IEC 62071-1

Edition 1.0 2005-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-7 –
Part 1: VTR specifications

Système de magnétoscope numérique à cassette à balayage hélicoïdal à signal compressé utilisant une bande magnétique de 6,35 mm – Format D-7 –
Partie 1: Spécifications VTR

IEC 62071-1:2005

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,…).
It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,…).
Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 62071-1

Edition 1.0 2005-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-7 –
Part 1: VTR specifications

Système de magnétoscope numérique à cassette à balayage hélicoïdal à signal compressé utilisant une bande magnétique de 6,35 mm – Format D-7 –
Partie 1: Spécifications VTR

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX XD

ICS 33.160.40

ISBN 978-2-83220-317-0

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-7 –

Part 1: VTR specifications

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62071-1 has been prepared by technical area 6: Higher data rate storage media, data structures and equipment of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This bilingual version (2012-11) corresponds to the monolingual English version, published in 2005-10.

The text of this standard is based on the following documents:

CDV	Report on voting
100/900/CDV	100/984/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 62071 consists of the following parts, under the general title *Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-7*:

Part 1: VTR specifications

Part 2: Compression format

Part 3: Data stream format

This part 1 describes the VTR specifications which are tape, magnetization, helical recording, modulation method and basic system data for video compressed data.

Part 2 describes the specifications for encoding process and data format for 525i and 625i systems.

Part 3 describes the specifications for transmission of DV-based compressed video and audio data stream over 270 Mb/s and 360 Mb/s serial digital interface.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-7 –

Part 1: VTR specifications

1 Scope

This part of IEC 62071 specifies the content, format and recording method of the data blocks containing video, audio, and associated data which form the helical records on 6,35 mm tape contained in cassettes as specified in SMPTE 307M.

In addition, this standard specifies the content, format, and recording method for longitudinal cue and control tracks.

One video channel and two independent audio channels are recorded in the digital format for 25 Mb/s VTRs and one video channel and four independent audio channels for 50 Mb/s VTRs. Each of these channels is designed to be capable of independent editing.

The video channel records and reproduces a component television signal in the 525-line system with a frame frequency of 29,97 Hz (hereinafter referred to as the 525/60 system) and the 625-line system with a frame frequency of 25,00 Hz (hereinafter referred to as the 625/50 system).

Prior to recording, the digital signal is be compressed to a DV-based 25 Mb/s bit stream with 4:1:1 sampling or a DV-based 50 Mb/s bit stream with 4:2:2 sampling.

The standard includes the process required to decode the DV-based 25 Mb/s bit stream and 50 Mb/s bit stream into output video, audio, and data.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

AES3:2003, *AES Recommended Practice for Digital Audio Engineering – Serial transmission format for two-channel linearly represented digital audio data*

SMPTE 12M: 1999, *Television, Audio and Film – Time and Control Code*

SMPTE 259M: 1997, *Television – 10-Bit 4:2:2 Component and 4fsc NTSC Composite Digital Signals – Serial Digital Interface*

3 Abbreviations and acronyms

AAUX	Audio auxiliary data
AP1	Audio application ID
AP2	Video application ID
AP3	Subcode application ID
APT	Track application ID

Arb	Arbitrary
AS	AAUX source pack
ASC	AAUX source control pack
B/W	Black and white flag
CGMS	Copy generation management system
DBN	DIF block number
DCT	Discrete cosine transform
DIF	Digital interface
DSF	DIF sequence flag
ECC	Error correction code
EFC	Emphasis channel flag
EOB	End of block
ID	Identification
IDP	ID parity
ITI	Insert and track information
LF	Locked mode flag
PF	Pilot frame
QNO	Quantization number
QU	Quantization
Res	Reserved for future use
SMP	Sampling frequency
SSA	Start sync area
SSYB	Subcode sync block number
STA	Status of the compressed macro block
Syb	Sync block number
TF	Transmitting flag
TIA	Track information area
Trp	Track pair number
VAUX	Video auxiliary data
VLC	Variable length coding
VS	VAUX source pack
VSC	VAUX source control pack
VSM	Vibrating sample magnetometer

