International Standard 7929

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Information processing — Magnetic disk for data storage devices — 83 000 flux transitions per track, 130 mm (5.12 in) outer diameter, 40 mm (1.57 in) inner diameter

Traitement de l'information — Disque magnétique pour unités de stockage des données — 83 000 transitions de flux par piste, diamètre extérieur 130 mm (5,12 in), *diamètre intérieur* 40 mm (1,57 in)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

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.

International Standard ISO 7929 was prepared by Technical Commitee ISO/TC 97, *Information processing systems.*

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Information processing — Magnetic disk for data storage devices — 83 000 flux transitions per track, 130 mm (5.12 in) outer diameter, 40 mm (1.57 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 130 mm (5.12 in) outer diameter and 40 mm (1.57 in) inner diameter intended for mounting in data storage devices.

This International Standard defines the requirements for a disk to give satisfactory performance at 83 332 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 should neither be mixed nor reconverted.

2 Reference

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

3 Conformance

A magnetic disk is in conformance with this International Standard when it satisfies all requirements of this International Standard.

4 General requirements

4.1 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 300 to 2 000 A/m.

4.1.1 Operation

The operating temperature of the air surrounding the disk shall be within the range of 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.

4.1.2 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.

4.2 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.

4.3 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.

4.4 Coefficient of thermal expansion

The coefficient of thermal expansion of the disk material shall be

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

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

The sample length L is equal to

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

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

4.5 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.

5 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 ± 0,5 °C (73 ± 1 °F), of

$$d_1 = 39{,}975\,^{0}_{-0{,}010} \text{ mm } (1.573\,8\,^{0}_{-0.000\,4} \text{ in})$$

and an outer radius

$$r_1 = 26{,}34 \pm 0{,}10 \text{ mm } (1.037 \pm 0.004 \text{ in})$$

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.

5.1 Inner diameter

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

$$d_2 = 40{,}000\,^{+0{,}051}_{0} \text{ mm } (1.574\,8\,^{+0.002\,0}_{0} \text{ in})$$

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

5.2 Outer diameter

The outer diameter of the disk shall be

$$d_3 = 130{,}00 \pm 0{,}10 \text{ mm } (5.118 \pm 0.004 \text{ in})$$

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

5.3 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.

5.4 Thickness

The thickness of the disk shall be

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

5.5 Edge chamfer (see figure 3)

For a distance

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

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.

5.6 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:

$$r_2 \geqslant 26{,}5 \text{ mm } (1.040 \text{ in})$$

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

5.7 Location of magnetic surfaces

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

$$r_3 \leqslant 30{,}0 \text{ mm } (1.181 \text{ in})$$

$$r_4 \geqslant 62{,}0 \text{ mm } (2.441 \text{ in})$$

6 Physical characteristics

6.1 Moment of inertia

The moment of inertia of the disk shall not exceed $1{,}43 \times 10^{-4}$ kg·m² (0.486 lb·in²)

6.2 Maximum rotational frequency

The disk shall be capable of withstanding the effect of stress at a rotational frequency of 4 000 r/min.

6.3 Runout

For measuring the axial runout and the velocity and the acceleration of axial runout, the disk shall be clamped and driven according to 6.3.1.

The requirements of 6.3.2, 6.3.3 and 6.3.4 shall be met at all radii between r_3 and r_4.

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

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

$F = 1\ 100 \pm 110$ N (250 $\pm$ 25 lbf)

evenly applied over an annular surface on the disk defined by

r_5 = 21,95 mm (0.864 in)

r_6 = 26,00 mm (1.024 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 µm (16 µin)] 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 µm (40 µin).

6.3.2 Axial runout

The axial runout at any rotational frequency up to 4 000 r/min shall not exceed 0,05 mm (0.002 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 0,10 mm (0.004 in). These two planes shall be equidistant from the clamping plane of the respective disk surface.

6.3.3 Velocity of axial runout

With the disk revolving at 3 600 ±36 r/min, the velocity of axial runout of the recording disk 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 3,0 kHz and a high frequency roll-off of 18 dB/octave. The probe diameter shall be 1,7 mm (0.067 in).

6.3.4 Acceleration of axial runout

With the disk revolving at 3 600 ± 36 r/min, the acceleration of axial runout shall not exceed 38,1 m/s^2 (1 500 in/s^2) within the measurement band-width defined by a low-pass filter with a cut-off frequency of 5,0 kHz and a high frequency roll-off of 18 dB/octave. The probe diameter shall be 1,7 mm (0.067 in).

6.3.5 Radial runout

The radial runout of the disk depends on the concentricity (see 5.3) and circularity (see 5.1 and 5.2) 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.

