

Specification for

# Helical-scan video tape cassette system using 12.65 mm (0.5 in) magnetic tape on type Beta format —

(Implementation of CENELEC  
HD 461 S1)

UDC 621.397.61:621.798.11-52

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- British Radio and Electronic Equipment Manufacturers' Association
- Cinematograph Exhibitors' Association of Great Britain and Ireland
- Council for Educational Technology for the United Kingdom
- Electronic Engineering Association
- Independent Television Companies' Association
- Industrial Council for Educational and Training Technology Ltd.

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- Association of Professional Audio and Radio Consultants
- Association of Professional Recording Studios Limited
- Audio Engineering Society
- British Educational Equipment Association
- British Film and Television Producers' Association
- British Kinematograph, Sound and Television Society
- British Photographic Association
- Educational Television Association
- Ergonomics Society
- European Tape Industry Association
- Independent Broadcasting Authority
- Music Trades Association
- Royal Photographic Society
- Royal Television Society

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# Contents

|                                                                                         | Page               |
|-----------------------------------------------------------------------------------------|--------------------|
| Committees responsible                                                                  | Inside front cover |
| National foreword                                                                       | iii                |
| <hr/>                                                                                   |                    |
| Section 1. General                                                                      |                    |
| 1 Scope                                                                                 | 1                  |
| 2 Object                                                                                | 1                  |
| 3 Environment                                                                           | 1                  |
| <hr/>                                                                                   |                    |
| Section 2. Video-tape cassette                                                          |                    |
| 4 Mechanical parameters                                                                 | 1                  |
| <hr/>                                                                                   |                    |
| Section 3. Videocassette recorders                                                      |                    |
| 5 Tape speed                                                                            | 2                  |
| 6 Drum diameter                                                                         | 2                  |
| 7 Tape tension                                                                          | 3                  |
| 8 Maximum forces and tensions                                                           | 3                  |
| 9 Automatic stop system                                                                 | 3                  |
| 10 Video heads                                                                          | 3                  |
| 11 Track configuration and dimensions                                                   | 4                  |
| <hr/>                                                                                   |                    |
| Section 4. Tape characteristics                                                         |                    |
| 12 Dimensions of video tape                                                             | 4                  |
| 13 Leader tape and trailer tape                                                         | 4                  |
| 14 Magnetic tape properties                                                             | 5                  |
| <hr/>                                                                                   |                    |
| Section 5. Recording characteristics                                                    |                    |
| 15 FM recording of luminance component                                                  | 5                  |
| 16 NTSC chrominance signal recording                                                    | 6                  |
| 17 PAL chrominance signal recording                                                     | 7                  |
| 18 SECAM chrominance signal recording                                                   | 8                  |
| 19 Time difference between the luminance and chrominance signals                        | 10                 |
| 20 Audio signal recording                                                               | 10                 |
| 21 Control signal recording                                                             | 11                 |
| <hr/>                                                                                   |                    |
| Appendix A Noise reduction                                                              | 27                 |
| <hr/>                                                                                   |                    |
| Figure 1 — Appearance of video cassette. Top and side view                              | 12                 |
| Figure 2 — Appearance of video cassette. Bottom view                                    | 13                 |
| Figure 3 — Datum spots and supported areas                                              | 14                 |
| Figure 4 — Location of reels of the cassette in the recorder and/or player              | 14                 |
| Figure 5 — Protecting lid of cassette                                                   | 15                 |
| Figure 6 — Reel of cassette                                                             | 16                 |
| Figure 7 — Relationship between reels and reel spindles                                 | 16                 |
| Figure 8 — Allowable and operating ranges for unlocking the lever of cassette lid       | 17                 |
| Figure 9 — Force needed to unlock the lid                                               | 18                 |
| Figure 10 — Force needed to open the lid                                                | 18                 |
| Figure 11 — Spring force needed to hold the reel                                        | 18                 |
| Figure 12 — Strength of safety tab                                                      | 19                 |
| Figure 13 — Extraction force and friction torque                                        | 19                 |
| Figure 14 — Tape tension measurement                                                    | 20                 |
| Figure 15 — Track configuration and basic design dimensions. (View from recording side) | 21                 |

|                                                                            | Page              |
|----------------------------------------------------------------------------|-------------------|
| Figure 16 — Block diagram of recording NTSC colour video signal (example)  | 23                |
| Figure 17 — Block diagram of recording PAL colour video signal (example)   | 24                |
| Figure 18 — Block diagram of recording SECAM colour video signal (example) | 25                |
| Figure 19 — Characteristic frequencies                                     | 26                |
| Table I — Track configuration                                              | 22                |
| Publication referred to                                                    | Inside back cover |

# National foreword

This British Standard has been prepared under the direction of the Electronic Equipment Standards Committee and is identical with IEC Publication 767 “*Helical-scan video tape cassette system using 12.65 mm (0.5 in) magnetic tape on type beta format*”, published in 1983 by the International Electrotechnical Commission (IEC). This British Standard is also in agreement with Harmonization Document HD 461 S1, published by the European Committee for Electrotechnical Standardization (CENELEC).

