INTERNATIONAL STANDARD

ISO/IEC 11321

First edition
1992-12-15

Information technology — 3,81 mm wide magnetic tape cartridge for information interchange — Helical scan recording — DATA/DAT format

Technologies de l'information — Cartouche de bande magnétique de 3,81 mm *de large pour l'échange d'information — Enregistrement hélicoïdal — Format DATA/DAT*

Reference number
ISO/IEC 11321:1992(E)

Contents

Annexes

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 11321 was prepared by the European Computer Manufacturers Association (as Standard ECMA-146) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A, D, E, F, G, H, K and M form an integral part of this International Standard. Annexes B, C, J and L are for information only.

Patents

During the preparation of the ECMA standard, information was gathered on patents upon which application of the standard might depend. Relevant patterns were identified as belonging to Hitachi and the Sony Corporation. However, neither ECMA nor ISO/IEC can give authoritative or comprehensive information about evidence, validity or scope of patent and like rights. The patent holders have stated that licences will be granted under reasonable and non-discriminatory terms. Communications on this subject should be addressed to

Hitachi, Ltd.
European Operation Centre
Wallbrook Business Centre
Green Lane
Hounslow TW4 6NW
United Kingdom

Sony Corporation
Licensing and Trademark Division
6-7-35 Kitashinagawa
Shinagawa-ku
Tokyo 141
Japan

Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DATA/DAT format

Section 1 : General

1 Scope

This International Standard specifies the physical and magnetic characteristics of a 3,81 mm wide magnetic tape cartridge to enable interchangeability of such cartridges. It also specifies the quality of the recorded signals, and the format and recording method, thereby allowing data interchange by means of such magnetic tape cartridges.

2 Conformance

2.1 Magnetic tape cartridge

A tape cartridge shall be in conformance with this International Standard if it meets all mandatory requirements specified herein. The tape requirements shall be satisfied throughout the extent of the tape.

2.2 Generating system

A system generating a magnetic tape cartridge for interchange shall be entitled to claim conformance to this International Standard if all recordings on the tape meet the mandatory requirements of this International Standard.

2.3 Receiving system

A system receiving a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if it is able to handle any recording made on the tape according to this International Standard.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/R 527:1966, *Plastics - Determination of tensile properties*

ISO/IEC 646:1991, *Information technology - ISO 7-bit coded character set for information interchange.*

ISO 1302:1978, *Technical Drawings - Method of indicating surface texture on drawings*

IEC 950:1990, *Safety of Information Technology Equipment, including Electrical Business Equipment*

4 Definitions

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

4.1 Absolute Frame Number (AFN): A sequence number allocated to, and recorded in, each frame.

4.2 AC erase: A process of erasure utilizing alternating fields of decaying level.

4.3 Area ID: An identifier for each area of the tape specifying the types of frame written therein.

4.4 Automatic Track Finding (ATF): A method by which tracking is achieved.

4.5 Average Signal Amplitude: The average peak-to-peak value of the output signal from the read head at the fundamental frequency of the specified physical recording density, over a minimum of 7,8 mm of track, exclusive of missing pulses.

4.6 azimuth: The angular deviation, in degrees, minutes and seconds of arc, made by the mean flux transition line with the line normal to the centreline of the recorded track.

4.7 back surface: The surface of the tape opposite to the magnetic coating which is used to record data.

4.8 byte: An ordered set of bits acted upon as a unit.

4.9 cartridge: A case containing magnetic tape stored on twin hubs.

4.10 Channel bit: A bit after 8-to-10 transformation.

4.11 Data Format ID: An identifier specifying which data format is being used on the tape.

4.12 End of Data (EOD): The point where the host stopped writing data on the tape.

4.13 End of Information (EOI): A group which indicates the end of partition area in a tape.

4.14 End of Partition (EOP): A group which indicates the end of data area in a partition.

4.15 Error Correcting Code (ECC): A mathematical algorithm yielding check bytes used for the detection and correction of errors.

4.16 flux transition position: That point which exhibits maximum free-space flux density normal to the tape surface.

4.17 flux transition spacing: The distance along a track between successive flux transitions.

4.18 frame: A pair of adjacent tracks with azimuth of opposite polarity, in which the track with the positive azimuth precedes that with the negative azimuth.

