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**Information technology — 3,81 mm wide  
magnetic tape cartridge for information  
interchange — Helical scan recording —  
DDS-2 format using 120 m length tape**

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*Technologies de l'information — Cartouche de bande magnétique de  
3,81 mm de large pour l'échange d'information — Enregistrement par  
balayage en spirale — Format DDS-2 utilisant une bande de 120 m de long*

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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 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.

This International Standard was prepared by JISC (as Standard JIS X.6129-1993) with document support and contribution from ECMA 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, D, E, F, G, H and K form an integral part of this International Standard. Annexes B, C, J, L and M are for information only.

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## Introduction

Numerous International Standards for cassettes and cartridges containing magnetic tapes of different width and characteristics have been published. Of these, the following relate to helical scan recording.

ISO/IEC 10777:1991	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical Scan Recording - DDS format</i>
ISO/IEC 11319:1993	<i>Information technology - 8 mm wide magnetic tape cartridge for information interchange - Helical scan recording</i>
ISO/IEC 11321:1992	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DATA/DAT format</i>
ISO/IEC 11557:1992	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DDS-DC format using 60 m and 90 m length tapes</i>
ISO/IEC 12246:1993	<i>Information technology - 8 mm wide magnetic tape cartridge dual azimuth format for information interchange - Helical scan recording</i>
ISO/IEC 12247:1993	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DDS format using 60 m and 90 m length tapes</i>
ISO/IEC 12248:1993	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DATA/DAT-DC format using 60 m and 90 m length tapes</i>

ISO/IEC 10777 defines a specification for data interchange using 3,81 mm wide magnetic tape cartridges, with the DDS format.

A derivative International Standard ISO/IEC 11557 defines another data interchange specification for the same cartridges, but with a recorded format, namely DDS-DC, which enables data to be compressed by the drive before being recorded.

This International Standard defines a specification, based on the features of both of these, which offers a further increase in data capacity. The primary change to the recorded format is an increase in the track density by a factor of 1,5. This produces a corresponding increase in data capacity for a cartridge of a given tape length. Such a track density, when recorded on a cartridge tape whose tape length is 125 metres, will provide a storage capacity of 4 Gigabytes of uncompressed user data and typically 8 to 16 Gigabytes of compressed user data.

The design philosophy is one of minimum change to the track format which is common to DDS and DDS-DC. This will aid the development of drives that support this DDS-2 format by derivation from existing products. It will also ease the development of drives that are able to support both previous formats as well as this format, thus providing the backwards compatibility which the market demands. However, it is not a requirement for compliance to this International Standard that a drive also reads and writes either the DDS format or the DDS-DC format. Nor is it a requirement for compliance to this International Standard that a drive compresses data and writes it in entities on the tape, or that a drive decompresses data contained within entities on the tape. All the recording on one cartridge will be at the same track density, either that of DDS and DDS-DC, or that of DDS-2. The media coating and the track density are indicated by the combination of the states of the Recognition Holes on the cartridge case.

This International Standard also includes the specifications of the Media Recognition System, namely a striped splicing tape.

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# Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DDS-2 format using 120 m length tape

## 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 physical interchangeability of such cartridges between drives. It also specifies the quality of the recorded signals, the recording method and the recorded format, thereby allowing data interchange between drives by means of such magnetic tape cartridges.

The recorded format, known as DDS-2, includes all the features of the DDS recorded format specified in ISO/IEC 12247 and of the DDS-DC recorded format specified in ISO/IEC 11557. The principal difference between this recorded format and those recorded formats is the use of a greater track density by this format.

Information interchange between systems utilising this International Standard also requires the use, as a minimum, of a labelling specification, e.g. ISO 1001:1986, *Information processing - File structure and labelling of magnetic tapes for information interchange*, and an interchange code which shall be agreed upon by the interchange parties.

Under information interchange circumstances in which a processing algorithm is applied to the host data prior to recording on the tape and a complementary reprocessing algorithm is applied after the data is read from the tape, agreement upon the algorithms employed by the interchange parties is also required. It is outside the scope of this International Standard to specify any of these.

### 2 Conformance

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#### 2.1 Magnetic tape cartridge

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

For each recorded Entity any algorithm used for Processing the data therein shall have been registered, and the registration identification shall be included, when appropriate, in Byte No. 3 of the Entity Header.