6.4 Surface roughness

6.4.1 Magnetic surfaces

The finished magnetic surfaces shall have a surface roughness less than 0,025 µm (1.0 µin), arithmetic average, with a maximum deviation in height of 0,25 µm (10 µin) from the average, when measured with a stylus of radius 2,5 µm (100 µin) with a 0,5 mN load and a 750 µm (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 µm (6 µin) when measured over a radial length of 4,8 mm (0.19 in) with a stylus of radius 2,5 µm (100 µin) with a 0,5 mN load and lower cut-off range of 250 µm (0.01 in).

6.4.2 Clamping area

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

6.5 Cleaning of the magnetic surfaces

The cleaning method shall be agreed between supplier and purchaser.

6.6 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:

6.6.1 Head conditioning

Condition the head (of type specified in 7.4) by 50 take-off and landing operations outside the test area defined in 6.6.2. All write operations on a track shall be preceded by DC-erasure (7.5.2) of that track.

6.6.2 Read amplitude

Select two reference tracks, A and B, 12,7 mm (0.50 in) apart. Write at $2f$ (see 7.9) 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

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

6.6.3 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.

Without moving the head, perform 10 000 take-off and landing operations, during which the disk shall be accelerated and decelerated between 0 and 3 600 r/min. Acceleration and deceleration time between 0 and 2 400 r/min shall be within 6,0 ± 1,0 s.

6.6.4 Head wear factor

Repeat the procedure given in 6.6.2 using the same tracks. The average read signal from the two reference tracks after the wear test shall be

$$E'_{AV} = \frac{E'_A + E'_B}{2}$$

The head wear factor is defined as

$$\frac{E_{AV}}{E'_{AV}}$$

Multiply the second set of readings for the test tracks by this head wear factor.

6.6.5 Durability criteria

The following requirements shall be met:

a) The head wear factor shall be ⩽ 1,11;

b) For each of the test tracks the corrected reading derived in 6.6.4 shall not differ by more than 10 % from the reading taken in 6.6.2.

6.7 Head/disk gliding requirements

The magnetic surfaces shall be free of surface defects which would cause head to disk contact when the head is flying at 0,25 µm (10 µin) minimum at radius r_3, and proportionally increasing in flying height to 0,30 µm (12 µin) minimum at radius r_4.

6.8 Dynamic head/disk friction

In the area between radii r_3 and r_4, the average dynamic coefficient of friction μ_1 shall not be greater than 0,200. Its peak-to-peak variation $\Delta\mu_1$ shall not exceed 0,035.

The method of measuring is described in annex B.

6.9 Static head/disk friction

In the area between radii r_3 and r_4, the static coefficient of friction μ_2 when measured after the head has been in stationary contact with the disk under the conditions of 4.1.1 for at least 48 h shall not be greater than 1,0.

The method of measurement is described in annex B.

6.10 Discharge path

The disk shall allow flow of electrical charges from the magnetic surface to the clamping area.

7 Testing of magnetic characteristics

7.1 General conditions

7.1.1 Rotational frequency

The rotational frequency shall be 3 600 ± 36 r/min in any test period.

7.1.2 Ambient stray magnetic field

The intensity of the ambient stray magnetic field shall not exceed 300 A/m.

7.2 Track and recording conditions

7.2.1 Width of tracks

For testing purposes, the effective track width shall be

85 ± 4 µm (3 350 ± 160 µin)

A suggested method of measuring the effective track width is described in annex C.

7.2.2 Track spacing

For testing purposes, the track centreline spacing shall be such that the whole area defined in 7.2.3 will be tested.

7.2.3 Tested area

All functional tests and all track quality tests shall be performed between an innermost track having its centreline at a radius r_7 and an outermost track having its centreline at a radius r_8.

r_7 = 42,93 mm (1.690 in)

r_8 = 59,44 mm (2.340 in)

7.2.4 Location of the line of access

The line of access shall be radial within 0,25 mm (0.010 in).

7.2.5 Recording offset angle

At the instant of writing or reading a magnetic transition, the transition may have an angle of 60′ maximum with the line of access.

7.3 Standard reference surface

7.3.1 Characteristics

The standard reference surface shall be characterized at the innermost and outermost tracks (radii r_7 and r_8) using a test head specified in 7.4 having its calibration factors (see 7.4.9) equal to 1.

When recorded at $1f$ (see 7.9) using this test head, the track average amplitude (see 7.8) shall be

2,00 mV at radius r_7

3,00 mV at radius r_8.

When recorded at $2f$ (see 7.9) using this test head, the track average amplitude (see 7.8) shall be

1,50 mV at radius r_7

2,55 mV at radius r_8.

When measured at radius r_8 using this test head, the overwrite ratio (see 8.3) shall be 0,018.

7.3.2 Secondary standard reference surface

This is a surface the output of which shall be related to the standard reference surface via calibration factors C_{D1} (for $1f$), C_{D2} (for $2f$) and an overwrite calibration factor C_{D0}.

