INTERNATIONAL STANDARD 1862

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

Information processing — 9-track, 12,7 mm (0.5 in) wide magnetic tape for information interchange recorded at 8 rpmm (200 rpi)

Traitement de l'information — Bande magnétique à 9 pistes, de 12,7 mm (0,5 in) de large, pour l'échange d'information, enregistrée à 8 rangées par millimètre (200 rpi)

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

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International Standard ISO 1862 was drawn up by Technical Committee ISO/TC 97, *Computers and information processing*, and circulated to the Member Bodies in November 1974.

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It has been approved by the Member Bodies of the following countries :

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No Member Body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 1862-1971 of which it constitutes a technical revision.

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Printed in Switzerland

Information processing — 9-track, 12,7 mm (0.5 in) wide magnetic tape for information interchange recorded at 8 rpmm (200 rpi)

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a 9-track, 8 rows per millimetre (rpmm) [200 rows per inch (rpi)], 12,7 mm (0.5 in) wide magnetic tape for interchangeability of tape between information processing systems which utilize the 7-bit coded character set specified in ISO 646. It refers solely to magnetic tape for digital recording, on which the direction of magnetization is nominally longitudinal as opposed to nominally transverse.

NOTES

1 Certain other aspects of coding requirements, such as significance of binary digits, sequence of characters, filling of unused positions and magnetic labelling for use on magnetic tape, are the subject of ISO 962 and ISO/R 1001.

2 Details of unrecorded tape and reels are specified in the complementary publication, ISO 1864.

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2 REFERENCES

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ISO 962, *Information processing — Implementation of the 7-bit coded character set and its 7-bit and 8-bit extensions on 9-track, 12,7 mm (0.5 in) magnetic tape.*

ISO/R 1001, *Magnetic tape labelling and file structure for information interchange.*

ISO 1864, *Information processing — Unrecorded 12,7 mm (0.5 in) wide magnetic tape for information interchange — 8 and 32 rpmm (200 and 800 rpi), NRZI, and 63 rpmm (1 600 rpi), phase-encoded.*

3 DEFINITIONS

NOTE — The material contained in clauses 3 and 4 of this International Standard is duplicated from ISO 1864 for unrecorded magnetic tape. The latter document shall be considered to be correct, that is, the primary document, so far as any differences between the comparable clauses of the two documents are concerned (in the event of these clauses referring to the 200 rpi recording density).

For the purpose of this International Standard, the following definitions apply :

3.1 magnetic tape : Tape which will accept and retain magnetic signals intended for input, output and storage purposes on computers and associated equipment.

3.2 reference tape : A tape which has been selected for given properties for use in the calibration.

3.3 secondary reference tape : A tape intended for routine calibrating purposes, whose performance is known and stated in relation to that of a reference tape.

3.4 signal amplitude reference tape : A reference tape selected as a standard for signal amplitude.

NOTE — A master standard (computer amplitude reference) has been established at the U.S. National Bureau of Standards (NBS), based on reference tapes and heads. Secondary signal amplitude reference tapes are available from NBS under the part number SRM 3200.

3.5 reference field : For any specified packing density, the minimum field applied to the signal amplitude reference tape which causes an output signal equal to 95 % of the maximum output.

3.6 reference edge : The edge further from an observer, or nearer the top of a page, when a tape is lying flat with the magnetic surface uppermost and the direction of movement for recording from left to right. (See figures 1 and 2.)

3.7 in contact : An operating condition in which the magnetic surface of a tape is in contact with a magnetic head.

3.8 track : A longitudinal area on the tape along which a series of magnetic signals may be recorded.

3.9 packing density : The number of bits of recorded information per unit length of track.

3.10 inter-block gap : A DC-erased section of tape separating blocks of information.

4 REFLECTIVE MARKERS (See note introducing clause 3, and figure 3)

Each reel of tape shall be furnished with two photo-reflective markers, each consisting of, or equivalent to, a transparent plastic base with a metallic (for example vaporized aluminium) coating sandwiched between the base and a thin layer of low cold flow thermal setting adhesive.