**Terminology and conventions.** The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards.

**Cross-reference**

| International Standard | Corresponding British Standard                                                                                                                                  |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC 94-1:1981          | BS 6288 <i>Magnetic tape sound recording and reproducing systems</i><br>Part 1:1982 <i>Specification for general conditions and requirements</i><br>(Identical) |

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**Summary of pages**

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 28, an inside back cover and a back cover.  
This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.



## Section 1. General

### 1 Scope

This standard applies to magnetic video recording using 12.65 mm (0.5 in) tape cassettes on two-head helical-scan video cassette recorders and defines the basic beta-format video cassette systems.

### 2 Object

This standard gives dimensional and other characteristics necessary to permit the interchangeability of recorded cassettes. The requirements given relate to the 525 line-60 field and 625 line-50 field systems. Three tape speeds, 40 mm/s, 20 mm/s and 13.3 mm/s, are available for the 525 line-60 field systems. Tape speed 18.7 mm/s applies to 625 line-50 field system.

### 3 Environment

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

|                      |                   |
|----------------------|-------------------|
| Temperature:         | $20 \pm 1$ °C     |
| Relative humidity:   | $50 \pm 2$ %      |
| Barometric pressure: | 86 kPa to 106 kPa |

## Section 2. Video-tape cassette

### 4 Mechanical parameters

#### 4.1 Datum planes

Datum plane Z shall be determined by three datum spots A, B and C indicated in Figure 3, page 14.

Datum plane X shall be orthogonal to datum plane Z and include the centres of datum hole (a) and datum hole (b) as shown in Figure 2, page 13.

Datum plane Y shall be orthogonal to both datum plane X and datum plane Z and include the centre of datum hole (a) as shown in Figure 2, page 13.

#### 4.2 Dimensions of cassette

The dimensions permitting the interchangeability of cassettes shall be in accordance with Figure 1 to Figure 12, pages 12 to 19.

#### 4.3 Tape winding

The recording side of the tape shall face outside on both the supply reel and take-up reel as shown in Figure 4, page 14.

#### 4.4 Label and/or window area

The cross-hatched area in Figure 1 is available for the label and/or window. The label as well as the window shall not protrude beyond the height of the cassette.

#### 4.5 Cassette supporting areas

The cassette shall be supported by the recorder and/or player unit on the hatched and cross-hatched area indicated in Figure 3.

#### 4.6 Cassette holding areas

The cassette shall be held in position by the recorder and/or player unit on the holding area as described in Figure 1.

#### 4.7 Guiding grooves

The cassette shall be provided with three guiding grooves for correct insertion as shown in Figure 1 and Figure 2.

#### 4.8 Safety tab

The cassette shall be provided with a safety tab as shown in Figure 2. The tab when broken out prevents accidental erasure. The tab shall be so constructed that it can withstand a force of 0.6 N using a rod of 2.5 mm diameter centred on the safety tab as shown in Figure 12, page 19.

#### 4.9 Protecting lid

##### 4.9.1 Automatic locking

The cassette shall be provided with a lid that is automatically unlocked upon insertion into the recorder and/or player unit and automatically locked upon ejection from it.

##### 4.9.2 Force to unlock the lid

The lid can be unlocked by making the unlocking lever activate in either direction A or direction B, as illustrated in Figure 9, page 18. The force needed to unlock the lid shall be not greater than 1 N in the A direction and not greater than 1.5 N in the B direction.

##### 4.9.3 Force to open the lid

The maximum force needed to open the lid shall be not greater than 1.5 N as specified in Figure 10, page 18.

##### 4.9.4 Opening range

The opening range of the lid in the recorder and/or player unit shall be within  $27.5^{+1.5}_0$  mm.

##### 4.9.5 Allowable and operating ranges for unlocking the lever of cassette lid

The allowable range for unlocking the lever of the cassette lid is specified in Figure 8, page 17, as shown by the hatched and cross-hatched areas, while the cross-hatched areas specify the operation range for it.

#### 4.10 Reels

##### 4.10.1 Locking of reels

The reels shall be locked in order to avoid loosening of the tape during storage or transportation. Upon opening the lid, specified in Sub-clause 4.9, the reels shall be automatically unlocked.