4 Environment and test conditions

4.1 Environment

Tests and measurements made on the system to check the requirements of this standard shall be carried out under the following conditions:

– Temperature: 20 °C ± 1 °C
– Relative humidity: (50 ± 2) %
– Barometric pressure: from 86 kPa to 106 kPa
– Tape conditioning: not less than 24 h

– Centre tape tension: 0,09 N ± 0,02 N (see Annex A)

4.2 Reference tape

A blank tape for reference recordings shall be available from the format holder or approved source.

4.3 Calibration tapes

The calibration tapes meeting the requirements of 4.3.1, 4.3.2, and Clause 5 shall be made available from manufacturers who produce digital television tape recorders and players in accordance with this standard.

4.3.1 Record locations and dimensions

Calibration tape shall be manufactured to tolerances shown in Table 1 or Table 2 for 25 Mb/s format or Table 3 or Table 4 for 50 Mb/s format but with these tolerances reduced by 50 %.

4.3.2 Calibration signals

Two sets of signals shall be recorded on the calibration tape:

a) – Video: 100 / 0 / 100 / 0 colour bars
   – Audio: 1 kHz tone at 20 dB below full scale on each audio channel
   – Cue: 1 kHz and 6 kHz tone at the analogue recording reference level;

b) A signal of constant recorded frequency (i.e. the Nyquist frequency) for the purpose of mechanical alignment. The recording level shall conform to 7.1.4.3

5 Tape

5.1 Base

The base material shall be polyester or equivalent.

5.2 Width

The tape width shall be 6,350 mm ± 0,005 mm.

The tape, covered with glass, is measured without tension at a minimum of five different positions along the tape using a calibrated comparator having an accuracy of 0,001 mm (1 μm). The tape width shall be within the aforementioned specification at any measuring position.

5.3 Width fluctuation

Tape width fluctuation shall not exceed 5 μm peak-to-peak. Measurement of tape width fluctuation shall be taken over a tape length of 900 mm. The tape width fluctuation shall be within the aforementioned specification at each of ten equally spaced points in the 900 mm span.

5.4 Reference edge straightness

The reference edge straightness maximum deviation is 6 μm peak-to-peak. Edge straightness fluctuation is measured at the edge of a moving tape guided by three guides having contact on the same edge and having a distance of 85 mm from the first to second guide and 85 mm from the second to third guide. Edge measurements are averaged over a 10 m length and are made 5 mm from the midpoint between the first and second guide towards the first guide.

5.5 Tape thickness

The total tape thickness shall be $8{,}8\ ^{0}_{-0{,}8}$ µm and $6{,}7\ ^{0}_{-0{,}4}$ µm.

NOTE Tape of either thickness may be used for 25 Mb/s or 50 Mb/s formats.

5.6 Transmissivity

Transmissivity shall be less than 5 %, measured over the range of wavelengths 800 nm to 1 000 nm.

5.7 Offset yield strength

The offset yield strength shall be greater than 3 N. The force to produce 0,2 % elongation of a 1 000 mm test sample with a pull rate of 10 mm per minute shall be used to confirm the offset yield strength. The line beginning at 0,2 % elongation parallel to the initial tangential slope is drawn and then read at the point of intersection of the line and the stress-strain curve.

5.8 Magnetic coating

The magnetic layer of the tape shall consist of a coating of metal particles or equivalent.

5.9 Coating coercivity

The magnetic coating coercivity shall be a class 2300 (approximately 2300 Oe / 184000 A/m), with an applied field of 10000 Oe / 800000 A/m measured by a VSM.

6 Helical recordings

6.1 Tape speed

The tape speed for the 25 Mb/s format shall be 33,8201 mm/s for the 525/60 system and 33,8539 mm/s for the 625/50 system. The tape speed for the 50 Mb/s format shall be 67,6401 mm/s for the 525/60 system and 67,7077 mm/s for the 625/50 system. The tolerance shall be ±0,2 % respectively.

