRIPTION

2 GENERAL DESCRIPTION

2.1 General figures

A typical twelve-disk pack is represented in figures 1 to 6 :

- figure 1 shows an exploded view;
- figure 2 shows a vertical cross-section;
- figure 3 shows, at an enlarged scale, the relationship between the top cover and the bottom protective disk;
- figure 4 shows a schematic cross-section of part of the disk pack;
- figure 5 shows a schematic cross-section of the spindle lock;
- figure 6 shows an enlarged view of the edge of a disk.

2.2 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.

2.3 Direction of rotation

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

2.4 Pack capacity

A gross information capacity of 100 million 8-bit bytes is achieved in this 12-disk pack by the use of 19 data disk surfaces. Data are recorded on 404 tracks per data surface. The track spacing gives approximately 8 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 TWO : MECHANICAL AND PHYSICAL CHARACTERISTICS

3 GENERAL REQUIREMENTS

3.1 Operation and storage environment

3.1.1 *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.

3.1.2 *Storage*

The storage temperature shall be within the range − 40 °C (− 40 °F) to + 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.

3.2 Test conditions

Unless otherwise stated, measurements shall be carried out at 23 ± 3 °C (73.4 ± 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.

3.3 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 specifications of this International Standard. Protection against shock and vibration during transportation and storage shall be subject to agreement between supplier and user.

3.4 Material

Unless otherwise stated, the disk pack may be constructed from any suitable material so long as the dimensional, inertial and other functional requirements of this International Standard are maintained. The coefficient of thermal expansion of all the recording disks shall be the same.

4 DIMENSIONAL CHARACTERISTICS

4.1 Reference plane

All dimensions are referred to a reference plane. It is the surface, perpendicular to the axis of the pack, on which the pack rests with its three rest buttons.

4.2 Overall external dimensions

4.2.1 Overall height (see figure 2)

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

$h_1 \leqslant 180$ mm (7.09 in).

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4.2.2 *Overall diameter* (see figure 2)

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

$d_1 \leqslant 381$ mm (15.0 in).

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4.3 Top cover (see figure 3)

4.3.1 *Outside radius, pack-centreline relationship*

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

183,65 mm (7.230 in) $< r_1 <$ 185,42 mm (7.300 in).

4.3.2 *Vertical distance*

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

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

4.4 Hub (see figure 4)

4.4.1 *Diameter of the flexure pads*

The diameter of the three hub flexure pads shall be

$d_2 = 44,432 \pm 0,005$ mm (1.749 3 ± 0,000 2 in)

measured at 20,0 ± 0,5 °C (68 ± 1 °F).

4.4.2 *Height of the flexure pads*

The height of the hub flexure pads shall be

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

4.4.3 *Finish of the flexure pads*

The finish shall be of class N5, i.e. 0,4 μm (16 μin) arithmetical mean deviation; see ISO 1302.

4.4.4 *Relief of the flexure pads*

The hub flexure pad shall be relieved to

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

measured at 20,0 ± 0,5 °C (68 ± 1 °F).

4.4.5 *Height of flexure pads from the reference plane*

The height of the flexure pads from the reference plane shall be

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

4.4.6 *Radial compliance of flexure pads*

The radial compliance of each flexure pad shall be 1,0 ± 0,2 μm (40 ± 8 μin) per 4,5 N (1 lbf) radial force located at the collet flexure pad with d_2 expanded to 44,450 0 ± 0,002 5 mm (1.750 0 ± 0.000 1 in).

4.4.7 *Rest buttons*

4.4.7.1 LOCATION

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

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

4.4.7.2 DIAMETER AND SHAPE

The diameter of the rest buttons shall be

$d_5 = 11 \pm 1$ mm (0.43 ± 0.04 in).

Their rest surface shall be spherical with a radius

$r_2 = 110 \pm 15$ mm (4.33 ± 0.59 in).

4.4.7.3 ROUGHNESS AND HARDNESS

The finish of the rest surfaces shall be of class N4, i.e. 0,2 μm (8 μin) arithmetical mean deviation; see ISO 1302. The hardness shall be 55 to 60 HRC (Rockwell scale C).

4.5 Spindle lock (see figure 5)

4.5.1 *Thread of the spindle lock*

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

4.5.2 *Diameter of the lower part of the spindle lock*

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

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

4.5.3 *Minimum full thread length*

The full thread length of the spindle lock shall be

$h_5 \geqslant 7{,}14$ mm (0.281 in).

4.5.4 *Chamfer*

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

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

and an angle

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

4.5.5 *Location of the shoulder of the spindle lock*

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

$h_6 = 13{,}51\,^{+0{,}23}_{-0{,}30}$ mm (0.532 $^{+0.009}_{-0.012}$ in).

