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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 JTC 1. 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 12246 was prepared by the European Computer Manufacturers Association (ECMA) (as Standard ECMA-169) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A, B and C form an integral part of this International Standard. Annexes D, E and F are for information only.

Introduction

ISO/IEC have produced a series of International Standards for cassettes and cartridges containing magnetic tapes of different width and characteristics.

The first International Standards (e.g. ISO 3407, ISO 4057, ISO 8063, ISO 8462, ISO/IEC 9661, ISO/IEC 11559) dealt with media designed for the digital recording of data for storage and processing in data processing systems. Later, other magnetic media, originally developed for audio and video applications, have been considered for use in data processing applications for storage as well as for information interchange. The recording method known as helical scan recording, together with new types of magnetic tapes, allows to achieve capacities of more than 1 gigabyte of user data. International Standards ISO/IEC 10777, ISO/IEC 11319, ISO/IEC 11321, ISO/IEC 11557, ISO/IEC 12247 and ISO/IEC 12248 deal with such magnetic tape cartridges.

This International Standard is based on ISO/IEC 11319 with extensions and modifications which specify the additional features of the Dual Azimuth format. The specifications of the tape, cartridge, recorded signal, recording method and much of the recorded format are identical with those in ISO/IEC 11319.

It is not intended that this International Standard replace ISO/IEC 11319. Existing drives and cartridges which conform to ISO/IEC 11319 will continue to do so and will not conform to this International Standard. Future drives and tapes which conform to ISO/IEC 11319 may, in addition, conform to this International Standard, but only if they support those features herein which are not in ISO/IEC 11319.

Information technology - 8 mm wide magnetic tape cartridge dual azimuth format for information interchange - Helical scan recording

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of an 8 mm wide magnetic tape cartridge to enable interchangeability of such cartridges. It also specifies the quality of the recorded signals, the format and the recording method, thus allowing, together with ISO 1001 for Magnetic Tape Labelling, full data interchange by means of such magnetic tape cartridges. It is based on ISO/IEC 11319, but uses Dual Azimuth Recording to allow the raw capacity to be doubled. The format supports variable length Logical Records, high speed search, and the use of a registered data compression algorithm.

2 Conformance

A magnetic tape cartridge conforms to this International Standard if it satisfies all mandatory requirements specified herein. The tape requirements shall be satisfied throughout the extent of the tape.

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 1001:1986, *Information processing - File structure and labelling of magnetic tapes for information interchange.*

ISO 1302:1992, *Technical drawings - Method of indicating surface texture.*

ISO/IEC 11319: 1993, *Information technology - 8 mm wide magnetic tape cartridge for information interchange - Helical scan recording.*

ISO/IEC 11576:1993, *Information technology - Procedure for the registration of algorithms for the lossless compression of data.*

IEC 950:1991, *Safety of information technology equipment, including electrical business equipment.*

4 Definitions

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

4.1 a.c. erase: A process of erasure utilizing alternating magnetic fields of decaying level.

4.2 algorithm: A set of rules for transforming the logical representation of data.

4.3 Average Signal Amplitude: The average peak-to-peak value of the signal output of the read head measured over a minimum of 1,40 mm of track, exclusive of missing pulses.

4.4 azimuth: The angular deviation, in degrees of arc, of the recorded flux transitions on a track from the line normal to the track centreline.

4.5 back surface: The surface of the tape opposite to the magnetic coating used to record data.

4.6 bit cell: A distance along the track allocated for the recording of a Channel Bit.

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

4.8 cartridge: A case containing magnetic tape stored on twin reels.

4.9 compressed data: The representation of host-transmitted data after transformation by a data compression algorithm.

4.10 Cyclic Redundancy Check (CRC) Character: A character used for error detection.

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

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

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

4.14 logical record: Related data, from the host, treated as a unit of information.

4.15 magnetic tape: A tape that accepts and retains magnetic signals intended for input, output, and storage of data for information processing.

4.16 Master Standard Reference Tape: A tape selected as the standard for amplitude, Typical Field and Resolution.

NOTE - The Master Standard Reference Tape has been established by the SONY Corporation.

4.17 Physical Beginning of Tape (PBOT): The transition from the tape leader to the opaque area of the splice by which the translucent leader tape is joined to the magnetic tape.

4.18 Physical End of Tape (PEOT): The transition from the opaque area of the splice to the translucent trailer tape.

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

4.20 Secondary Reference Amplitude: The Average Signal Amplitude from the Secondary Standard Reference Tape when it is recorded with the Test Recording Current at 2 236 ftpmm.

4.21 Secondary Reference Field: The Typical Field of the Secondary Standard Reference Tape.

4.22 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 - Secondary Standard Reference Tapes can be ordered under the Part Number RSE-5001, until the year 2001, from the Sony Corporation, Magnetic Product Group, Data Media Sales Division, 6-7-35 Kitashinagawa, Shinagawa-ku, TOKYO 141, Japan. It is intended that these be used for calibrating Tertiary Reference Tapes for use in routine calibration.