Reflective markers shall be placed on the side of the tape which does not carry the magnetic surface, and they shall be on opposite edges of the tape with the beginning-of-tape reflective marker (BOT) on the reference edge.

The width of the markers shall be 4,8 ± 0,5 mm (0.19 ± 0.02 in).

The length of the markers shall be 28 ± 5 mm (1.1 ± 0.2 in).

The thickness of the markers, measured after their application to the tape, shall be not greater than 0,020 mm (0.000 8 in).

The beginning-of-tape reflective marker (BOT) shall be placed 4,9 ± 0,6 m (16 ± 2 ft) from the beginning of the tape and the end-of-tape marker (EOT) shall be placed $7{,}6\ ^{+1{,}5}_{0}$ m ($25\ ^{+5}_{0}$ ft) from the end of the tape.

The distance from the outer edge of a marker to the adjacent edge of the tape shall be 0,8 mm (0.03 in) maximum and the marker shall not protrude beyond the edge of the tape.

The markers shall be free of wrinkles and excessive adhesive. The surface of the reflective markers shall be non-conductive.

NOTE – It is desirable to employ the thinnest markers which perform satisfactorily to minimize the distorsion of layers of tape adjacent to them.

5 DIRECTION OF TAPE WIND (See figure 4)

On a reel of tape used for data interchange, the tape shall be wound with the magnetic surface innermost and the reference edge towards the front, i.e. away from the write-enable ring groove.

NOTE – This means that the tape will be wound in a clockwise direction from the end (nearest the hub) to the start (outer end) if the reel is viewed from the front.

6 WIND TENSION

For interchange purposes, a tape shall be wound at a tension not less than 1,5 N and not greater than 3 N (5 to 10 ozf approximately).

7 REFERENCE EDGE

The reference edge shall be used for guiding the tape.

8 TRACK IDENTIFICATION

NOTE – The contents of this clause are in accordance with ISO 962.

Tracks shall be numbered consecutively, beginning at the reference edge with track No. 1, and shall be assigned as follows :

Magnetic tape track	1	2	3	4	5	6	7	8	9
Environment bit	E_3	E_1	E_5	P	E_6	E_7	E_8	E_2	E_4
Binary value	2^2	2^0	2^4	P	2^5	2^6	2^7	2^1	2^3

Bit "P" is the parity bit. Row parity is odd.

9 TRACK CONFIGURATION

The written track width shall be 1,09 mm (0.043 in) minimum.

The distance from the centre line of any track to the reference edge shall be

$$[0{,}737 + (n - 1)\ 1{,}397] \pm 0{,}08 \text{ mm}$$
$$[0.029 + (n - 1)\ 0.055] \pm 0.003 \text{ in}$$

where n is the track number. (See figures 1 and 2.)

10 DENSITY OF RECORDING

The nominal density shall be 8 rows per millimetre (200 rows per inch), i.e. 8 bits per millimetre of track.

11 SIGNAL AMPLITUDE

11.1 Standard reference amplitude

The standard reference amplitude is the average peak-to-peak signal amplitude derived from the signal amplitude reference tape (SRM 3200) on the NBS measurement system or equivalent at the recording current I_r of $2{,}1 \times I_t$ and the recording density of 8 ftpmm (200 ftpi).

The signal amplitude shall be averaged over 4 000 flux transitions and shall be measured on the read-while-write pass. The reference current I_t is the minimum current which produces the reference field.

11.2 Average signal amplitude

The average peak-to-peak output signal amplitude of an interchanged tape at 8 rpmm (200 rpi) shall not deviate more than ± 15 % from the standard reference amplitude. Averaging shall be done over a minimum of 4 000 flux transitions which, for the interchange tape, may be segmented into blocks. Averaging shall be done on the first read pass after interchange.

11.3 Maximum signal amplitude

An interchanged tape shall contain no flux transition whose base-to-peak signal amplitude exceeds 1,2 times half the standard reference amplitude, in the first read pass after interchange.

11.4 Minimum signal amplitude

An interchanged tape shall contain no flux transition whose base-to-peak signal amplitude is less than 35 % of half the standard reference amplitude, in the first read pass after interchange.