4.19 group: A number of frames constituting a recorded unit.

4.20 Logical Beginning of Tape (LBOT): The point along the length of the tape where the recording of data for interchange commences.

4.21 Logical End of Tape (LEOT): A point along the length of the tape which indicates the approach, in the direction of tape motion, of the partition boundary or physical end of tape.

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

4.23 Master reference: The area which contains partition information in the tape.

4.24 Master Standard Amplitude Calibration Tape: A pre-recorded tape on which the standard signal amplitudes have been recorded in the tracks of positive azimuth, 23,0 µm wide, at nominal track pitch, on an AC-erased tape.

Note 1 - The tape includes recordings made at 83,4 ftpmm, 333,6 ftpmm, 500,4 ftpmm, 1 001 ftpmm and 1 501 ftpmm.

Note 2 - The Master Standard Amplitude Calibration Tape has been established by the Sony Corporation.

4.25 Master Standard Reference Tape: A tape selected as the standard for Reference Recording Field, Signal Amplitude, Resolution Overwrite and Signal-to-Noise Ratio.

Note 3 - The Master Standard Reference Tape has been established by the Sony Corporation.

4.26 optimum recording field: In the plot of Average Signal Amplitude against the recording field at the physical recording density of 3 002 ftpmm, the field that causes the maximum Average Signal Amplitude.

4.27 partition: Partition of a tape in which user data is recorded.

4.28 partition reference: The area which contains group information in the partition.

4.29 Physical Beginning of Tape (PBOT): The point where the leader tape is joined to the magnetic tape.

4.30 Physical End of Tape (PEOT): The point where the trailer tape is joined to the magnetic tape.

4.31 physical recording density: The number of recorded flux transitions per unit length of track, expressed in flux transitions per millimetre (ftpmm).

4.32 pre-recording condition (maximum recorded levels): The recording levels above which a tape intended for interchange shall not previously have been recorded.

4.33 record: Related data treated as a unit of information.

4.34 Reference Recording Field: The optimum recording field of the Master Standard Reference Tape.

4.35 Secondary Standard Amplitude Calibration Tape: A tape pre-recorded as defined for the Master Standard Amplitude Calibration Tape; the outputs of which are known and stated in relation to that of the Master Standard Amplitude Calibration Tape.

Note 4 - The Secondary Standard Amplitude Calibration Tape can be ordered from the Sony Corporation, Audio Device Business Department, Component Marketing Group 4-10-18, Takanawa, Minato-ku, Tokyo 108, Japan, under Part Number TY-7000 G until the year 2001. It is intended that these be used for calibrating tertiary tapes for use in routine calibration.

4.36 Secondary Standard Reference Tape: A tape the performance of which is known and stated in relation to that of the Master Standard Reference Tape.

Note 5 - A Secondary Standard Reference Tape can be ordered from the Sony Corporation, Audio Device Business Department, Component Marketing Group 4-10-18, Takanawa, Minato-ku, Tokyo 108, Japan, under Part Number RSD 1079 until the year 2001. It is intended that these be used for calibrating tertiary tapes for use in routine calibration.

4.37 separator: A record containing no user data, which is used to separate data.

4.38 Standard Reference Amplitude: The Average Signal Amplitude from the tracks of positive azimuth of the Master Standard Amplitude Calibration Tape at a specified physical recording density.

4.39 tape noise amplitude: The tape noise amplitude is the subtractive value of amplifier noise from total noise in root mean square (rms).

4.40 Tape Reference Edge: The bottom edge of the tape when viewing the recording side of the tape with the PEOT of the tape to the observer's right.

4.41 track: A diagonally positioned area on the tape along which a series of magnetic signals may be recorded.

5 Environment and safety

Unless otherwise stated, the conditions specified below refer to ambient conditions in the air immediately surrounding the cartridge.

5.1 Testing environment

Unless otherwise stated, tests and measurements made on the tape cartridge to check the requirements of this International Standard shall be carried out under the following conditions:

temperature	: 23 °C ± 2 °C
relative humidity	: 40 % to 60 %
conditioning period before testing	: 24 h

5.2 Operating environment

Cartridges used for data interchange shall be capable of operating under the following conditions:

temperature : 5 °C to 45 °C

relative humidity : 20 % to 80 %

wet bulb temperature : 26 °C max.