6.2 Sectors

Each recorded track contains an ITI sector, an audio sector, a video sector and a subcode sector.

6.3 Record locations and dimensions

Record locations and dimensions for continuous recording of 25 Mb/s format shall be as specified in Figures 1 and 3, and Table 1 (525/60 system) or in Figures 1 and 3, and Table 2 (625/50 system). In recording, sector locations on each helical track shall be contained within the tolerance specified in Figure 1 and Table 1 (525/60 system) or in Figure 1 and Table 2(625/50 system).

Record location and dimensions for continuous recording of 50 Mb/s format shall be as specified in Figures 2 and 3, and Table 3 (525/60 system) or in Figures 2 and 3, and Table 4 (625/50 system). In recording, sector locations on each helical track shall be contained within the tolerance specified in Figure 2 and Table 3 (525/60 system) or in Figure 2 and Table 4 (625/50 system).

The reference edge of the tape for dimensions specified in this standard shall be the lower edge as shown in Figures 1 and 2. The magnetic coating, with the direction of tape travel as shown in Figures 1 and 2, are on the side facing the observer.

As indicated in Figures 1 and 2, this standard anticipates a zero guard band between recorded tracks, and the nominal record head width shall be equal to the track pitch of 18 μm. The scanner head configuration should be chosen so that the recorded track widths are contained within the limits of 16 μm to 20 μm.

The format requires flying erasure for recording. In insert editing, this standard provides a guard band of 3 μm ± 1,5 μm between the previously recorded track and the inserted track at editing points only. A typical track pattern for insert editing is shown in Figures B.1 and B.2 of Annex B.

6.4 Helical track record tolerance zones

In the case of 25 Mb/s format, the centre of two consecutive tracks starting at the first track in each video frame shall be contained within the pattern of the two tolerance zones established in Figure 4. Each zone is defined by two parallel lines which are inclined at an angle of 9,178 4° basic with respect to the tape reference edge. The centrelines of each zone shall be spaced apart 18,0 μm basic. The width of zone 1 shall be 3 μm and the width of zone 2 shall be 5 μm. These zones are established to contain track angle errors, track straightness errors, and vertical head offset tolerances (the measuring technique is shown in Annex C).

In the case of 50 Mb/s format, the lower edge of four consecutive tracks starting at the first track in each video frame shall be contained within the pattern of the four tolerance zones established in Figure 5. Each zone is defined by two parallel lines which are inclined at an angle of 9,1784° basic with respect to the tape reference edge. The centrelines of each zone shall be spaced apart 18,0 μm basic. The width of zone 2 shall be 3 μm and the width of zone 1, 3 and 4 shall be 5 μm. These zones are established to contain track angle errors, track straightness errors, and vertical head offset tolerance.