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

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

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

4.5.7 *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

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

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

$h_8 \leqslant 16{,}97$ mm (0.668 in)

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

$h_9 \geqslant 14{,}65$ mm (0.577 in)

from the shoulder of the spindle lock.

The diameter with relaxed balls shall be

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

4.5.8 *Location of the safety balls*

The centres of the safety balls shall be located with regard to the spindle lock shoulder at a distance of

$h_{10} = 9{,}04 \pm 0{,}23$ mm (0.356 ± 0.009 in).

4.5.9 *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

$d_{10} = 3{,}18 \pm 0{,}13$ mm (0.125 ± 0.005 in).

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4.5.10 *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

$h_{11} \leqslant 13{,}84$ mm (0.545 in)

from the shoulder.

4.5.11 *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

$h_{12} = 14{,}44 \pm 0{,}21$ mm (0.569 ± 0.008 in)

from the shoulder.

4.6 Bottom protective disk (see figure 4)

4.6.1 *Diameter*

The diameter of the bottom protective disk shall be

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

4.6.2 *Thickness*

The thickness of the bottom protective disk shall be

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

4.7 Disk supports (see figure 4)

The radius of all disk supports shall be

$r_3 \leqslant 90{,}0$ mm (3.58 in).

4.8 Recording disks

4.8.1 *Diameter* (see figure 4)

The diameter of all recording disks shall be

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

4.8.2 *Thickness* (see figure 6)

The thickness of all recording disks shall be

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

4.8.3 *Disk edge chamfer* (see figure 6)

For a distance

$b \leqslant 1{,}3$ mm (0.05 in)

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

4.9 Top protective disk (see figure 4)

4.9.1 *Diameter*

The diameter of the top protective disk shall be

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

4.9.2 *Thickness*

The thickness of the top protective disk shall be

$e_4 = 1{,}27 \pm 0{,}05$ mm (0.050 ± 0.002 in).

4.10 Location of the disks (see figure 4)

The disks shall be located with regard to the reference plane as described in 4.10.1 to 4.10.3.

4.10.1 *Bottom protective disk*

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

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

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4.10.2 *Recording disks*

The distance above the reference plane to the recording disks shall be

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

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

$h_{16} = 29{,}528 \pm 0{,}203$ mm (1.162 5 ± 0.008 in),

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

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

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

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

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

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

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

4.10.3 *Top protective disk*

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

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

4.11 Location of the lowest element

The lowest element of the disk pack shall not extend outside an annular space defined by

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

and two radii

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

$r_5 = 96{,}5$ mm (3.80 in).

4.12 Height without covers

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

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

4.13 Hub/disk relationship

4.13.1 *Axial position limits of disk surfaces*

With the disk pack revolving at any speed in the range 2 500 to 3 700 rev/min, 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 4) shall remain within the axial position limits defined for each surface by the plus and minus tolerance around the datum dimension expressed as a dimension from the reference plane for that surface (dimensions h_{13} through h_{24}). This requirement shall apply to the area of all disk surfaces between a radius of 175,08 mm (6.893 in) minimum and a radius of 98,42 mm (3.875 in) maximum.

4.13.2 *Axial runout of disks*

The axial runout of any disk at any rotational frequency up to the maximum allowable rotational frequency (see 5.3) shall not exceed

0,15 mm (0.006 in) for the recording disks,

0,51 mm (0.020 in) for the protective disks,

total indicator reading.

4.13.3 *Acceleration of axial runout*

With the disk pack revolving at $3\,600 \pm 72$ min^{-1}, the acceleration of the axial runout of the recording disk surfaces (measured with a high frequency cutoff defined by the flat response/high frequency asymptote intercept of 2 200 Hz and a high frequency fall-off of 18 dB per octave) in the area between a radius of 175,08 mm (6.893 in) minimum and a radius of 98,42 mm (3.875 in) maximum shall not exceed a peak acceleration from the base line of ± 76 m/s^2 (± 3 000 in/s^2).

4.13.4 *Horizontal runout of disks*

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

4.13.5 *Angular shift between disks and hub*

After the disk pack has experienced a positive or negative acceleration up to 3 000 rad/s^2, the angular shift between disks and hub must remain equal to zero when measured with a device capable of detecting a shift of 3″ of arc.

4.14 Location of magnetic surfaces

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

5 PHYSICAL CHARACTERISTICS

5.1 Moment of inertia

The moment of inertia of the disk pack without covers shall not exceed 107 g·m^2 (365.6 lb·in^2).