A recorded tape shall be either a Single Data Space Tape or a Partitioned Tape.

#### 2.2 Generating system

A system generating a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if all recordings on the tape meet the mandatory requirements of this International Standard, and if either or both methods of appending and overwriting are implemented.

A claim of conformance shall state which of the following optional features are implemented and which are not

- the performing of a Read-After-Write check and the recording of any necessary repeated frames;
- the recording of multiple representations of the same Basic Group;
- the generation of ECC3 Frames.

In addition a claim of conformance shall state

- whether or not one, or more, registered algorithm(s) are implemented within the system and are able to process data received from the host prior to collecting the data into Basic Groups, and
- the algorithm registration identification number(s) of the implemented algorithm(s).

### 2.3 Receiving system

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

- be able to recognize repeated Frames and to make available to the host, data and Separator Marks from only one of these Frames;
- be able to recognize multiple representations of the same Basic Group, and to make available to the host, data and Separator Marks from only one of these representations;
- be able to recognize an ECC3 Frame, and ignore it if the system is not capable of using ECC3 check bytes in a process of error correction;
- be able to update the System Log(s) if the Write-inhibit Hole state so permits;
- be able to recognize processed data within an Entity, identify the algorithm used, and make the algorithm registration number available to the host;
- be able to make processed data available to the host.

In addition a claim of conformance shall state

- whether or not the system is capable of using ECC3 check bytes in a process of error correction;
- whether or not one or more Reprocessing algorithm(s) are implemented within the system, and are able to be applied to Processed Data prior to making such data available to the host;
- the algorithm registration number(s) of the processing algorithm(s) for which a complementary Reprocessing algorithm is implemented.

### 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 indicated below. Members of IEC and ISO maintain registers of currently valid international standards.

ISO/R 527:1966,	<i>Plastics - Determination of tensile properties.</i>
ISO 1302:1992,	<i>Technical drawings - Method of indicating surface texture.</i>
ISO/IEC 11576:1994,	<i>Information technology - Procedure for the registration of algorithms for the lossless compression of data.</i>
IEC 950 :1991,	<i>Safety of information technology equipment including electrical business equipment.</i>

### 4 Definitions

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

- 4.1 Absolute Frame Number (AFN) :** A sequence number, encoded in the Frame.
- 4.2 a.c. erase :** A process of erasure utilising magnetic fields of decaying intensity.
- 4.3 Access Point :** A point, at the start of a processed record sequence, at which the presentation of Codewords to a reprocessing algorithm is required to start, regardless of whether the data of interest in a retrieval operation starts at that point or at a subsequent point.
- 4.4 Algorithm :** A set of rules for transforming the logical representation of data.
- 4.5 Area ID :** An identifier defining the area of the tape and specifying the types of Frame written.
- 4.6 Automatic Track Finding (ATF) :** The method by which tracking is achieved.

- 4.7 **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.
- 4.8 **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.
- 4.9 **back surface** : The surface of the tape opposite to the magnetic coating which is used to record data.
- 4.10 **byte** : An ordered set of bits acted upon as a unit.
- 4.11 **cartridge** : A case containing magnetic tape stored on twin hubs.
- 4.12 **Channel bit** : A bit after 8-10 transformation.
- 4.13 **Codeword** : A word which is generated by a processing algorithm. The number of bits in a Codeword is variable, and is not defined by this International Standard.
- 4.14 **Data Format ID** : An identifier specifying which data format is being used on the tape.
- 4.15 **Early Warning Point (EWP)** : A point along the length of the tape at which warning is given of the approach, in the forward direction of tape motion, of the partition boundary or of the Physical End of Tape.
- 4.16 **End of Data (EOD)** : The point on the tape at the end of the group which contains the last user data.
- 4.17 **Entity** : A unit of recorded data, comprising a Processed Record Sequence preceded by housekeeping information.
- 4.18 **Error Correcting Code (ECC)** : A mathematical computation yielding check bytes used for the detection and correction of errors.
- 4.19 **flux transition position** : That point which exhibits maximum free-space flux density normal to the tape surface.
- 4.20 **flux transition spacing** : The distance along a track between successive flux transitions.
- 4.21 **Frame** : A pair of adjacent tracks with azimuths of opposite polarity, in which the track with the positive azimuth precedes that with the negative azimuth.
- 4.22 **Housekeeping Frame** : A Frame which contains no user data and which is identified as such by the values in the data fields therein.
- 4.23 **Logical Beginning of Tape (LBOT)** : The point along the length of the tape where a recording of data for interchange commences.
- 4.24 **magnetic tape** : A tape which will accept and retain the magnetic signals intended for input, output and storage purposes on computers and associated equipment.
- 4.25 **Master Standard Amplitude Calibration Tape** : A pre-recorded tape on which the standard signal amplitudes have been recorded in the tracks of positive azimuth, 21 µm wide, recorded at a track pitch of 27,2 µm, on an a.c. erased tape.

