
International Standard



7297

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Information processing — Magnetic disk for data storage devices — 96 000 flux transitions per track, 200 mm (7.9 in) outer diameter, 63,5 mm (2.5 in) inner diameter

Traitement de l'information — Disque magnétique pour unités de stockage des données — 96 000 transitions de flux par piste, diamètre extérieur 200 mm (7,9 in), diamètre intérieur 63,5 mm (2,5 in)

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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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Information processing — Magnetic disk for data storage devices — 96 000 flux transitions per track, 200 mm (7.9 in) outer diameter, 63,5 mm (2.5 in) inner diameter

1 Scope and field of application

This International Standard specifies the mechanical, physical and magnetic characteristics of a lubricated magnetic disk of 200 mm (7.9 in) outer diameter and 63,5 mm (2.5 in) inner diameter intended for mounting in data storage devices.

The International Standard defines the requirements for a disk to give satisfactory performance at 95 840 flux transitions per track.

When used at other densities, equivalent performance may require changes to the mechanical, magnetic and electrical criteria.

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 SI units. In the process of conversion into the alternative system, values may have been rounded. Therefore, the two sets of figures are consistent with, but not exactly equal to, each other. Either set may be used, but the two shall be neither mixed nor reconverted.

2 Reference

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

3 General requirements

3.1 Operation and storage environment

To prevent corruption of data, the ambient stray magnetic field intensity at the surface of the disk shall not exceed 4 000 A/m. When heads are present, the general ambient field shall be reduced to take account of the concentrating effect of the core of the head.

NOTE — This will usually require the limitation of the allowed ambient field to the range of 300 to 2 000 A/m.

3.1.1 Operation

The operating temperature of the air surrounding the disk shall be within the range 15 to 57 °C (59 to 135 °F) at a relative humidity of 8 to 80 %. The wet bulb temperature shall not exceed 26 °C (79 °F). The air surrounding the disk shall be of cleanliness class 100, as defined in annex A.

3.1.2 Storage

The storage temperature shall be within the range – 40 to + 65 °C (– 40 to + 150 °F) at a relative humidity of 8 to 80 %. The wet bulb temperature shall not exceed 30 °C (86 °F). Under no circumstances shall condensation on the disk be allowed to occur.

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

3.2 Test conditions

Unless otherwise stated, measurements shall be carried out at 23 ± 3 °C (73 ± 5 °F), 40 to 60 % relative humidity after a period of acclimatization during which condensation on the disk shall not be allowed to occur. Tests requiring the use of heads shall be performed in air of cleanliness class 100.

3.3 Material

The disk may be constructed from any suitable material so long as the dimensional, inertial and other functional requirements of this International Standard are maintained.

3.4 Coefficient of thermal expansion

The coefficient of thermal expansion of the disk material shall be

$$\frac{\Delta L}{L \Delta t} = \frac{1}{L} \times \frac{L_{57} - L_{15}}{42} \text{ K}^{-1} = (24 \pm 1) \times 10^{-6} \text{ K}^{-1}$$

$$\left[\frac{\Delta L}{L \Delta t} = \frac{1}{L} \times \frac{L_{135} - L_{59}}{76} \text{ per } ^\circ\text{F} = (13.3 \pm 0.5) \times 10^{-6} \text{ per } ^\circ\text{F} \right]$$

The sample length L is equal to

$$\frac{L_{57} + L_{15}}{2} \left(\frac{L_{135} + L_{59}}{2} \right)$$

where L_{57} (L_{135}) and L_{15} (L_{59}) are the lengths at 57 °C (135 °F) and 15 °C (59 °F), respectively.

3.5 Surface identification

The direction of relative motion between head and disk shall be consistent. The disk surface that is to rotate counter-clockwise shall be identified.