The amplitude calibration factors C_D are defined by

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

For both C_{D1} and C_{D2} the measurements shall be made at radii r_7 and r_8.

The overwrite calibration factor C_{D0} is defined by

$$C_{D0} = \frac{\text{Overwrite ratio of standard reference surface}}{\text{Overwrite ratio of secondary standard reference surface}}$$

The measurements shall be made at radius r_8.

To qualify as a secondary standard reference surface, the calibration factors C_D and C_{D0} for such disks shall satisfy $0{,}90 \leqslant C_D \leqslant 1{,}10$ at the measured radii for both frequencies.

NOTE — It is expected that a standard reference surface for signal amplitude will be established by an internationally agreed institution. Secondary signal amplitude reference surfaces or a calibration service would then also be made available.

7.4 Test head

The test head shall be calibrated to the standard reference surface, and used for amplitude measurements and testing of the magnetic surfaces.

NOTE — A suitable test head is a 3 350-type head without amplifier, modified to conform to the requirements listed hereunder.

7.4.1 Gap width

The width of the recording gap (measured optically) shall be 81,3 ± 4 µm (3 200 ± 150 µin).

7.4.2 Gap length

The length of the recording gap shall be 1,4 ± 0,2 µm (55 ± 8 µin).

7.4.3 Gap offset angle

The angle between the recording gap in the ferrite core and the relevant mounting surface of the head may be 60′ maximum.

7.4.4 Flying height

When flying over the innermost track, the test head shall have a flying height at the gap of 0,48 ± 0,05 µm (19 ± 2 µin).

7.4.5 Inductance

The total head inductance shall be 17,0 ± 0,5 µH, measured in air at 1 MHz. Each leg shall have an inductance of 5,0 ± 0,3 µH.

7.4.6 Resonant frequency

The resonant frequency of the total read/write coil of the head shall be such as to meet the requirements given in 7.6.1.

7.4.7 Resolution

The test head shall have a resolution of (75 ± 3) % at radius r_7 and (85 ± 5) % at radius r_8. Resolution is defined as

$$\frac{2f\ \text{Amplitude}}{1f\ \text{Amplitude}}\ 100\ \%$$

7.4.8 Head loading force

The net head loading force shall be such as to achieve the flying height (7.4.4) and shall be

0,093 ± 0,010 N (0.020 9 ± 0.002 2 lbf)

7.4.9 Calibration factors

The amplitude calibration factors of the test head C_{H1} at $1f$ and C_{H2} at $2f$ and its overwrite calibration factor C_{H0} shall satisfy $0{,}90 \leqslant C_{Hi} \leqslant 1{,}10$.

C_H is defined by

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

when measured on a standard reference surface, or by

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

when measured on a secondary standard reference surface.

C_{H0} is defined by

$$C_{H0} = \frac{\text{Standard reference surface overwrite ratio}}{\text{Actual measured overwrite ratio}}$$

when measured on a standard reference surface, or by

$$C_{H0} = \frac{\text{Standard reference surface overwrite ratio}}{(\text{Actual measured overwrite ratio}) \times C_{D0}}$$

when measured on a secondary standard reference surface.

7.5 Conditions for test head measurements

7.5.1 Write current

The $1f$ write current shall conform to figure 4. The current amplitude measured at the head termination connector shall have two values as shown in table 1.

Table 1

Radii		Write current ($I_{w+} + I_{w-}$)	
mm	in	mA	tolerance, %
59,44 to 51,18	2.340 to 2.015	50	± 1
51,18 to 42,93	2.015 to 1.690	46	± 1

The difference between the positive and negative amplitudes of the quiescent write current $|I_{w+} - I_{w-}|$ shall be less than 2 mA.

$T_R = 80 \pm 5$ ns

$T_F = 80 \pm 5$ ns

Overshoot: (4,0 ± 0,5) % of I_w, where $I_w = I_{w+} + I_{w-}$

Two consecutive half periods T_1, T_2 shall not differ from $\frac{T_1 + T_2}{2}$ by more than 1 %.

7.5.2 DC-erase current

The DC-erase current supplied to one of the two read/write coils when DC-erase is specified shall be as shown in table 2.

Table 2

Radii		Write current	
mm	in	mA	tolerance, %
59,44 to 51,18	2.340 to 2.015	25,0	± 1
51,18 to 42,93	2.015 to 1.690	23,0	± 1

7.6 Read channel

7.6.1 Input impedance

The differential input impedance of the read channel shall be 750 ± 37 Ω in parallel with 12 ± 2,5 pF, including the amplifier input impedance and all other distributed and lumped impedance measured at the input connections of the read amplifier.