12 SPACING OF ROWS

For the purpose of defining the location of recorded data on the tape, the position of a flux transition representing a binary "one" is defined as the point of maximum free-space surface flux density normal to the tape surface.

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Rows of data shall be separated by a nominal distance of 0,127 mm (0.005 in). For such rows, the longitudinal spacing between any "one" in a given row and any "one" in an adjacent row shall be not less than 0,089 mm (0,003 5 in) and not greater than 0,165 mm (0.006 5 in). The tolerance band containing any row of "ones" (data or check row) shall be 0,025 mm (0.001 in).

To define the length of tape occupied by a flux transition, the length of tape over which the component of free-space surface flux density normal to the surface of the tape exceeds 20 % of its maximum value shall be not greater than 0,076 mm (0.003 in).

13 BLOCK LENGTH

All blocks for data interchange shall consist of not less than 18 data rows and not more than 2 048 data rows and, in addition, a longitudinal check row. (See clause 22.)

14 PARITY OF DATA ROWS

The parity track shall be track 4 and all data rows shall have overall odd parity. (See clause 1.)

15 LONGITUDINAL CHECK ROW

This row, written at the end of a block, shall make the longitudinal parity of each track even for that block.

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16 LONGITUDINAL CHECK ROW GAP

There shall be gap of 0,48 ± 0,05 mm (0.019 ± 0.002 in) between the last row of recorded data and the longitudinal check row.

17 INTER-BLOCK GAP

The length of the inter-block gap shall be :

- nominal : 15 mm (0.6 in)
- minimum : 12,7 mm (0.50 in)
- maximum : 7,6 m (25 ft)

The actual gap length depends upon the number of consecutive erase instructions.

18 RECORDING AREA

There shall be a minimum distance of 76 mm (3 in) and a maximum of 7,6 m (25 ft) from the trailing end of beginning-of-tape reflective marker (BOT) to the first row on the tape. There shall be no magnetic signals on the tape between the leading end of this marker and the first row.

The recording area on the tape shall not extend more than 3 m (10 ft) beyond the leading edge of the end-of-tape marker (EOT). (See figure 3.)

19 METHOD OF RECORDING

The "non-return to zero mark" (NRZI) method of recording shall be used where a "one" is represented by a change of direction of longitudinal magnetization.

When erased, the rim end of the erased area of the tape shall be magnetized so that it is a North-seeking pole, and the hub end of the erased area is a South-seeking pole (see figure 3 and the annex). This criterion shall apply also to inter-block gaps. The full width of the tape is DC-erased in the specified direction.

20 QUALITY OF RECORDING FOR DATA INTERCHANGE

Tape shall not be employed for data interchange where the number of gaps which have been elongated due to erase instructions exceeds two in number or 0,5 % of the total number of blocks written, whichever is the larger.

No permanent parity errors while writting are permissible in the data to be interchanged.

