International Standard ISO 5653

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Information processing — Interchangeable magnetic twelve-disk pack (200 Mbytes)

Traitement de l'information — Chargeur magnétique interchangeable à douze disques (200 mégaoctets)

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5653 was developed by Technical Committee ISO/TC 97, *Computers and information processing*, and was circulated to the member bodies in August 1978.

It has been approved by the member bodies of the following countries :

Australia	Italy	Sweden
Belgium	Japan	Switzerland
Brazil	Mexico	United Kingdom
Bulgaria	Netherlands	USA
Czechoslovakia	Poland	USSR
Egypt, Arab Rep. of	Romania	Yugoslavia
France	South Africa, Rep. of	
Germany, F. R.	Spain	

No member body expressed disapproval of the document.

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Information processing — Interchangeable magnetic twelve-disk pack (200 Mbytes)

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 one — General description

3 General description

3.1 General figures

A typical twelve-disk pack is represented in figures 6 to 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 two — 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 ± 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

$h_1 \leqslant 180$ 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

$d_1 \leqslant 381$ 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 mm (7.230 in) $< r_1 <$ 185,42 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 ± 1,47 mm (0.140 ± 0.058 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 ± 0,005 mm (1.749 3 ± 0.000 2 in)

measured at 20 ± 0,5 °C (68 ± 1 °F).

5.4.2 Height of the flexure pads

The height of the hub flexure pads shall be

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

5.4.3 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.)

5.4.4 Relief of the flexure pads

The hub flexure pads shall be relieved to

d_3 = 44,478 ± 0,015 mm (1.751 1 ± 0.000 6 in)

measured at 20 ± 0,5 °C (68 ± 1 °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 ± 0,30 mm (0.055 ± 0.012 in).

5.4.6 Radial compliance of flexure pads

The radial compliance of each flexure pad shall be 0,1 ± 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).

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 ± 0,13 mm (5.500 ± 0.005 in).

5.4.7.2 Diameter and shape

The diameter of the rest buttons shall be

d_5 = 11 ± 1 mm (0.43 ± 0.04 in).

Their rest surface shall be spherical with a radius

r_2 = 110 ± 15 mm (4.33 ± 0.59 in).

5.4.7.3 Roughness and hardness

The finish of the rest surfaces shall be of class N 4, i.e. 0,2 µm (8 µin) 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 ± 0,13 mm (0.369 ± 0.005 in).

5.5.3 Minimum full thread length

The full thread length of the spindle lock shall be

h_5 > 7,14 mm (0.281 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 ± 0,13 mm (0.315 ± 0.005 in)

and an angle

γ = 45 ± 2°.

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

$h_6 = 13{,}51\ ^{+\ 0{,}23}_{-\ 0{,}30}$ mm $(0{,}532\ ^{+\ 0.09}_{-\ 0.012}$ 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 ± 0,076 mm (0.754 ± 0.003 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 ± 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 < 15,14 mm (0.596 in)

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

$h_9 > 12{,}98$ mm (0.511 in)

from the shoulder of the spindle lock.

The diameter with relaxed balls shall be

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

5.5.8 Location of the safety balls

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

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

$d_{10} = 5{,}16\ ^{+\ 0.13}_{-\ 0{,}02}$ mm (0.203 $^{+\ 0.005}_{\ \ 0.001}$ 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

$h_{11} < 11{,}81$ mm (0.465 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

$h_{12} < 12{,}71$ mm (0.500 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

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

5.6.2 Thickness

The thickness of the bottom protective disk shall be

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

5.7 Disk supports (see figure 9)

The radius of all disk supports shall be

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

5.8 Recording disks

5.8.1 Diameter (see figure 9)

The diameter of all recording disks shall be

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

5.8.2 Thickness (see figure 11)

The thickness of all recording disks shall be

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

5.8.3 Disk edge chamfer (see figure 11)

For a distance of

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

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

5.9 Top protective disk (see figure 9)

5.9.1 Diameter

The diameter of the top protective disk shall be

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

5.9.2 Thickness

The thickness of the top protective disk shall be

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

5.10 Location of the disks (see figure 9)

The disks shall be located with regard to the reference plane as described in 5.10.1 to 5.10.3.