The resonant frequency of the electrical circuit comprising the head winding, the input impedance of the read channel and interconnecting wiring shall be 9,3 ± 0,5 MHz.

7.6.2 Frequency and phase characteristics

The frequency response shall be flat within ± 0,20 dB from 0,075 MHz to 5,00 MHz (0,06f to 4f).

The −3 dB roll-off point shall be at 7,50 MHz (6f).

The attenuation above 7,50 MHz shall not be less than that given by a line drawn through zero dB at 7,50 MHz with a slope of 18 dB/octave.

The phase shift shall be linear within ± 5° between 0,075 MHz and 5,00 MHz (0,06f and 4f).

7.6.3 Transfer characteristics

For inputs between 0,2 mV peak-to-peak and 6,0 mV peak-to-peak, the transfer characteristics of the read channel shall be linear within ± 3 %, or 50 µV, whichever is larger.

7.7 Automatic Gain Controlled amplifier

The AGC-amplifier shall produce an output voltage V_{AGC} constant within ± 1 % for input voltages from $V_{in_{min}}$ = 0,2 mV peak-to-peak to $V_{in_{max}}$ = 6,0 mV peak-to peak (see figure 5).

The AGC response time (T_R) shall be 10 ± 1 µs to recover 90 % of the nominal AGC signal output amplitude (V_{out}) when the input signal (V_{in}) is subjected to a 50 % amplitude step reduction. All frequencies below 10 kHz shall be attenuated at a rate of 6 dB/octave.

7.8 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 test head when electrically loaded as described in 7.6.

7.9 Test signals

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

$1f = (2\,500 \pm 2{,}5) \times 10^3$ transitions/s

$2f = (5\,000 \pm 5\ \ ) \times 10^3$ transitions/s

7.10 DC-erasure

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

8 Surface tests

8.1 Amplitude test

8.1.1 Procedure

Write on any part of the surface at $2f$, read back and measure the V_{TA}.

8.1.2 Result

The upper limit for the track average amplitude of the corrected test head output shall be 1,95 mV peak-to-peak at radius r_7 and shall increase linearly to a value of 3,32 mV peak-to-peak at radius r_8. The lower limit for the track average amplitude shall be 1,05 mV peak-to-peak at radius r_7 and shall increase linearly to a value of 1,79 mV peak-to-peak at radius r_8 (see figure 6).

8.2 Resolution test

8.2.1 Procedure

On any part of the magnetic surfaces write at $1f$, read back and measure the V_{TA}. Then DC-erase, write at the same position at $2f$, read back and again measure the V_{TA}. The values of the measured V_{TA} shall be corrected by the appropriate head calibration factors (see 7.4.9).

8.2.2 Result

In all cases the ratio

$$\frac{\text{Corrected average track amplitude of } 2f\text{-signal}}{\text{Corrected average track amplitude of } 1f\text{-signal}}$$

shall be 0,80 ± 0,13.

8.3 Overwrite test

8.3.1 Procedure

Write at $1f$ at radius r_8 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 with the frequency-selective voltmeter.

8.3.2 Result

In all cases the ratio

$$\frac{\text{Average amplitude of } 1f\text{-signal after overwrite}}{\text{Average amplitude of } 1f\text{-signal before overwrite}} \times C_{H0}$$

shall be less than 0,035.

8.4 Residual noise test

8.4.1 Procedure

DC-erase a 5-track band with the central track at radius r_7. Write at radius r_7 at $2f$, read back and measure the RMS value (V_{RMS}), using a true RMS-voltmeter with a band width of 10 MHz at the −6 dB point.

Then DC-erase at least five times, read back and measure the RMS value (V_{DCRMS}), unload the head and measure the RMS value of the noise due to all other noise sources (V_{NRMS}). V_{NRMS} shall not be greater than 0,025 V_{RMS}.

8.4.2 Result

The ratio

$$\frac{\sqrt{V^2_{DCRMS} - V^2_{NRMS}}}{V_{RMS}}$$

shall be less than 0,05.

9 Track quality tests

9.1 Positive modulation test

9.1.1 Procedure

Write on any track at $2f$, read back and measure the V_{TA}. With a delay of t_d = 1,55 ± 0,15 µs after detecting a read pulse exceeding 130 % of 0,5 V_{TA}, count all further such read pulses during a time period t_{pm} = 3,10 ± 0,15 µs (see figure 7).

9.1.2 Result

Positive amplitude modulation occurs if the number of the counted pulses exceeds 11.

9.2 Negative modulation test

9.2.1 Procedure

Write on any track at $2f$, read back and measure the V_{TA}. With a delay of t_d = 1,55 ± 0,15 µs after detecting a read pulse not reaching 70 % of 0,5 V_{TA}, count all further such read pulses during a time period t_{nm} = 60 ± 1 µs (see figure 7).