5.2 Balance

The disk pack shall be dynamically balanced. Residual unbalance shall be less than 100 g·mm (0.14 oz·in) when measured at 3 600 min^{-1} in each of two planes parallel to the disk surface at $5{,}84 \pm 1{,}3$ 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.

5.3 Maximum rotational frequency

The disk pack shall be capable of withstanding the effect of stress at a rotational frequency of 3 700 min^{-1} counterclockwise as viewed from the top.

5.4 Locking pull

The disk pack shall be held to the disk drive spindle by a force of $1\,550 \pm 450$ N (350 ± 100 lbf), exerted by the downward pull of the disk drive lockshaft on the disk pack spindle lock.

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5.5 Ambient air

5.5.1 *Filtered air*

The filtered air in the immediate area of the disk pack shall be equivalent to a class 100 clean room (see annex A).

5.5.2 *Pressure*

The static pressure in the immediate area of the disk pack shall be 0,25 mbar (0.1 inH_2O) minimum above the environment of the drive.

5.6 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 $3\,600 \pm 72$ min^{-1} and within the specified operating environment and conditions.

5.7 Electrical earthing

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

5.8 Physical characteristics of magnetic surfaces

5.8.1 *Surface roughness*

The finished magnetic surface shall have a surface roughness less than 0,05 µm (2.0 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) cutoff range.

5.8.2 *Durability of magnetic surfaces*

5.8.2.1 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.

5.8.2.2 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.

5.8.2.3 Abrasive wear resistance

The coating shall be able to withstand operational wear.

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SECTION THREE : MAGNETIC CHARACTERISTICS

6 TRACK AND RECORDING INFORMATION – DATA SURFACES

6.1 General geometry, surfaces and heads

Head and surface details shall be as in figures 7 and 13.

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.

6.2 Track geometry

6.2.1 *Number of tracks*

There shall be 411 discrete concentric tracks per data surface.

6.2.2 *Width of tracks*

The recorded track width on the data surface shall be

0,109 ± 0,005 mm (0.004 3 ± 0.000 2 in).

(A suggested method of measuring the track width is shown in annex B.)

6.2.3 *Track location*

The centreline of any track shall lie within

± 0,005 mm (0.000 2 in)

of its corresponding data track centreline as defined in 10.1.5.3.

The incremental head movement and its tolerance are defined by the servo track information and shall correspond to the servo track spacing (see 10.1.5.4).

6.2.4 *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

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

$Y_B = - 7{,}772$ mm (0.306 in).

6.2.5 *Recording offset angle*

At the instant of writing or reading a magnetic transition, the transition may have an angle of

± 30′ maximum

with the line of access.

6.2.6 *Identification of data tracks*

For the purposes of testing data tracks, the identifying system specified in 6.2.6.1 to 6.2.6.4 is used.

6.2.6.1 DATA TRACK IDENTIFICATION

Data track identification shall be a three-digit decimal number (000 to 410) which numbers data tracks consecutively starting at the outermost data track of each data surface.

6.2.6.2 DATA SURFACE IDENTIFICATION

The data surfaces shall be numbered from 00 to 18 corresponding with the head numbers (see figure 7).

6.2.6.3 CYLINDER

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

6.2.6.4 DATA TRACK ADDRESS

A five-digit decimal number is 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.

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7 TEST CONDITIONS AND EQUIPMENT – DATA SURFACES

7.1 General conditions

7.1.1 *Rotational frequency*

The rotational frequency shall be 3 600 ± 72 min^{-1} in any test period. Rotation shall be counter-clockwise when viewed from above.

7.1.2 *Temperature*

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

27 ± 2 °C (81 ± 4 °F).

7.1.3 *Relative humidity*

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

7.1.4 *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.

7.2 Standard reference data surface

7.2.1 *Characteristics*

The standard reference data surface shall be characterized at the innermost and outermost track. When recorded at 1f

(see 7.8), using a data test head, the track average amplitude (see 7.7) shall be :

3,75 mV at track 000,

1,9 mV at track 410.

When recorded at $2f$ (see 7.8), using a data test head, the track average amplitude (see 7.7) shall be :

2,7 mV at track 000,

1,3 mV at track 410.

7.2.2 *Secondary standard reference data surface*

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

The calibration factor C_D is defined as

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

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

$$0{,}90 \leqslant C_D \leqslant 1{,}10$$

at both measured tracks and a both frequencies.

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7.3 Data test head

7.3.1 *Description*

Disk measurement shall be taken with a suitable test head[1]. The test head shall be calibrated to the standard reference data surface and used for amplitude and data testing of the data surfaces.

7.3.2 *Gap width*

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

109,0 ± 2,5 μm (0.004 3 ± 0.000 1 in).