There shall be no deposit of moisture on or in the cartridge.

Conditioning before operating:

If a cartridge has been exposed during storage and/or transportation to a condition outside the above values, before use the cartridge shall be conditioned in the operating environment for a time at least equal to the period during which it has been out of the operating environment, up to a maximum of 24 h.

Note 6 - Rapid variations of temperature should be avoided.

5.3 Storage environment

For long term or archived storage of cartridges the following conditions shall be observed:

temperature : 5 °C to 32 °C

relative humidity : 20 % to 60 %

maximum wet bulb temperature : 26 °C max.

The stray magnetic field at any point on the tape shall not exceed 4 000 A/m. There shall be no deposit of moisture on or in the cartridge.

5.4 Transportation

Recommended limits for the environment to which a cartridge may be subjected during transportation, and the precautions to be taken to minimize the possibility of damage, are provided in annex J.

5.5 Safety

The cartridge and its components shall satisfy the requirements of IEC 950.

5.6 Flammability

The cartridge and its components shall be made from material which, if ignited from a match flame, do not continue to burn in a still carbon dioxide atmosphere.

Section 2 : Requirements for the case

6 Dimensional and mechanical characteristics of the case

6.1 General

The case of the cartridge shall comprise

- an upper half- a lower half,
- a slider moveably mounted on the lower half,
- a lid pivotally mounted on the upper half.

In the drawings, using third angle projection, an embodiment of the cartridge is shown as an example.

Figure 1 is a perspective view of the cartridge seen from the top.
Figure 2 is a perspective view of the cartridge seen from the bottom.
Figure 3 is a partial view of the rear side.
Figure 4 is a schematic view showing the Reference Planes X, Y, and Z.
Figure 5 shows the front side.
Figure 6 shows the top side with the lid in closed position.
Figure 7 shows the left side.

Figure 8 shows the top side with the lid in open position.
Figure 9 shows the left side with the lid in open position.
Figure 10 shows the bottom side with the lid and the slide in closed position.
Figure 11 shows the bottom side with the lid and the slider in open position.
Figure 12 is a view from the top of the inside of the lower half with the upper half removed.
Figure 13 is a view of the bottom half with the lid and the slider in open position.
Figure 14 is a view of the left side with the lid and the slider in open position.
Figure 15 is a top view of a hub.
Figure 16 is a side view of a hub with partial cross section.
Figure 17 is a partial cross-section through a hub and both halves of the case showing the interface with the drive spindle.
Figure 18 shows at a larger scale the lid in the open position.
Figure 19, 20 show at a larger scale the functional relationship between the lid and the locking mechanism of the hubs.
Figure 21, 22 show the label areas on the top and the rear side.

The dimensions are referred to three orthogonal Reference Planes X, Y, and Z (figure 4).

6.2 Overall dimensions (figures 6 and 7)

The overall dimensions of the case with the lid in the closed position shall be

L_1 = 73,0 mm ± 0,3 mm

L_2 = 54,0 mm ± 0,3 mm

L_3 = 10,5 mm ± 0,2 mm

The edges formed by the rear side and left and right sides shall be rounded off with a radius

R_1 = 1,5 mm max.

The two edges of the lid shall be rounded off with a radius

R_2 = 0,5 mm max.

6.3 Loading grip (figure 6)

The top side shall have a loading grip for loading and positioning the cartridge into the drive. The position and dimensions of the loading grip shall be

L_4 = 25,5 mm ± 0,3 mm

L_5 = 10 mm min.

L_6 = 5,0 mm ± 0,2 mm

L_7 = 2,0 mm min.

The depth of the loading grip below surface of the top side shall be

$$0{,}5 \text{ mm} \; {}^{+\,0{,}2}_{-\,0{,}0} \text{ mm}$$

6.4 Holding areas (figure 6)

The two areas shown shaded in figure 6 shall be the areas along which the cartridge shall be held down when inserted in the drive. Their positions and dimensions shall be

L_8 = 6,0 mm ± 0,1 mm

L_9 = 5,0 mm ± 0,1 mm

6.5 Notches of the lid (figures 5 and 8)

The lid shall have two pairs of notches.

