

INTERNATIONAL STANDARD

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2007-06

**Helical-scan compressed digital video cassette
system using 6,35 mm magnetic tape –
Format D-12 –**

**Part 1:
VTR specifications**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE
SYSTEM USING 6,35 mm MAGNETIC TAPE –
FORMAT D-12 –**

Part 1: VTR specifications

FOREWORD

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International Standard IEC 62447-1 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

CDV	Report on voting
100/1091/CDV	100/1186/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.

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

The list of all the parts of the IEC 62447-1 series, under the general title *Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-12*, can be found on the IEC website.

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 1080i, 1080p and 720p systems.

Part 3 describes the specifications for transmission of DV-based compressed video and audio data stream over 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- withdrawn;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
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HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-12 –

Part 1: VTR specifications

1 Scope

This part of IEC 62447 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 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 compressed video channel, eight independent audio channels and subcode data are recorded on tape in the digital form. Each of these channels is capable of independent editing.

On the following digital video formats, the helical recordings are synchronized to:

- 1080 line/59,94 Hz field frequency;
- 1080 line/50 Hz field frequency;
- 720 line/59,94 Hz frame frequency.

These are hereafter referred to as the 1080/60i, 1080/50i and 720/60p systems, respectively. Similarly, in this standard, the 60 Hz system nomenclature refers to both 1080/60i and 720/60p systems, whereas, the 50 Hz system refers only to the 1080/50i system. Nomenclature 1080 line system refers to both 1080/60i and 1080/50i systems, while the 720 line system refers only to the 720/60p system.

The recorded digital video signal shall be compressed according to the DV-based 100 Mb/s specification.

The recorded digital video signal, eight audio channels and subcode data shall be defined by the data structure according to the DV-based 100 Mb/s specification.

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.

IEC 62447-2, *Helical-scan compressed digital videocassette system using 6,35 mm magnetic tape – Format D-12 – Part 2: Compression format*

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

SMPTE 276M:1995, Television – Transmission of AES-EBU Digital Audio Signals Over Coaxial Cable

SMPTE 292M:1998, Television – Bit-Serial Digital Interface for High-Definition Television Systems

AES3-1992(R1997), Serial transmission format for two-channel linearly represented digital audio data

3 Abbreviations and acronyms

AAUX	Audio auxiliary data
ATF	Automatic track finding
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
CGMS	Copy generation management system
DCT	Discrete cosine transform
DIF	Digital interface
ECC	Error correction code
EFC	Emphasis channel flag
EOB	End of block
IDP	ID parity
ITI	Insert and track information
LF	Locked mode flag
QNO	Quantization number
QU	Quantization
Res	Reserved for future use
SMP	Sampling frequency
SSA	Start sync area
Syb	Sync block number
TIA	Track information area
Trp	Track pair number
VAUX	Video auxiliary data
VS	VAUX source pack
VSC	VAUX source control pack

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 in 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

4.3.1 Tape

The calibration tapes meeting the requirements of 4.3.2, 4.3.3, and Clause 4 are available from manufacturers who produce digital television tape recorders and players in accordance with this standard.

4.3.2 Record locations and dimensions

All tolerances shown in Table 1 or Table 2 and 4.2 will be reduced by 50 %.

4.3.3 Calibration signals

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

- a) Video: 100/0/100/0 colour bars compressed according to SMPTE 370M
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 6.1.4.3

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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 remain within the above specifications 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 afore-mentioned specification at each of 10 equally spaced points in the 900 mm span.

5.4 Reference edge straightness

The maximum deviation of the reference edge straightness 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 $8,8 \begin{smallmatrix} 0 \\ -0,8 \end{smallmatrix} \mu\text{m}$ and $6,7 \begin{smallmatrix} 0 \\ -0,4 \end{smallmatrix} \mu\text{m}$.

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 2 300 Oe/184 000 A/m), with an applied field of 10 000 Oe/800 000 A/m measured by a vibrating sample magnetometer.

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6 Helical recordings

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6.1 Tape speed [https://standards.iteh.ai/catalog/standards/sist/ea3140e9-dcb1-4afc-a8f3-](https://standards.iteh.ai/catalog/standards/sist/ea3140e9-dcb1-4afc-a8f3-ad42db7380bf/iec-62447-1-2007)

The tape speed shall be 135,2801 mm/s for the 60-Hz system and 135,4154 mm/s for the 50-Hz system. The tolerance shall be $\pm 0,2$ %.

6.2 Sectors

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

6.3 Record location and dimensions

The record location and dimensions for continuous recording shall be as specified in Figures 1 and 2 and Tables 1 or 2. In recording, sector locations on each helical track shall be contained within the tolerance specified in Figure 1 and Tables 1 or 2.

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

As indicated in Figure 1, this standard anticipates a zero guard band between recorded tracks. The nominal record head width shall be equal to the track pitch of 18 μm . The scanner head configuration should be chosen in such a way 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 $3 \mu\text{m} \pm 1,5 \mu\text{m}$ between the previously recorded track and the inserted track at editing points only. A typical track pattern for insert editing is shown in Figure B.1.

6.4 Helical track record tolerance zones

The lower edge of eight consecutive tracks starting at the first track in each frame shall be contained within the pattern of the eight tolerance zones established in Figure 3. Each zone is defined by two parallel lines which are inclined at an angle of $9,1784^\circ$ basic with respect to the tape reference edge. The centre lines of each zone shall be spaced $18,0 \mu\text{m}$ basic apart. The width of zone 2 shall be $3 \mu\text{m}$ and the width of zones 1, 3 to 8 shall be $5 \mu\text{m}$. These zones are established to contain track-angle errors, track-straightness errors, and vertical head offset tolerance (the measuring technique is shown in Annex C).

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 and 2.

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 centre line of track 0 in each ITI sector (see Figures 1 and 2).

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 and 2; dimensions X_0 and Y_0 are specified in Tables 1 and 2. The relationship between sectors and the contents of each sector is specified in Clause 6.

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