7.3.3 *Gap length*

The length of the recording gap shall be

2,54 ± 0,63 μm (100 ± 25 μin).

7.3.4 *Offset angle*

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

$0^\circ \pm 30'$.

7.3.5 *Flying height*

When flying over track 410, the test head shall have a flying height at the gap of

1,14 ± 0,05 μm (45 ± 2 μin).

7.3.6 *Inductance*

The total head inductance shall be 9,4 ± 0,2 μH measured in air at 1 MHz. One leg shall have an inductance of 2,70 ± 0,05 μH; the other leg shall have an inductance of 2,85 ± 0,05 μH.

7.3.7 *Resonant frequency*

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

19,5 ± 0,5 MHz.

7.3.8 *Resolution*

The test head resolution shall lie between 65 and 79 % at track 000, and between 61 % and 75 % at track 410. Resolution is defined as

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

7.3.9 *Head loading force*

The net head loading force shall be such as to achieve the flying height given in 7.3.5 and shall be within the limits

3,4 ± 0,4 N (0.76 ± 0.09 lbf).

7.3.10 *Calibration factor*

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

$$0{,}90 \leqslant C_H \leqslant 1{,}10.$$

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.

7.3.11 *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 $2f$, measure the average amplitude of the residual $1f$ signal.

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

The ratio :

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

shall be − 50 ± 5 dB.

7.4 Conditions for measurements using the data test head

7.4.1 *Write current*

The $2f$ write current shall conform to figure 8. The current amplitude measured at the head termination connector shall be varied in seven levels as presented below :

Data tracks	Write current amplitude $(I_{W1} + I_{W2})$	
0 to 63	180 mA	tolerance ± 1 %
64 to 127	173 mA	
128 to 191	166 mA	
192 to 255	160 mA	
256 to 319	153 mA	
320 to 383	147 mA	
384 to 410	140 mA	

The differences between the positive and negative amplitudes of the quiescent write current shall be $|I_{w1} - I_{w2}| < 2$ mA.

$T_R = 46 \pm 3$ ns,

$T_F = 46 \pm 3$ ns.

Overshoot : (6,5 ± 0,5) % of $I_W = \dfrac{I_{W1} + I_{W2}}{2}$,

$T_1 = T_2 \pm 2$ %.

7.4.2 *DC erase current*

The DC erase current supplied to one of the two read/write coils when DC erase is specified shall be :

Data tracks	DC erase current	
0 to 63	90,0 mA	tolerance ± 1 %
64 to 127	86,5 mA	
128 to 191	83,0 mA	
192 to 255	80,0 mA	
256 to 319	76,5 mA	
320 to 383	73,5 mA	
384 to 410	70,0 mA	

7.5 Read channel

7.5.1 *Input impedance*

The differential input impedance of the read channel shall be 900 ± 45 Ω in parallel with 25 ± 2 pF, including the pre-amplifier input impedance and all other distributed and lumped impedance measured at the head termination connector.

7.5.2 *Frequency and phase characteristics*

The frequency and phase characteristics are defined by the following :

a) the frequency response shall be flat within ± 0,25 dB from 0,1 MHz to 6,45 MHz (0,06f to 4f);

b) the −3 dB roll-off point shall be at 9,675 MHz (6f);

c) the attenuation above 9,675 MHz shall not be less than that given by a line drawn through zero at 9,675 MHz with a slope of −60 dB/decade;

d) the phase shift shall be less than ± 5° between 0,1 MHz and 6,45 MHz (0,06f and 4f).

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7.5.3 *Transfer characteristics*

For inputs between 0,3 mV and 10,0 mV the transfer characteristic shall be linear within ± 3 % or 50 µV, whichever is larger.

7.6 Automatic gain controlled amplifier

The AGC-amplifier shall produce an output voltage V_{AGC} constant to within ± 1 % for input voltages from $V_{IN,\,min} = 0,3$ mV to $V_{IN,\,max} = 10,0$ mV (see figure 9).

Its response time shall be 3,4 µs. All frequencies below 10 kHz shall be attenuated at a rate of 20 dB/decade.

7.7 Track average amplitude V_{TA}

The track average amplitude V_{TA} is the average of the peak-to-peak values of the signals over one revolution of the disk measured at the output of the data test head when electrically loaded as in 7.5.

7.8 Test signals

The recording frequencies specified as 1f and 2f shall be :

$1f = (3\,225 \pm 3{,}225) \times 10^3$ transitions/s,

$2f = (6\,450 \pm 6{,}450) \times 10^3$ transitions/s.

7.9 Use of DC erase

Unless otherwise specified all write operations shall be preceded by a DC erase operation.