21 DATA CONTENT

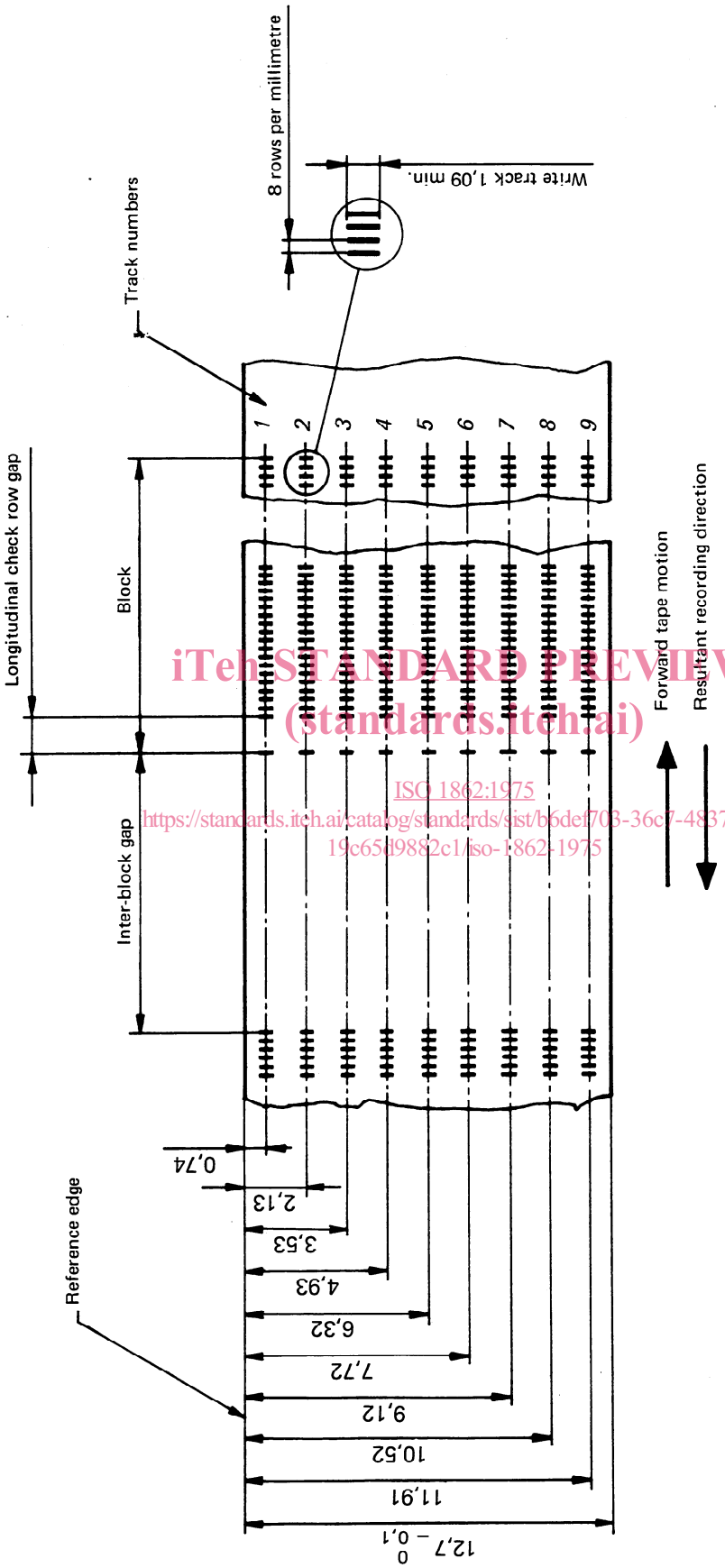
All 256 bit combinations are permissible in the eight data tracks of each row.

22 CONTROL CHARACTERS

For the purpose of separating data, a single row control block (known as a tape mark) shall be allowed. This block shall be accompanied by a longitudinal check row. The tape mark shall be represented by "1" bits in tracks 2, 3, and 8 only.

23 USE OF DUAL DENSITY SYSTEMS NRZI/PE

The use of tapes, previously recorded at 63 mm (1 600 rpi), for recording at 8 rpmm (200 rpi) presents a difficulty in an NRZI/PE system in that the 63 rpmm (1 600 rpi) PE identification burst extends from a minimum of 43,2 mm (1.7 in) before the trailing edge of the BOT marker. To ensure proper working of the 8 rpmm (200 rpi) system, it is necessary for the burst to be erased, either by the system itself or by bulk erasure.