4 Dimensions (see figures 1 to 3)

For measurement of the radii indicated hereafter, the disk shall be mounted on a reference hub (see figure 1) having a diameter, measured at $23,0 \pm 0,5$ °C (73 ± 1 °F), of

$$d_1 = 63,475 - \begin{smallmatrix} 0 \\ 0,010 \end{smallmatrix} \text{ mm } (2.499 \text{ } 0 - \begin{smallmatrix} 0 \\ 0.000 \text{ } 4 \end{smallmatrix} \text{ in})$$

and an outer radius

$$r_1 = 38,10 + \begin{smallmatrix} 0,10 \\ 0 \end{smallmatrix} \text{ mm } (1.500 + \begin{smallmatrix} 0.004 \\ 0 \end{smallmatrix} \text{ in})$$

All radii are referred to the axis of symmetry of this reference hub. The cylindrical surface of the reference hub defined by d_1 shall be contained between two coaxial cylindrical surfaces 10 µm (0.000 4 in) apart.

4.1 Inner diameter

The inner diameter of the disk, measured at $23,0 \pm 0,5$ °C (73 ± 1 °F), shall be

$$d_2 = 63,500 + \begin{smallmatrix} 0,051 \\ 0 \end{smallmatrix} \text{ mm } (2.500 \text{ } 0 + \begin{smallmatrix} 0.002 \text{ } 0 \\ 0 \end{smallmatrix} \text{ in})$$

The circumference of the inner edge shall be contained between two concentric circles 25 µm (1 000 µin) apart.

4.2 Outer diameter

The outer diameter of the disk shall be

$$d_3 = 200,00 \pm 0,10 \text{ mm } (7.874 \pm 0.004 \text{ in})$$

The circumference of the outer edge shall be contained between two concentric circles 25 µm (1 000 µin) apart.

4.3 Concentricity

The centre of the circumference of the outer edge of the disk shall be contained in a circle of diameter 50 µm (0.002 0 in) concentric with the centre of the circumference of the inner edge.

4.4 Thickness

The thickness of the disk shall be

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

4.5 Edge chamfer (see figure 3)

For a distance

$$l \leq 0,76 \text{ mm } (0.030 \text{ in})$$

from the edges of the disk, the disk contour shall be relieved within the extended boundaries of the disk surfaces. In order to avoid unbalance, the chamfer shall be uniform at all points on the circumference.

4.6 Clamping area

On both sides of the disk, the clamping area shall be an area free of magnetic coating, limited by the inner edge and a radius r_2 :

$$r_2 \geq 38,6 \text{ mm } (1.52 \text{ in})$$

Between r_2 and the start of the chamfer, the variation of the disk thickness shall not exceed 7,5 µm (300 µin).

4.7 Location of magnetic surfaces

On both sides of the disk, the area of magnetic surface over which heads may fly shall extend from an inside radius r_3 to an outside radius r_4 :

$$r_3 \leq 41,7 \text{ mm } (1.64 \text{ in})$$

$$r_4 \geq 97,0 \text{ mm } (3.82 \text{ in})$$

5 Physical characteristics

5.1 Moment of inertia

The moment of inertia of the disk shall not exceed

$$1,0 \text{ g} \cdot \text{m}^2 (3.4 \text{ lb} \cdot \text{in}^2)$$

5.2 Maximum rotational frequency

The disk shall be capable of withstanding the effect of stress at a rotational frequency of 7 000 r/min.

5.3 Runout

For measuring the axial runout and the velocity and the acceleration of axial runout, the disk shall be clamped and driven according to 5.3.1.

The requirements of 5.3.2, 5.3.3 and 5.3.4 shall be met at all radii between r_3 and r_4 .

5.3.1 Test spindle requirements and clamping conditions (see figure 1)

The disk shall be clamped on the reference hub by a force

$$F = 1\,100 \pm 110 \text{ N (250} \pm 25 \text{ lbf)}$$

evenly applied over an annular surface on the disk defined by

$$r_5 = 34,0 \text{ mm (1.34 in)}$$

$$r_6 = 38,1 \text{ mm (1.50 in)}$$

The finish of the surface of the reference hub on which the disk rests shall be of class N 5 [maximum arithmetical deviation $0,4 \mu\text{m}$ ($16 \mu\text{in}$)] as defined in ISO 1302.

At any rotational frequency up to 4 000 r/min, the axial runout of the reference hub shall not exceed $1,0 \mu\text{m}$ ($40 \mu\text{in}$).

