INTERNATIONAL STANDARD

ISO/IEC 20062

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Information technology — 8 mm wide magnetic tape cartridge for information interchange — Helical scan recording — VXA-1 format

Technologies de l'information — Cartouche de bande magnétique de 8 mm *de large pour échange d'informations — Enregistrement par balayage en spirale — Format VXA-1*

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of the joint technical committee is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 20062 was prepared by ECMA (as Standard ECMA-316) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval of national bodies of ISO and IEC.

Annexes A to J form a normative part of this International Standard. Annex K is for information only.

Information technology - 8 mm wide magnetic tape cartridge for information interchange - Helical scan recording - VXA-1 format

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of an 8 mm wide magnetic tape cartridge to enable physical interchange of such cartridges between drives. It also specifies the quality of the recorded signals, the recording method and the recorded format called VXA-1, and thereby allowing data interchange between drives by means of such magnetic tape cartridges.

This International Standard specifies three types depending on the length of magnetic tape contained in the case, referred to as Type A, Type B and Type C.

Information interchange between systems also requires, at a minimum, agreement between the interchange parties upon the interchange code(s) and the specifications of the structure and labelling of the information on the interchanged cartridge.

If compression is used with this format, it shall be according to International Standard ISO/IEC 15200.

2 Conformance

2.1 Magnetic tape cartridges

A magnetic tape cartridge shall be in conformance with this International Standard if it satisfies all mandatory requirements of this International Standard throughout the extent of the tape.

2.2 Generating drive

A drive generating a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if all the recordings that it makes on a tape meet the mandatory requirements of this International Standard. A claim of conformance shall state whether or not the registered compression algorithm specified in ISO/IEC 15200 is implemented within the system to process data from the host prior to allocating data to segment data packets.

2.3 Receiving drive

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 on this tape according to this International Standard. A receiving drive shall be able to recognise the use of the data compression algorithm specified in ISO/IEC 15200.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 15200:1996	*Information technology - Adaptive Lossless Data Compression algorithm (ALDC)*
ISO 527-3:1995	*Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets*
ISO 1302:—[1)]	*Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation*
ISO/IEC 11576:1994	*Information technology - Procedure for the registration of algorithms for the lossless compression of data*
IEC 60950-1:2001	*Information technology equipment - Safety - Part 1: General requirements*

1) To be published. (Revision of ISO 1302:1992)

4 Terms and definitions

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

4.1 **ac erase:** A process of erasure utilising alternating magnetic fields of decaying intensity.

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 output signal from the read head at a density of 2 740 ftpmm measured over a minimum distance of 100 mm, exclusive of missing pulses.

4.4 **azimuth:** The angular deviation, in degrees of arc, of the recorded flux transitions on a track from a 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 **Beginning of Data (BOD):** The point in a partition after which a recording of data for interchange commences.

4.7 **Beginning of Tape (BOT):** The transition from the tape leader to an opaque area of the splice by which a translucent leader tape is joined to the magnetic tape.

4.8 **bit cell:** A distance along the track allocated for the recording of a Channel bit.

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

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

4.11 **Channel bit:** A bit after 8-14 transformation.

4.12 **Cyclic Redundancy Check (CRC) character:** A character derived from information contained in data bytes that is used for error detection.

4.13 **End of Data (EOD):** The point in a partition before which a recording of data for interchange ends.

4.14 **End of Partition (EOP):** The virtual point along the length of tape at which a partition ends.

4.15 **End of Tape (EOT):** The transition from an opaque area of the splice to a translucent trailer tape.

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

4.17 **File Mark:** A mark recorded on the tape at the request of the host system to separate files or to provide an append point. This format provides for Long and Short File Marks.

4.18 **Logical Block:** Information (data) sent to the tape drive to be recorded.

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

4.20 **Master Standard Reference Tape:** A tape selected as the standard for Signal Amplitude, Typical Recording Current, Overwrite and Resolution.

Note - The Master Standard Reference Tape has been established by Ecrix Corporation.

4.21 **Partition:** A formatted length of tape used to record data.

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

4.23 **Reference Field:** The Typical Field of the Master Standard Reference Tape.

4.24 **Secondary Standard Reference Tape (SSRT):** 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 111.00124 from Ecrix Corporation, 5525 Central Avenue, Boulder, Co. 80301, USA.

In principle, such tapes will be available for a period of 10 years from the publication of the first edition of this International Standard. However, by agreement between ECMA and Ecrix Corporation, this period may be shortened or extended to take account of demand for such tapes.

It is intended that these be used for calibrating Tertiary Reference Tapes for use in routine calibration.

4.25 **Set Mark:** A mark recorded on the tape at the request of the host system to separate a set of data or to provide an append point.

4.26 **Standard Reference Amplitude (SRA):** The Average Signal Amplitude derived from the Master Standard Reference Tape, using the Test Recording Current at 2 740 ftpmm.

4.27 **Standard Reference Current (Ir):** The current that produces the Reference Field.

4.28 **Tape Reference Edge:** The lower edge of tape as seen when viewing the recording surface of the tape with the supply reel to the observer's right.