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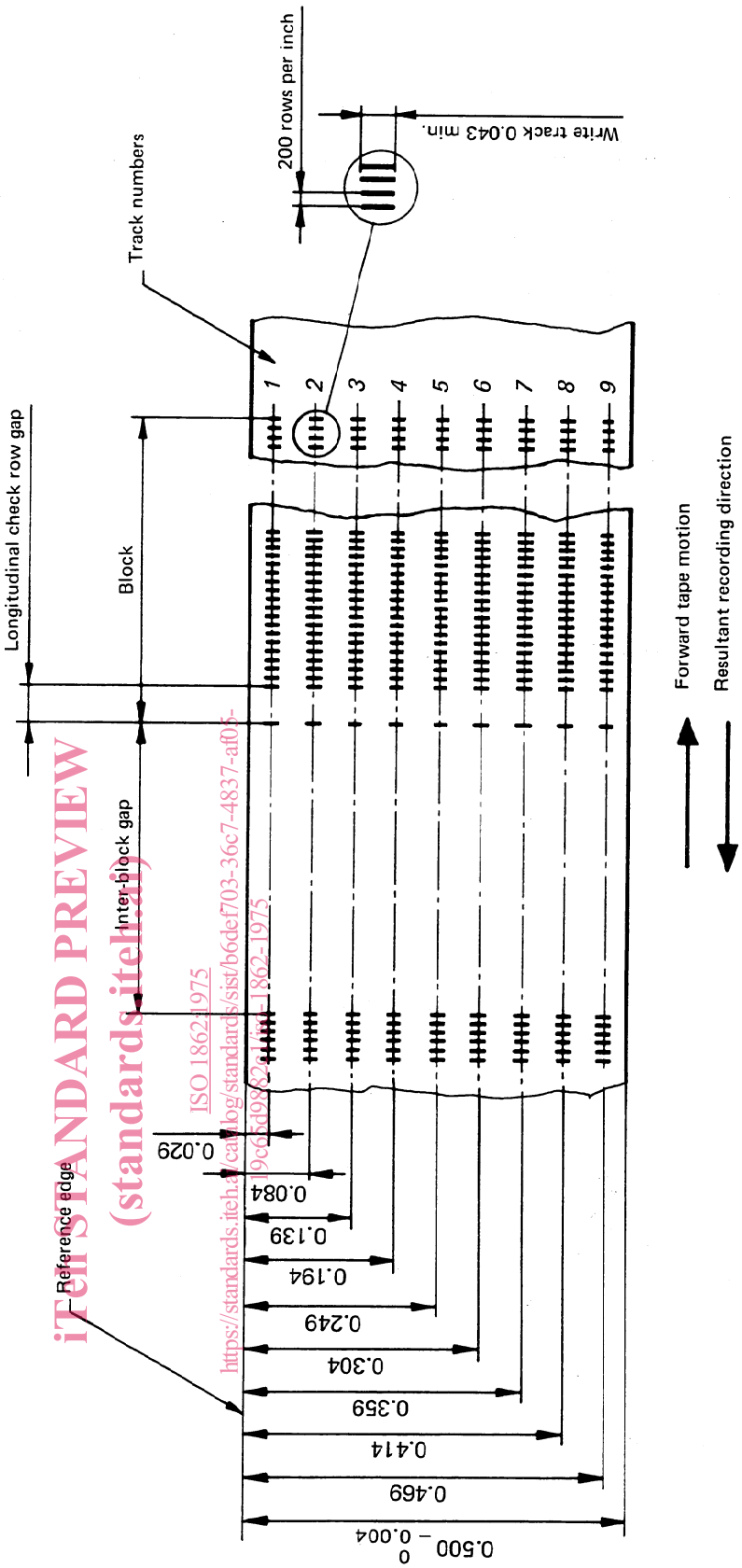
NOTES