9.2.2 Result

Negative amplitude modulation occurs if the number of counted pulses exceeds 240.

9.3 Missing pulse test

9.3.1 Procedure

Write on each track at $2f$ and read back using the AGC-amplifier.

9.3.2 Result

A missing pulse shall be any read pulse whose amplitude is less than 55 % of the AGC output voltage (V_{AGC}).

9.4 Extra pulse test

9.4.1 Procedure

Write on each track at $2f$, read back and measure the V_{TA}. Then DC-erase once and read back over one revolution.

9.4.2 Result

An extra pulse shall be any spurious read signal exceeding 35 % of 0,5 V_{TA}.

10 Requirements for magnetic surfaces

10.1 Surface requirements

The disk shall meet the requirements of all tests specified in clause 7.

10.2 Track quality requirements

Positive or negative amplitude modulation as defined in 9.1 and 9.2 shall not occur in any track.

11 Defects of magnetic surfaces

11.1 Single defect

A single defect is the occurrence of a missing pulse (9.3) or of an extra pulse (9.4).

11.2 Acceptance criteria

The acceptance criteria for defects are subject to agreement between supplier and purchaser.

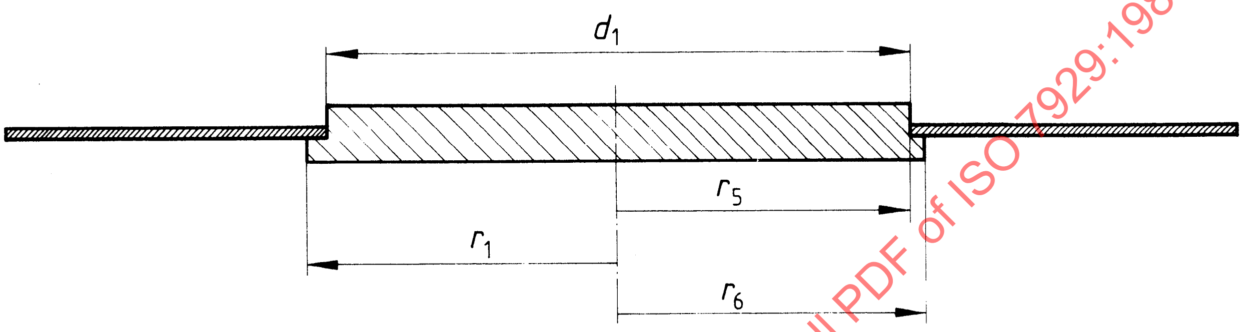

Figure 1 — Cross-sectional view of the reference hub with disk

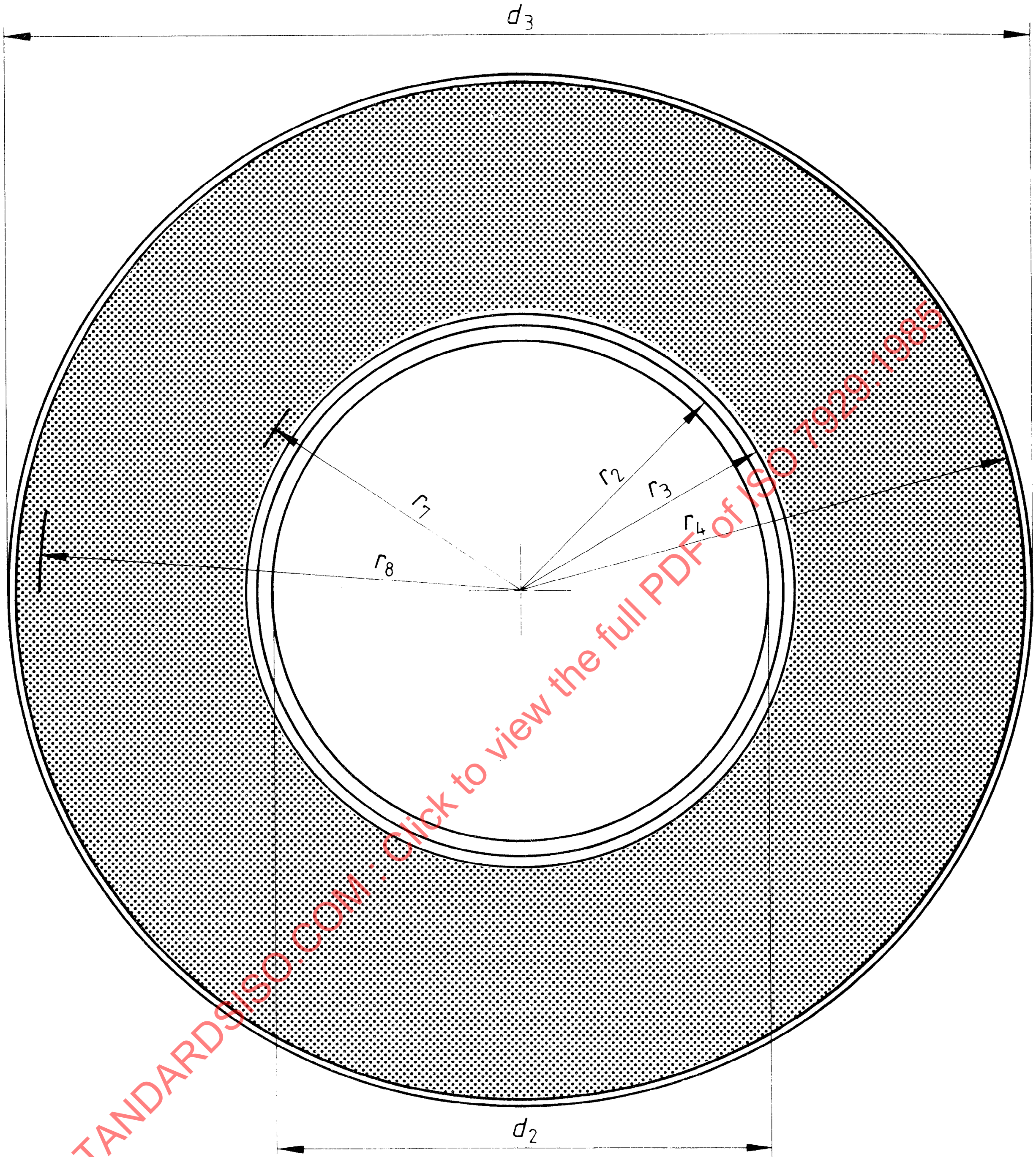

Figure 2 — Disk, top view

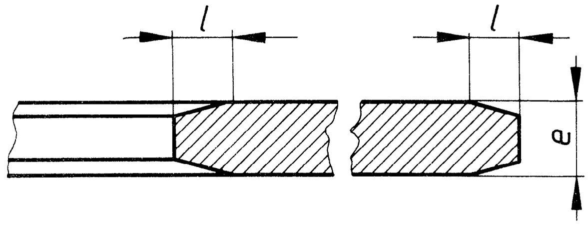

Figure 3 — Disk, edge chamfers, cross-sectional view

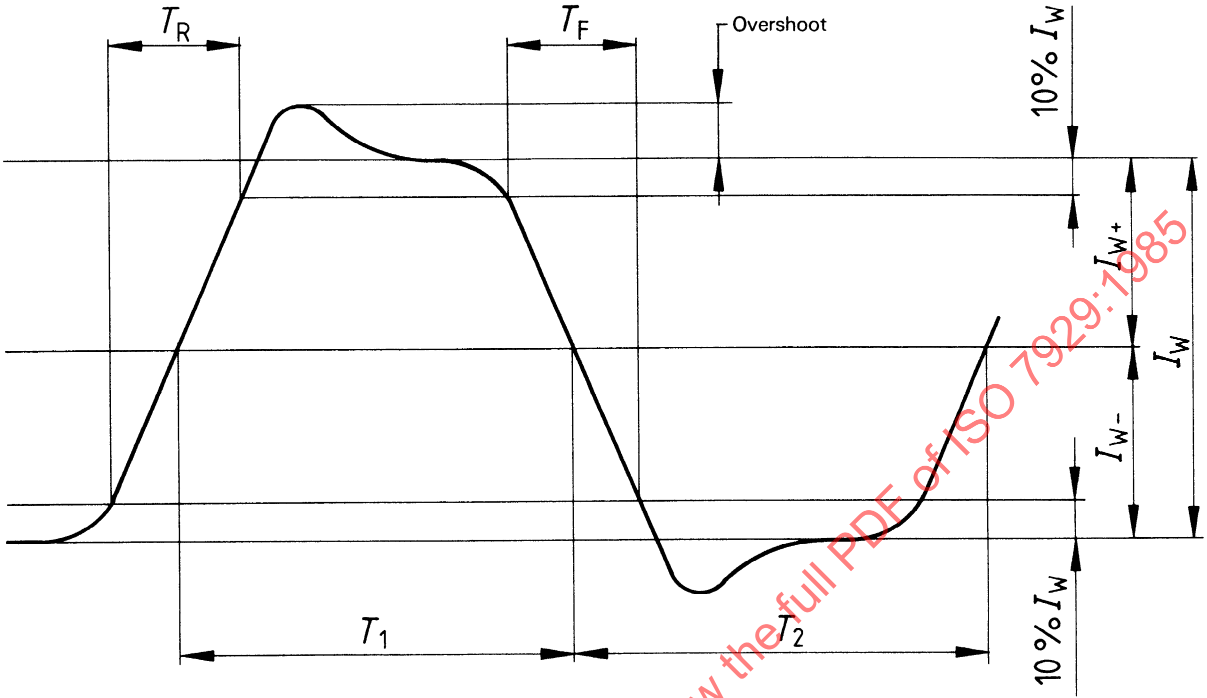

Figure 4 — Write current waveform

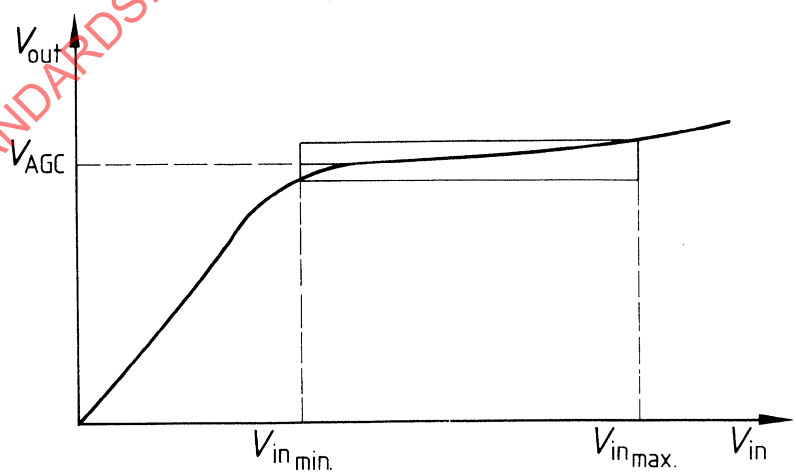

Figure 5 — AGC-amplifier characteristics

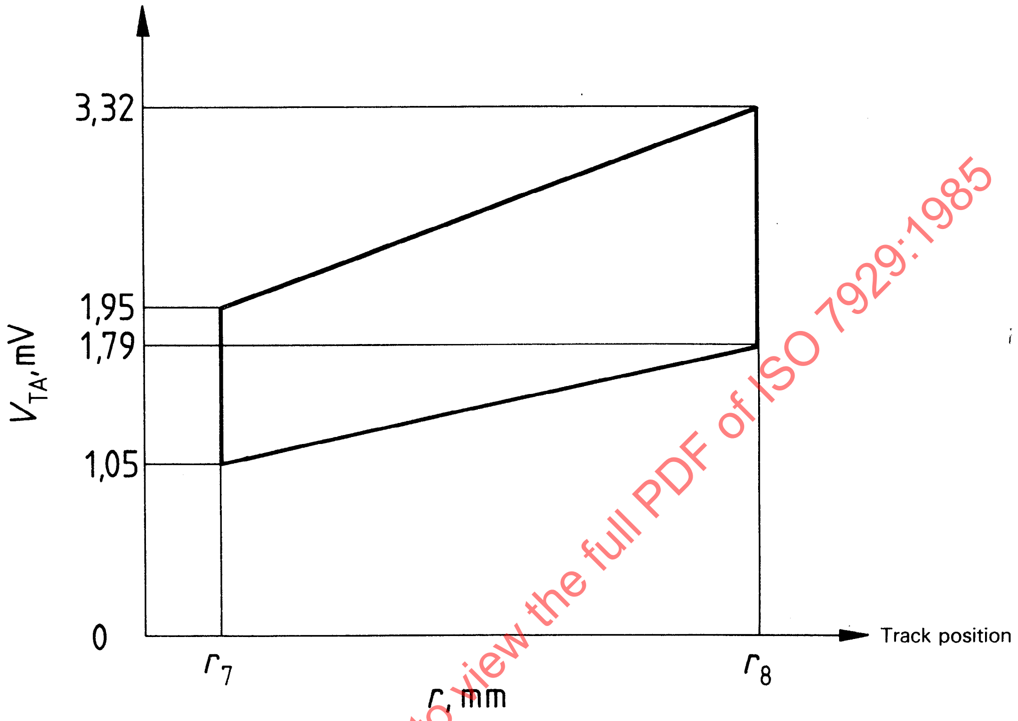

Figure 6 — Track average amplitudes

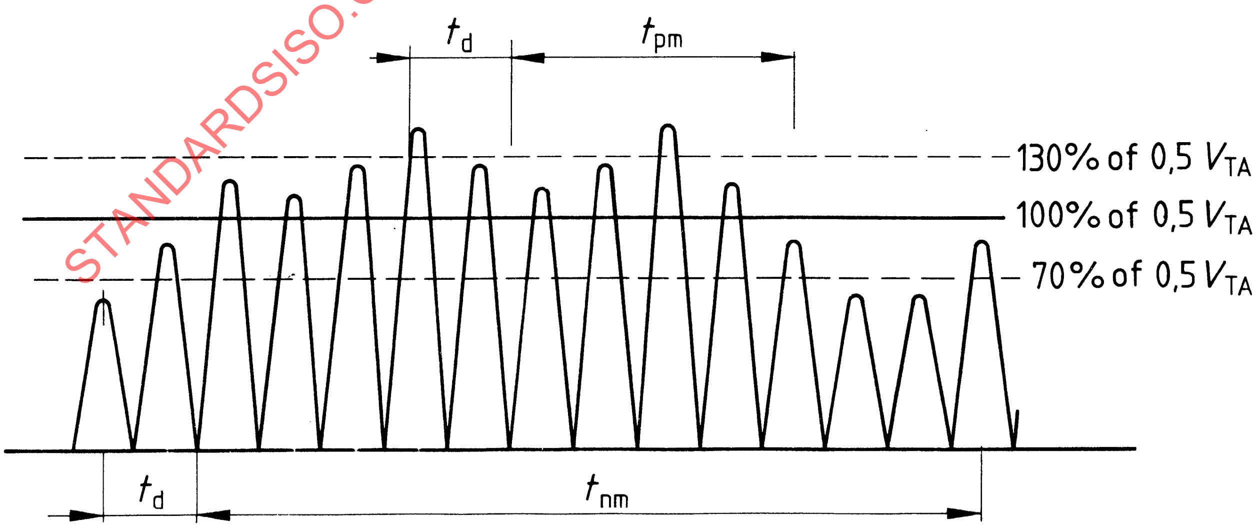

Figure 7 — Modulation tests

Annex A

Air cleanliness class 100[1]

(This annex forms an integral part of the standard.)

A.1 General