5.3.2 Axial runout

The axial runout at any rotational frequency up to 4 000 r/min shall not exceed $0,076 \text{ mm}$ (0.003 in), total indicator reading. Moreover, every point of each surface of the disk shall be located between two planes perpendicular to the axis of the reference hub and distant from each other by $0,15 \text{ mm}$ (0.006 in). These two planes shall be equidistant from the clamping plane of the respective disk surface.

5.3.3 Velocity of axial runout

With the disk revolving at $3\,600 \pm 36 \text{ r/min}$, the velocity of axial runout of the recording disk surfaces shall not exceed 31 mm/s (1.22 in/s). It shall be measured within the band width defined by a low-pass filter with a cut-off frequency of 3 kHz and a high frequency roll-off of 18 dB/octave. The probe diameter shall be $1,7 \text{ mm}$ (0.067 in).

5.3.4 Acceleration of axial runout

With the disk revolving at $3\,600 \pm 36 \text{ r/min}$, the acceleration of axial runout shall not exceed $38,1 \text{ m/s}^2$ ($1\,500 \text{ in/s}^2$) within the measurement band-width defined by a low-pass filter with a cut-off frequency of 7 kHz and a high frequency roll-off of 18 dB/octave. The probe diameter shall be $1,7 \text{ mm}$ (0.067 in).

5.3.5 Radial runout

The radial runout of the disk depends on the concentricity (see 4.3) and circularity (see 4.1 and 4.2) of the inner and outer edges, as well as on the clamping conditions in the device in which it is mounted. It is therefore not specified by this International Standard.

5.4 Surface roughness

5.4.1 Magnetic surfaces

The finished magnetic surfaces shall have a surface roughness of less than $0,025 \mu\text{m}$ ($1.0 \mu\text{in}$), arithmetic average, with a maximum deviation in height of $0,25 \mu\text{m}$ ($10 \mu\text{in}$) from the average, when measured with a stylus of radius $2,5 \mu\text{m}$ ($100 \mu\text{in}$) with a $0,5 \text{ mN}$ load, and a $750 \mu\text{m}$ (0.03 in) upper cut-off range.

The finished magnetic surfaces shall have an undulation profile with a peak-to-peak amplitude of less than $0,15 \mu\text{m}$ ($6.0 \mu\text{in}$) when measured over a radial length of $4,8 \text{ mm}$ (0.19 in) with a stylus of radius $2,5 \mu\text{m}$ ($100 \mu\text{in}$) with a $0,5 \text{ mN}$ load and a lower cut-off range of $250 \mu\text{m}$ (0.01 in).

5.4.2 Clamping area

The finished surface of the clamping area shall have a surface roughness of less than $0,8 \mu\text{m}$ ($30 \mu\text{in}$), arithmetic average, with a maximum deviation in height of $2,0 \mu\text{m}$ ($80 \mu\text{in}$) from the average, when measured with a stylus of radius $2,5 \mu\text{m}$ ($100 \mu\text{in}$) with a $0,5 \text{ mN}$ load, and a $750 \mu\text{m}$ (0.03 in) upper cut-off range.

5.5 Cleaning of the magnetic surfaces

The cleaning method shall be agreed between supplier and purchaser.

5.6 Durability of the magnetic surfaces

The disk shall be able to withstand the effect of 10 000 head take-off and landing operations on any part of the disk surfaces between r_3 and r_4 .

Measurements shall be taken as follows :

5.6.1 Head conditioning

Condition the head (of type specified in 6.4) by 50 take-off and landing operations outside the test area defined in 5.6.2. All write operations on a track shall be preceded by DC-erasure (see 6.5.2) of that track.

5.6.2 Read amplitude

Select two reference tracks, A and B, $12,7 \text{ mm}$ (0.50 in) apart. Write at $2f$ (see 6.9) on these two tracks and on at least 20 test tracks evenly spaced between A and B. Measure the read amplitude on each track before moving the head to the next track. The average read signal from the two reference tracks before the wear test shall be

$$E_{AV} = \frac{E_A + E_B}{2}$$

5.6.3 Wear test

Locate the head between tracks A and B so that no part of the head touches an area which would be flown over when the pole tip of the head is on either track A or track B.