1 Tape is shown with magnetic surface towards observer. Read-write head on same side as magnetic surface.

2 Tape shown representing "one" bits in all tracks.

3 Exact track dimensions and tolerances are given in clause 9. Dimensions shown above are approximate.

FIGURE 1 – **Track layout – Dimensions in millimetres**



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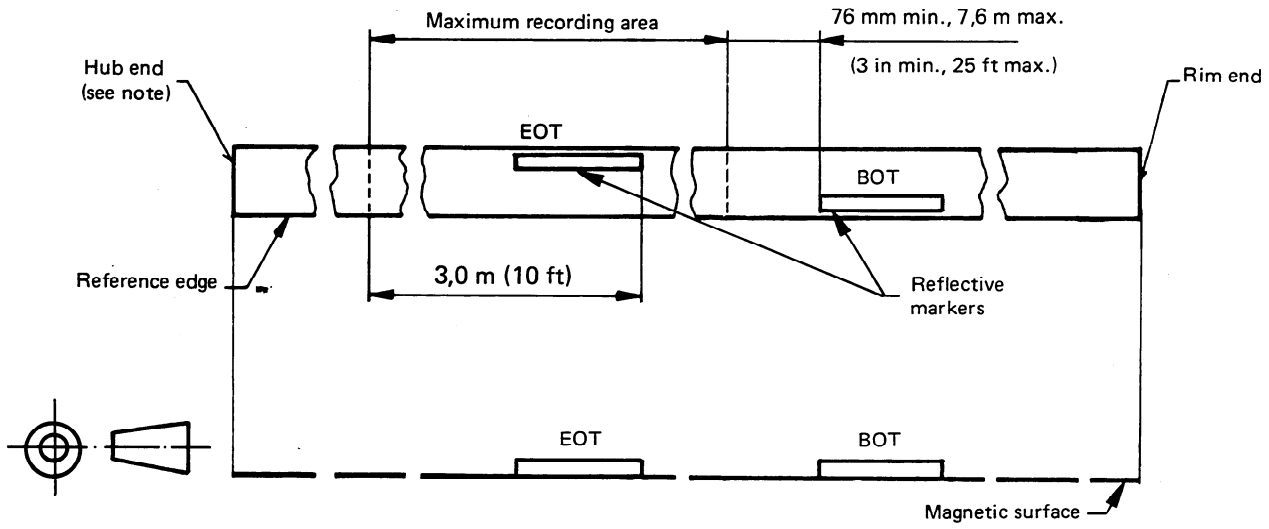
NOTES

1 Tape is shown with magnetic surface towards observer. Read-write head on same side as magnetic surface.

2 Tape shown representing "one" bits in all tracks.

3 Exact track dimensions and tolerances are given in clause 9. Dimensions shown above are approximate.

FIGURE 2 – Track layout – Dimensions in inches



NOTE – Tape shall not be attached to the hub.

FIGURE 3 – **Reflective markers and recording area**

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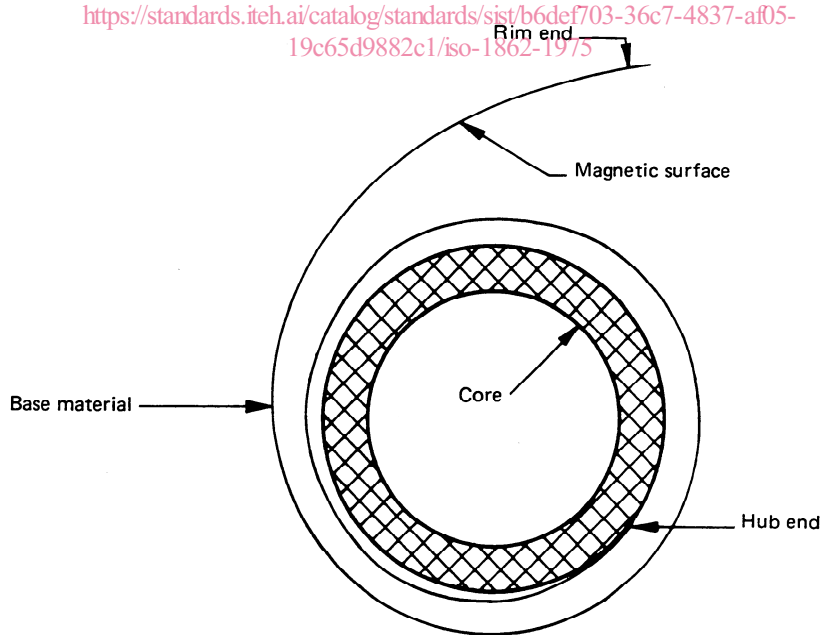

NOTES

1 Spool viewed from the front. Write-enable ring groove at the rear.

2 The tape shall not be attached to the hub.

FIGURE 4 – **Direction of tape wind**

ANNEX

DETERMINATION OF THE ERASE MAGNETIC FIELD DIRECTION

A.1 PRINCIPLE

The beginning of a correctly erased tape must exhibit a North-seeking pole (see clause 19). When the point of a compass needle which normally indicates North is placed in close proximity to the rim end of a correctly erased tape, the needle will be deflected away from the tape.

A.2 METHOD OF TEST

A section of the erased area of the tape shall be cut in such a way that the end toward the rim end of the tape is identifiable. This end of the cut section is brought as close as possible to the compass needle and the presence or absence of deflection of the needle away from the tape is determined.

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