5.10.1 Bottom protective disk

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

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

5.10.2 Recording disks

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

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

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

h_{16} = 29,258 ± 0,203 mm (1.162 5 ± 0.008 in),

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

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

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

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

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

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

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

5.10.3 Top protective disk

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

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

5.11 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

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

and inner and outer radii of

r_4 = 78,0 mm (3.07 in),

r_5 = 96,5 mm (4.84 in).

5.12 Height without covers

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

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

5.13 Hub/disk relationship

5.13.1 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.

5.13.2 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 mm (0.006 in) for the recording disks,

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

total indicator reading.

5.13.3 Acceleration of axial runout

With the disk pack revolving at 3 600 ± 72 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 ± 102 m/s^2 (± 4 000 in/s^2) in the annular area between an outer radius of 175,08 mm (6.893 in) minimum and a inner radius of 98,42 mm (3.875 in) maximum.

5.13.4 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.

5.13.5 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.

5.14 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 gm^2 (365.6 lbin^2).

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} counterclockwise 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 inH_2O) 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 three — Magnetic characteristics

7 Track and recording information — Data surfaces

7.1 General geometry, surfaces and heads

Head and surface details shall be as in figures 12 and 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 ± 0,004 mm (0.002 00 ± 0.000 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

± 0,003 mm (0.000 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 mm (0.306 in),

Y_B = + 7,772 mm (0.306 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

± 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 ± 36 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 ± 2 °C (81 ± 4 °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

$$0,90 < C_D < 1,10$$

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 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.

8.3.2 Gap width

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

50,0 ± 2,5 µm (1 970 ± 100 µin).

8.3.3 Gap length

The length of the recording gap shall be

2,54 ± 0,51 µm (100 ± 20 µin).

8.3.4 Offset angle

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

0° ± 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 ± 0,05 µm (35 ± 2 µin).

8.3.6 Inductance

The total head inductance shall be 23 ± 2,3 µH measured in air at 1 MHz. Each leg shall have an inductance of 6 ± 0,6 µH.

8.3.7 Resonant frequency

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

10,7 ± 1,3 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 ± 0,4 N (0.76 ± 0.09 lbf).

8.3.10 Calibration factor

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

$$0,90 < C_H < 1,10.$$

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

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 :

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

shall be -48 ± 3.

8.4 Conditions for measurements using the data test head

8.4.1 Write current

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

Data tracks	Write current amplitude ($I_{w1} + I_{w2}$)	
0 to 127	130 mA	tolerance ± 1 %
128 to 255	123 mA	
256 to 383	115 mA	
384 to 511	108 mA	
512 to 639	100 mA	
640 to 767	93 mA	
768 to 814	90 mA	

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

$T_R = 70 \pm 5$ ns,
$T_F = 70 \pm 5$ ns.

Overshoot : $(3{,}5 \pm 1{,}5)$ % of $I_w = \dfrac{I_{w1} + I_{w2}}{2}$

Two consecutive half periods T_1, T_2 shall not differ from

$$\frac{T_1 + T_2}{2}$$

by more than 2 %.

8.4.2 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 127	65,0 mA	tolerance ± 1 %
128 to 255	61,5 mA	
256 to 383	57,5 mA	
384 to 511	54,0 mA	
512 to 639	50,0 mA	
640 to 767	46,5 mA	
768 to 814	45,0 mA	

8.5 Read channel

8.5.1 Input impedance

The differential input impedance of the read channel shall be $1\,200 \pm 60\ \Omega$ in parallel with 15 ± 3 pF, including the amplifier input impedance and all other distributed and lumped impedance measured at the head termination connector.

8.5.2 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 − 18 dB/octave;

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

8.5.3 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.

8.6 Automatic gain controlled amplifier

The AGC-amplifier shall produce an output voltage V_{AGC} constant to within ± 2 % for input voltages from

$V_{IN,\,min} = 0{,}3$ mV to $V_{IN,\,max} = 10{,}0$ mV (see figure 14).

Its response time shall be 3,4 µs. All frequencies below 10 kHz shall be attenuated at a rate of 6 dB/octave.