6.5 Relative positions of recorded information

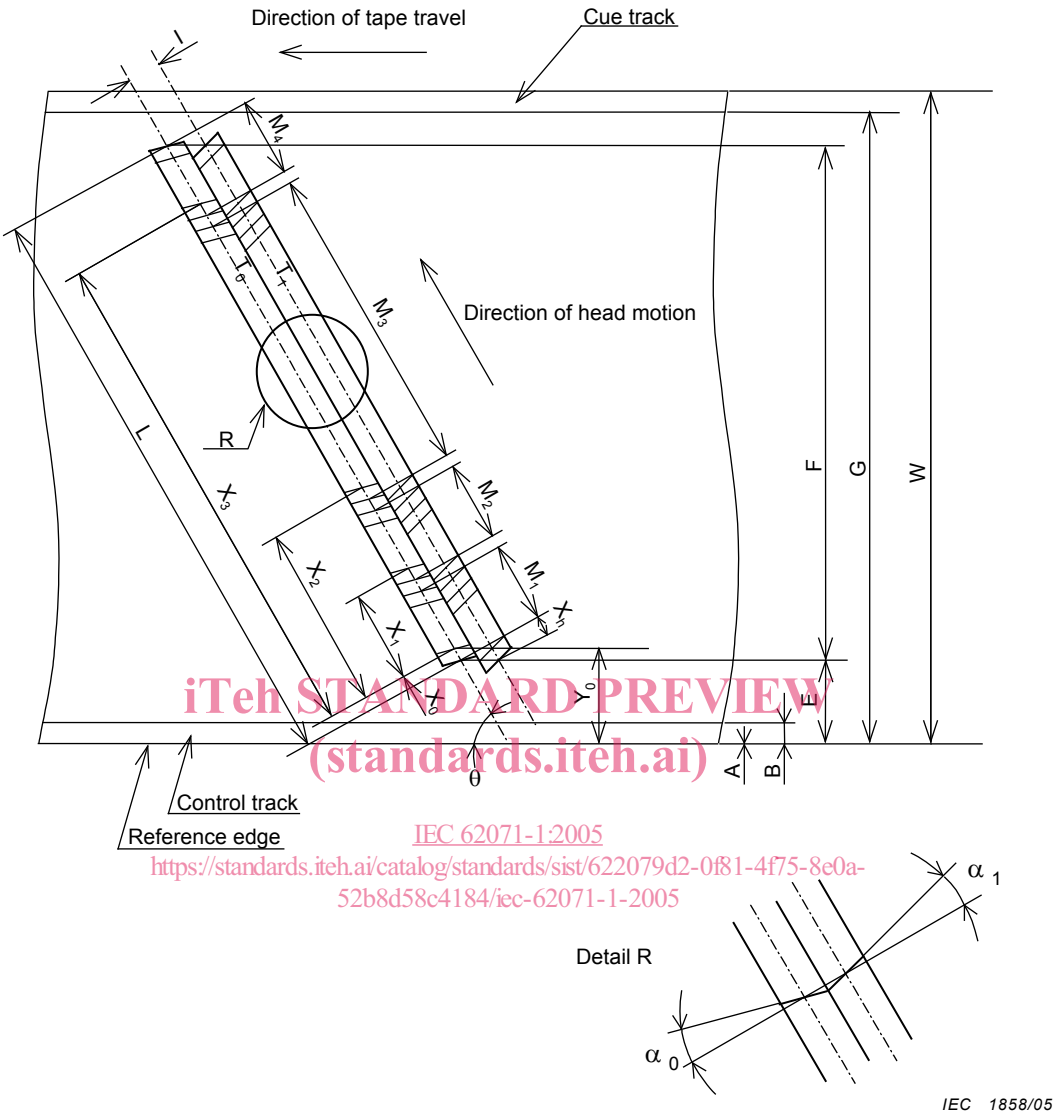
6.5.1 Relative positions of longitudinal tracks

Audio, video, control track and cue track with information intended to be time coincident shall be positioned as shown in Figures 1 to 3.

6.5.2 Programme area reference point

The programme area reference point is determined by the intersection of a line parallel to the reference edge of the tape at a distance Y_0 from the reference edge and the centreline of track 0 in each ITI sector (see Figures 1 to 3).

The end of the preamble and beginning of SSA in the ITI sector shall be recorded at the programme area reference point, and the tolerance of dimension X_0. The locations are shown in Figures 1 to 3; dimensions X_0 and Y_0 are specified in Tables 1 to 4. The relationship between sectors and contents of each sector is specified in Clause 7.



NOTE 1 M_1 is an ITI sector.

NOTE 2 M_2 is an audio sector.

NOTE 3 M_3 is a video sector.

NOTE 4 M_4 is a subcode sector.

NOTE 5 Tracks viewed from magnetic coating side.

NOTE 6 Dimension X_1 to X_3 are determined by the programme reference point as defined in Figure 3.

Figure 1 – Locations and dimensions of recorded tracks of 25 Mb/s format