4.29 **Test Recording Current (TRC):** The current used to record the SRA. The TRC is 1,4 times the Standard Reference Current.

4.30 **Track:** A diagonally positioned area on the tape along which a series of magnetic transitions may be recorded.

4.31 **Typical Field:** In the plot of the Average Signal Amplitude against the recording field at the physical recording density of 2 740 ftpmm, the minimum field that causes an Average Signal Amplitude equal to 90 % of the maximum Average Signal Amplitude.

5 Conventions and Notations

5.1 Representation of numbers

A measured value is rounded off to the least significant digit of the corresponding specified value. It implies that a specific value of 1,26 with a positive tolerance of +0,01, and a negative tolerance of -0,02 allows a range of measured values from 1,235 to 1,275.

- Letters and digits in parentheses represent numbers in hexadecimal notation.
- The setting of a bit is denoted by ZERO or ONE.
- Numbers in binary notation and bit combinations are represented by strings of digits 0 and 1.
- Numbers in binary notation and bit combinations are shown with the most significant byte to the left, and with the most significant bit in each byte to the left.
- Negative values of numbers in binary notation are given in Two's complement.
- In each field the data is processed so that the most significant byte (byte 0) is processed first. Within each byte the most significant bit (numbered 7 in an 8-bit byte) is processed first, least significant bit is numbered 0 and is processed last. This order of processing applies also to the data input to the Error Detection and Correction circuits and to their output, unless otherwise stated.

5.2 Names

The names of entities, e.g. specific tracks, fields, etc., are given with a capital initial letter.

6 Acronyms

CRC	Cyclic Redundancy Check
BOD	Beginning of Data
BOT	Beginning of Tape
ECC	Error Correction Code
EOD	End of Data
EOT	End of Tape
LB	Logical Block
LBA	Logical Block Address
LBS	Logical Block Set
lsb	Least Significant Bit
LSB	Least Significant Byte
msb	Most Significant Bit
MSB	Most significant Byte
OWG	Overwritable Gap
SPM	Splice Position Marker
SRA	Standard Reference Amplitude
SSRT	Secondary Standard Reference Tape
TDR	Tape Directory Record
THR	Tape header Record
VPA	Virtual Packet Address

7 Environment and Safety

The conditions specified below refer to the 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.

7.1 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 min.

7.2 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.

The average temperature of the air immediately surrounding the tape shall not exceed 45°C.

If a cartridge has been exposed during storage and/or transportation to conditions 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.

7.3 Storage environment

The following conditions shall be observed during storage

temperature:	5 °C to 32 °C
relative humidity:	20 % to 60 %
stray magnetic field:	shall not exceed 4 000 A/m at any point on the tape.

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

7.4 Transportation

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

7.5 Safety

The cartridge shall satisfy the safety requirements of IEC 60950-1 when used in the intended manner or in any foreseeable use in an information processing system.

7.6 Flammability

The cartridge shall be made from materials that comply with the flammability class for HB materials, or better, as specified in IEC 60950-1.

Section 2 - Requirements for the case

8 Dimensional and mechanical characteristics of the case

8.1 General

The cartridge shall consist of the following elements:

- a case
- recognition holes
- a write inhibit mechanism
- twin reels containing magnetic tape
- a locking mechanism for the reels

Dimensional characteristics are specified for those parameters deemed to be mandatory for interchange and compatible use of the cartridge. Where there is freedom of design, only the functional characteristics of the elements described are indicated. In the figures a typical implementation is represented in third angle projections.

Figure 1 shows a perspective view of the cartridge seen from the top.
Figure 2 shows a perspective view of the cartridge seen from the bottom.
Figure 3 shows a perspective view of Reference Planes X, Y and Z.
Figure 4 shows the front side with the lid closed.
Figure 5 shows the left side with the lid closed.
Figure 6 shows the top side with the lid closed.
Figure 7 shows the right side with the lid closed.
Figure 8 shows the rear side with the lid closed.
Figure 9 shows the bottom side, datum and support areas.
Figure 10 shows the bottom side with the lid removed.
Figure 11 shows the enlarged view of the datum and recognition holes.
Figure 12 shows cross-sections through the light path holes, the recognition holes and the write-inhibit hole.
Figure 13 shows details of the lid when closed, rotating and open.
Figure 14 shows details of the lid release insertion channel.
Figure 15 shows the lid lock release requirements.
Figure 16 shows the reel lock release requirements.
Figure 17 shows the reel unlock force direction.
Figure 18 shows the lid release force direction.
Figure 19 shows the lid opening force direction.
Figure 20 shows the light path and light window.
Figure 21 shows the internal tape path and light path.
Figure 22 shows the cartridge reel and a cross-section view of the cartridge reel.
Figure 23 shows a cross-section view of the cartridge reel interface with the drive spindle.
Figure 24 shows the tape access cavity clearance requirements.

The dimensions are referred to three orthogonal Reference Planes X, Y and Z (see figure 3).