Classification of air cleanliness is based on particle count with a maximum allowable number of specified minimum sized particles per unit volume and on statistical average particle size distribution.

A.2 Definition[2]

class 100: Particle count shall not exceed a total of 3,5 particles per litre (100 particles per cubic foot) of size 0,5 µm and larger.

The statistical average particle size distribution is given in figure 8. Class 100 means that 3,5 particles per litre (100 particles per cubic foot) of a size 0,5 µm are allowed, but only 0,035 particles per litre (1 particle per cubic foot) of size 4,0 µm.

It should be recognized that single sample distribution may deviate from this curve because of local or temporary conditions. Counts below 0,35 particles per litre are unreliable except when a large number of samplings is taken.

A.3 Test method[3]

For particles in the 0,5 to 5,0 µm size range, equipment employing light-scattering principles shall be used. The air in the controlled environment is sampled at a known flow rate. Particles contained in the sampled air are passed through an illuminated sensing zone in the optical chamber of the instrument. Light scattered by individual particles is received by a photodetector which converts the light pulses into electrical current pulses. An electronic system relates the pulse height to particle size and counts the pulses such that the number of particles in relation to particle size is registered or displayed.

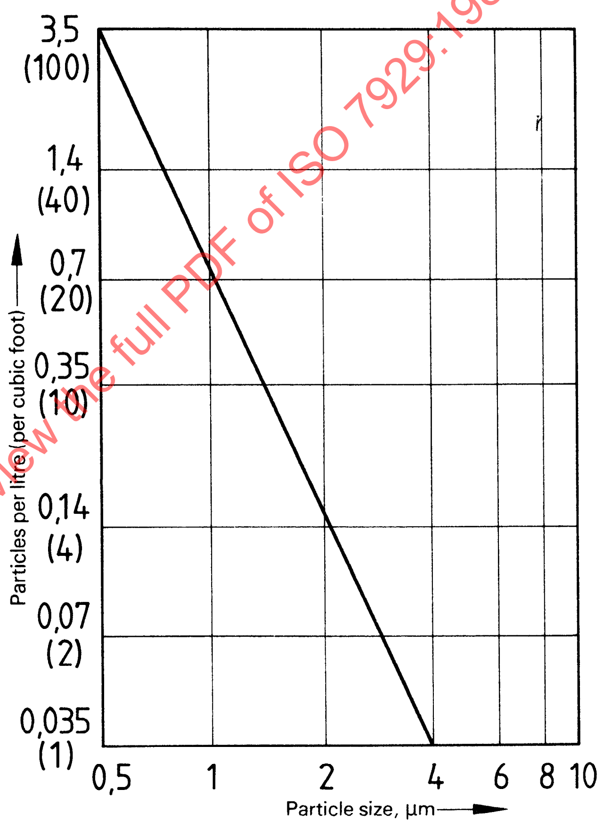

Figure 8 — Particle size distribution curve of air cleanliness class 100

1) See 3.1.1.

2) USA Federal Standard 209 B, available from the General Services Administration, Specifications Activity, Printed Materials Supply Division, Building 197, Naval Weapons Plant, Washington, DC 20407, USA.

3) ASTM Standard F 50, American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103, USA.