Note 1 - The tape includes recordings made at 83,3 ftpmm, 333,3 ftpmm, 500 ftpmm, 1 000,0 ftpmm and 1 499,9 ftpmm.

Note 2 - The Master Standard Amplitude Calibration Tape has been established by Reliability Centre for Electronic Components of Japan (RCJ).

- 4.26 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 RCJ.
- 4.27 Optimum Recording Field** : In the plot of Average Signal Amplitude against the recording field at the physical recording density of 2 999,9 ftpmm, the field that causes the maximum Average Signal Amplitude.
- 4.28 Partition Boundary** : The point along the length of a magnetic tape at which partition 1 ends and partition 0 commences.
- 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 (see annex F)** : The recording levels above which a tape intended for interchange shall not previously have been recorded.
- 4.33 processing** : The use of an algorithm to transform host data into Codewords.
- 4.34 processed data** : A sequence of Codewords which results from the application of processing to data.
- 4.35 Processed Record** : A sequence of Codewords which results from the application of processing to an Unprocessed Record.
- 4.36 Processed Record Sequence** : A sequence of one or more Processed Records which starts on an 8-bit boundary and ends on a subsequent 8-bit boundary.
- 4.37 record** : Related data treated as a unit of information.
- 4.38 Reference Recording Field** : The Optimum Recording Field of the Master Standard Reference Tape.
- 4.39 reprocessing** : The use of an algorithm to transform Codewords into data as required by the host.
- 4.40 Secondary Standard Amplitude Calibration Tape** : A tape pre-recorded as defined for the Master Standard Amplitude Calibration Tape; the outputs are known and stated in relation to those of the Master Standard Amplitude Calibration Tape.
- Note 4 - Secondary Standard Amplitude Calibration Tapes can be ordered from RCJ, 1-1-12 Hachiman-cho, Higashikurume, Tokyo 203, Japan, under Part Number JCM 6129 until the year 2005. It is intended that these be used for calibrating tertiary reference tapes for use in routine calibration.
- 4.41 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 - Secondary Standard Reference Tapes can be ordered from RCJ, 1-1-12 Hachiman-cho, Higashikurume, Toyko 203, Japan, under Part Number JRM 6129 until the year 2005. It is intended that these be used for calibrating tertiary reference tapes for use in routine calibration.
- 4.42 Separator Mark** : A record containing no user data, which is used to separate data.
- 4.43 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.



- 4.44 Tape Reference Edge** : The bottom edge of the tape when viewing the recording side of the tape, with the PEOT to the observer's right.
- 4.45 Test Recording Current** : The current that produces the Reference Recording Field.
- 4.46 track** : A diagonally positioned area on the tape along which a series of magnetic signals may be recorded.
- 4.47 unprocessed data** : Data which has not been subjected to processing.
- 4.48 Unprocessed Record** : A record of unprocessed data, comprising an integral number of bytes.
- 4.49 Virtual End of Tape (VEOT)** : The point along the length of the magnetic tape within partition 1 which defines the end of the part of partition 1 which is usable for recording data for interchange.

## 5 Environment and safety

Unless otherwise stated, the conditions specified below refer to the ambient conditions of 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

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### 5.2 Operating environment

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

- temperature : 5 °C to 45 °C  
<https://standards.iteh.ai/catalog/standards/sist/784c9ff9-ba04-4dc3-b31f-6847048b73c0/iso-iec-13923-1996>
- 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 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 J.