Plane X is perpendicular to Plane Z and passes through the centres of the Datum Holes A and B.

Plane Y is perpendicular to Plane X and Plane Z and passes through the centre of Datum Hole A.

Datum area A, B and C shall lie in Plane Z.

8.2 Overall dimension (figures 5 and 6)

The length of the case shall be

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

The width of the case shall be

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

The distance from the top of the case to Plane Z shall be

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

The distance from the rear 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

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

8.3 Holding areas (figure 6)

The holding areas shown hatched in figure 6 shall be the areas along which the cartridge shall be held down when inserted into the drive. The distance of the holding areas from Plane X shall be

$l_6 = 12{,}0 \text{ mm max.}$

The width when measured from the edge of the case shall be

$l_7 = 3{,}0 \text{ mm min.}$

8.4 Cartridge insertion (figures 4, 7, 10, 13 and 14)

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

The insertion channel (figures 4 and 14) shall provide for an unobstructed path, when the lid is closed and locked, to unlock the lid. The distance of the insertion channel from Plane Y shall be

$l_8 = 79{,}7 \text{ mm} \pm 0{,}2 \text{ mm}$

There shall be a chamfer at the beginning of the insertion channel defined by

$l_9 = 1{,}0 \text{ mm} \pm 0{,}1 \text{ mm}$

$l_{16} = 1{,}5 \text{ mm} \pm 0{,}1 \text{ mm}$

An additional chamfer further into the insertion channel shall be defined by

$l_{10} = 0{,}7 \text{ mm} \pm 0{,}1 \text{ mm}$

$l_{17} = 1{,}0 \text{ mm} \pm 0{,}1 \text{ mm}$

$l_{18} = 3{,}8 \text{ mm} \pm 0{,}1 \text{ mm}$

The innermost width of the insertion channel shall be

$l_{11} = 1{,}0 \text{ mm min.}$

The thickness of the lid shall be

$l_{12} = 1{,}2 \text{ mm} \pm 0{,}1 \text{ mm}$

There shall be a chamfer on the lid defined by

$l_{13} = 0{,}8 \text{ mm} \pm 0{,}1 \text{ mm}$

$l_{14} = 1{,}2 \text{ mm} \pm 0{,}1 \text{ mm}$

The lid shall extend from the case a distance of

$l_{15} = 0{,}5 \text{ mm} \pm 0{,}1 \text{ mm}$

The distance from the left side of the case to the lid lock shall be

$l_{19} = 0{,}2 \text{ mm} \pm 0{,}2 \text{ mm}$

The height of the insertion area shall be

$l_{20} = 2{,}3 \text{ mm min.}$

$l_{21} = 2{,}5 \text{ mm} \begin{matrix} + 0{,}2 \text{ mm} \\ - 0{,}0 \text{ mm} \end{matrix}$

The recess is located on the right side of the cartridge. The position and dimensions (figures 7 and 10) shall be defined by

$l_{22} = 7{,}5 \text{ mm max.}$

$l_{23} = 11{,}0 \text{ mm} \pm 0{,}2 \text{ mm}$

$l_{24} = 1{,}5 \text{ mm} \pm 0{,}1 \text{ mm}$

The depth of the recess shall be

$l_{25} = 1{,}5 \text{ mm} \pm 0{,}1 \text{ mm}$

The incline (figure 13) is part of the lid structure. The distance of the incline from Plane X shall be defined by

$l_{26} = 7{,}7 \text{ mm} \begin{matrix} + 0{,}0 \text{ mm} \\ - 2{,}5 \text{ mm} \end{matrix}$

The angle of the incline shall be

$a_1 = 20^{\circ} \pm 1^{\circ}$

The incline shall end at its intersection with radius r_3 (see 8.13).

8.5 Window (figure 1)

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

8.6 Loading grips (figures 5 and 7)

The cartridge shall have a recessed loading grip on the right side and on the left side to allow handling by an automatic loading mechanism.

The distance from Plane X to the centreline of the loading grip shall be

l_{28} = 39,35 mm ± 0,20 mm;

The distance from Plane Z on the bottom side and from the top side shall be

l_{29} = 1,5 mm ± 0,1 mm;

The width of the indent shall be

l_{30} = 5,0 mm ± 0,3 mm;

The depth of the indent shall be

l_{31} = 2,0 mm ± 0,2 mm;

and the angle of the indent

$a_2 = 90^o \pm 5^o$.

8.7 Label areas (figures 6 and 8)

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 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 label area on the rear side shall be defined by

l_{32} = 0,5 mm min.

l_{33} = 1,5 mm min.

l_{34} = 80,0 mm max.

The label areas shall not be recessed by more than 0,3 mm.

8.8 Datum areas and datum holes (figures 9, 10 and 11)

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 9).

The distance from the centre of datum hole B to Plane Y (see figure 9) 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 11) shall be

l_{36} = 10,20 mm ± 0,05 mm

The distance from the centre of datum hole D to Plane Y (see figure 11) 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 10) shall be

l_{38} = 36,35 mm ± 0,08 mm