The first pair of notches, the slider lock release notches, allows elements of the drive to release the locking mechanism of the slider. The positions and dimensions of these notches shall be

L_{10} = 0,4 mm max.

L_{11} = 3,0 mm min

L_{12} = 1,2 mm ± 0,1 mm

L_{13} = 49,8 mm ± 0,2 mm

The second pair of notches, the slider movement notches, allows elements of the drive to move the slider from closed to open position (see also 6.8.1). The positions and dimensions of these notches shall be

L_{11} = 3,0 mm min.

L_{14} = 0,9 mm min.

L_{15} = 7,5 mm ± 0,1 mm

L_{16} = 36,00 mm ± 0,15 mm

6.6 Lid dimensions (figures 6 to 8)

The lid is shown in closed position in figure 6 and 7. Its dimensions shall be

L_{17} = 1,2 mm ± 0,1 mm

L_{18} = 6,8 mm ± 0,4 mm

L_{19} = 1,1 mm ± 0,1 mm

L_{20} = 2,0 mm ± 0,1 mm

L_{21} = 6,4 mm ± 0,2 mm

L_{22} = 1,5 mm ± 0,1 mm

R_3 = 6,8 mm ± 0,4 mm

The lid shall have a chamfer of 45° with a length of

L_{23} = 1,5 mm ± 0,1 mm

There shall be a dimensional relationship between the height L_{24} shown in figure 7, which includes the slider and the upper half, and the height L_{25} of the lid. When a vertical force of 1 N is exerted on the upper half the following conditions shall be met

L_{24} = 10,5 mm ± 0,2 mm

$L_{25} \leq L_{24}$

When no force is exerted

L_{24} = 10,9 mm max.

In figure 8 the lid is shown in open position. The distance from the front edge of the lid to the rear side shall be

L_{26} = 55,5 mm ± 0,3 mm

6.7 Optical detection of the beginning and end of tape (figure 9 and 12)

Means for the optical detection of the beginning and end of tape shall be provided. These shall consist of a pair of windows on the left and right sides of the case (see also figure 18). The design of these windows allows this detection for two different drive designs:

- either a light source and a detector are provided in the drive on each side of the cartridge, in which case the light enters the case through the upper windows, falls on a prism (see section A-A) mounted inside the case which reflects this light so that it goes through the tape and falls on the detector through the lower window; the light transmittance of the prism shall be greater than 50 % of that of a reference prism when measured as specified in annex A,
- or, the light of a light source within the drive passes through the tape from inside the cartridge and falls through the lower windows on to the detectors placed on each side of the case.

The positions and dimensions of these windows allow the cartridge to be used with drives implementing either system, they shall be

L_{27} = 6,20 mm ± 0,10 mm

L_{28} = 7,65 mm ± 0,10 mm

L_{29} = 1,50 mm $^{+\ 0,20}_{-\ 0,00}$ mm

L_{30} = 3,9 mm ± 0,1 mm

L_{31} = 1,8 mm ± 0,1 mm

L_{32} = 7,0 mm ± 0,2 mm

L_{33} = 2,5 mm min.

Dimension L_{32} specifies the position of the rear edge of the windows relative to Reference Plane Y. Dimension L_{33} shall be measured relative to this rear edge.

6.8 Bottom side (figures 10 and 11)

The bottom side is shown in figure 10 with the lid and the slider in closed position and in figure 11 with both in the open position.

The dimension L_{34} of the bottom half, L_{35} of the slider and L_{36} of the lid shall satisfy the following conditions

L_{34} = 73,0 mm ± 0,3 mm

$L_{35} \leq L_{34}$

$L_{36} \leq L_{34}$

6.8.1 Locking mechanism of the slider

The cartridge shall have a locking mechanism for the slider which locks it in the closed and open positions. The design of this mechanism is not specified by this International Standard, except for the different forces acting on the slider, and for its detent.

The slider shall be spring-loaded by a spring holding it in closed position when it is unlocked. The force required to operate the slider shall not exceed 2 N.

The slider shall have two grooves with an opening at both ends. The detent of the locking mechanism shall protrude through these openings so as to hold the slider in both open and closed positions. The detent shown in cross section C-C is only an example of implementation.