4.23 Standard Reference Current: The current that produces the Secondary Reference Field.

4.24 Tape Reference Edge: The lower edge of the tape when the magnetic coating is facing the observer and the supply reel is to the observer's right.

4.25 Test Recording Current: The current that is 1,5 times the Standard Reference Current.

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

4.27 Typical Field: In the plot of the Average Signal Amplitude against the recording field at the physical recording density of 2 236 ftpmm, the minimum field that causes an Average Signal Amplitude equal to 90 % of the maximum Average Signal Amplitude.

4.28 uncompressed data: Data from the host which is not transformed by a data compression algorithm.

5 Environment and safety

The conditions specified below refer to ambient conditions immediately surrounding the cartridge. Cartridges exposed to environments outside these limits may still be able to function usefully; however, such exposure may cause permanent damage.

5.1 Testing environment

Unless otherwise specified, tests and measurements made on the 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, the cartridge shall be conditioned before use 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 - Rapid variations of temperature should be avoided.

5.3 Storage environment

For long-term or archival storage of cartridges the following conditions shall be observed

temperature: 5 °C to 32 °C

relative humidity: 20 % to 60 %

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 D.

5.5 Safety

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

5.6 Flammability

The tape and the case components shall be made from materials which, if ignited from a match flame, do not continue to burn in a still carbon dioxide atmosphere.

Section 2 - Cartridge

6 Dimensional and mechanical characteristics of the cartridge

6.1 General

The case of the cartridge shall consist of

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

In the drawings, 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 shows the top side with the lid closed using third angle projection.
Figure 4 shows the bottom side, datum and support areas.
Figure 5 shows the bottom side with the lid removed.
Figure 6 shows the enlarged view of the datum and recognition holes.
Figure 7 shows the cross-sections through the light path holes, the recognition holes and the write-inhibit hole.
Figure 8 shows details of the lid when closed, rotating and open.
Figure 9 shows the details of the lid release insertion channel.
Figure 10 shows the lid lock release requirements.
Figure 11 shows the reel lock release requirements.
Figure 12 shows the reel unlock force direction.
Figure 13 shows the lid release force direction.
Figure 14 shows the lid opening force direction.
Figure 15 shows the light path and light window.
Figure 16 shows the internal tape path and light path.
Figure 17 shows the cartridge reel and a cross-section view of the cartridge reel.
Figure 18 shows the cross-section view of the cartridge reel interface with the drive spindle.
Figure 19 shows the tape access cavity clearance requirements.

The dimensions are referred to three orthogonal Reference Planes X, Y and Z.

6.2 Overall dimensions

See figure 3.

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

$l_1 = 62{,}5 \text{ mm} \pm 0{,}3 \text{ mm}$

$l_2 = 95{,}0 \text{ mm} \pm 0{,}2 \text{ mm}$

$l_3 = 15{,}0 \text{ mm} \pm 0{,}2 \text{ mm}$

The distance from the near side to plane X shall be

$l_4 = 47{,}35 \text{ mm} \pm 0{,}15 \text{ mm}$

The distance from the right side to plane Y shall be

$l_5 = 13{,}0 \text{ mm} \pm 0{,}1 \text{ mm}$

6.3 Holding areas

The holding areas shown hatched in figure 3 shall be the areas along which the cartridge shall be held down when inserted in the drive. Their position and dimensions shall be

l_6 = 12,0 mm max.

l_7 = 3,0 mm min.

6.4 Cartridge insertion

The cartridge shall have asymmetrical features to prevent insertion in the drive in other than the correct orientation. These consist of a channel, a recess and an incline.

The channel (figures 3 and 9) shall provide for an unobstructed path, when the lid is closed and locked, to unlock the lid and the dimensions shall be

l_8 = 79,7 mm ± 0,2 mm

l_9 = 1,0 mm ± 0,1 mm

l_{10} = 0,7 mm ± 0,1 mm

l_{11} = 1,0 mm min.

l_{12} = 1,2 mm ± 0,1 mm

l_{13} = 0,8 mm ± 0,1 mm

l_{14} = 1,2 mm ± 0,1 mm

l_{15} = 0,5 mm ± 0,1 mm

l_{16} = 1,5 mm ± 0,1 mm

l_{17} = 1,0 mm ± 0,1 mm

l_{18} = 3,8 mm ± 0,1 mm

l_{19} = 0,2 mm ± 0,2 mm

l_{20} = 2,3 mm min.

l_{21} = 2,5 mm ± 0,2 mm

The recess dimensions (figures 3 and 5) shall be

l_{22} = 7,5 mm max.

l_{23} = 11,0 mm ± 0,2 mm

l_{24} = 1,5 mm ± 0,1 mm

l_{25} = 1,5 mm ± 0,1 mm

The incline (figure 8) is part of the lid structure and the dimensions shall be

$l_{26} = 7{,}7\ \text{mm}^{+0,0}_{-2,5}\ \text{mm}$

$l_{27} = 0{,}55\ \text{mm}^{+0,05}_{-0,10}\ \text{mm}$

A_1 = 17,5° ± 4,0°

6.5 Window

See figure 1.

A window may be provided on the top side so that a part of the reels is visible. The window, if provided, shall not extend beyond the height of the cartridge.

6.6 Loading grips

See figure 3.

The cartridge shall have loading grips for automatic loading into a drive.

The dimensions and positions of the loading grips shall be

l_{28} = 39,35 mm ± 0,20 mm

l_{29} = 1,5 mm ± 0,1 mm

l_{30} = 5,0 mm ± 0,3 mm

l_{31} = 2,0 mm ± 0,2 mm

A_2 = 90° ± 5°

6.7 Label areas

See figure 3.

A portion of the rear side of the cartridge and a portion of the top side of the cartridge may be used for labels. The rear side area provides for readability of the label when it is stacked or inserted in the drive. The position and the size of the labels shall not interfere with the operation or clearance requirements of the cartridge component parts.

The area used for labels on the top side shall not extend beyond the inner edge of the holding areas defined by l_6 and l_7.

The position and dimensions of the back side label area shall be

l_{32} = 0,5 mm min.

l_{33} = 1,5 mm min.

l_{34} = 80,0 mm max.

The depth of the label depression shall be 0,3 mm max.

6.8 Datum areas and datum holes

See figures 4, 5 and 6.

The annular datum areas A, B and C shall lie in plane Z. They determine the vertical position of the cartridge in the drive. Each shall have a diameter d_1 equal to 6,0 mm ± 0,1 mm and be concentric with the respective datum hole.

The centres of datum holes A and B lie in plane X.

The centre of the circular datum hole A shall be at the intersection of planes X and Y (see figure 5).

The distance from the centre of datum hole B to plane Y (see figure 4) shall be

l_{35} = 68,0 mm ± 0,1 mm

The distance from the centre of the circular datum hole C to plane Y (see figure 6) shall be

l_{36} = 10,20 mm ± 0,05 mm

The distance from the centre of datum hole D to plane Y (see figure 6) shall be

l_{37} = 79,2 mm ± 0,1 mm

The distance from the centres of datum holes C and D to plane X (see figure 5) shall be

l_{38} = 36,35 mm ± 0,08 mm

The diameter of datum hole A and datum hole C shall be $3,00\ \text{mm}^{+0,05}_{-0,00}$ mm. The dimensions of datum hole A and datum hole C shall be

$l_{39} = 1,2\ \text{mm}^{+1,0}_{-0,0}$ mm

l_{40} = 2,6 mm min.

l_{41} = 1,5 mm min.

l_{42} = 4,0 mm min.

l_{43} = 0,3 mm max.

A_3 = 45° ± 1°

The dimensions of datum hole B and datum hole D shall be

$l_{39} = 1{,}2\ \text{mm}^{+1{,}0}_{-0{,}0}\ \text{mm}$

l_{40} = 2,6 mm min.

l_{41} = 1,5 mm min.

l_{42} = 4,0 mm min.

l_{43} = 0,3 mm max.

$l_{44} = 3{,}00\ \text{mm}^{+0{,}05}_{-0{,}00}\ \text{mm}$

l_{45} = 3,5 mm ± 0,1 mm

l_{46} = 3,00 mm ± 0,05 mm

A_3 = 45° ± 1°

r_1 = 1,7 mm min.

6.9 Support areas

The cartridge support areas are shown shaded in figure 4. Support areas A, B and C shall be coplanar with datum areas A, B and C, respectively, within ± 0,1 mm. Support area D shall be coplanar with datum plane Z within ± 0,15 mm.

The areas within l_{49} of the edge of the cartridge shall be recessed from the support areas.

The dimensions and positions of the support areas shall be

l_{35} = 68,0 mm ± 0,1 mm

l_{47} = 10,0 mm ± 0,1 mm

l_{48} = 11,0 mm ± 0,1 mm

l_{49} = 0,5 mm ± 0,1 mm

l_{50} = 7,0 mm ± 0,1 mm

l_{51} = 30,0 mm ± 0,1 mm

l_{52} = 5,5 mm ± 0,1 mm

l_{53} = 64,5 mm ± 0,2 mm

6.10 Recognition holes

See figures 5, 6 and 7.

There shall be 5 recognition holes numbered 1 to 5 as shown in figure 6.

Their positions shall be defined by

l_{54} = 43,35 mm ± 0,15 mm

l_{55} = 3,7 mm ± 0,1 mm