##### 4.10.2 Reel spring

The reels in the cassette shall be pushed down by the reel spring with a force of  $1.5 \pm 0.5$  N as specified in Figure 11, page 18.

##### 4.11 Extraction force (F1, F2)

With a holdback torque of 0.001 N.m applied to a nearly empty reel, the amount of force required to pull the tape out from the reel shall not exceed 0.17 N. This shall apply to both supply and take-up reels of the cassettes as shown in Figure 13a, page 19.

##### 4.12 Friction torque of the take-up reel

With a holdback tension of 0.3 N applied to the nearly full take-up reel, the required torque to wind the tape shall not exceed 0.015 N.m as shown in Figure 13b, page 19.

### Section 3. Videocassette recorders

#### 5 Tape speed

The video tape speeds shall be as follows:

| 525 line-60 field    |                      |                      | 625 line-50 field    |
|----------------------|----------------------|----------------------|----------------------|
| 40.0 mm/s<br>± 0.5 % | 20.0 mm/s<br>± 0.5 % | 13.3 mm/s<br>± 0.5 % | 18.7 mm/s<br>± 0.5 % |

#### 6 Drum diameter

The drum diameter shall be  $74.487 \pm 0.010$  mm.

## 7 Tape tension

The tape back tension for a full supply reel shall be  $0.45 \pm 0.05$  N measured at the entrance to the drum when the tape is pulled as shown in Figure 14, page 20. The ratio of tensions between the maximum and minimum tape diameters shall be set as follows:

$$\frac{\text{tension at minimum amount of winding } (\varnothing 30 \text{ mm})}{\text{tension at maximum amount of winding } (\varnothing 70 \text{ mm})} = 1 \text{ to } 1.2$$

## 8 Maximum forces and tensions

The machine shall not apply forces greater than the following:

The maximum force on the safety tab described in Sub-clause 4.8 shall be not greater than 0.6 N.

The maximum tension on the splicing portion shall be not greater than 10 N.

Maximum tension to the portions where the leader and trailer tapes are fixed on the reel hubs shall be not greater than 15 N.

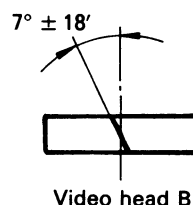
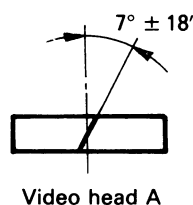
## 9 Automatic stop system

The tape transport shall have a mechanism which ensures that a non-contact automatic stopping device of the machine functions properly at both ends of the magnetic tape through the effect of the leader tape and trailer tape as specified in Clause 13.

## 10 Video heads

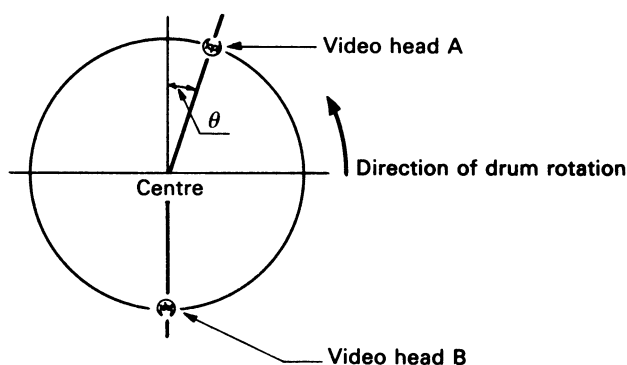
### 10.1 Inclined azimuth angle

The gap line of video heads shall be slanted in accordance with the figure below.



### 10.2 Video head position on the drum

The relative position of head A to head B is defined in the following figure and table.



|                                                                                                      | 525 line-60 field   | 625 line-50 field    |
|------------------------------------------------------------------------------------------------------|---------------------|----------------------|
| $\theta$                                                                                             | $0^\circ$ (nominal) | $17' 17''$ (nominal) |
| NOTE The angle $17' 17''$ corresponds to the time-delay of 95 H. H: the nominal horizontal interval. |                     |                      |

## 11 Track configuration and dimensions

### 11.1 Record locations

The track configuration and dimensions shall be in accordance with Figure 15, page 21, and Table I. The lower edge of the magnetic tape shall be the reference edge of tape.

### 11.2 Switching position and video signal overlap

The switching position between the two video heads shall lie between five and nine horizontal lines before the front edge of the vertical synchronizing pulse. The minimum overlap of the two video heads shall be 2.5 horizontal lines on either side of the switching position.

### 11.3 Relations of video track and video signal field

The track used for the first field of the recorded video signal is not specified. However, recorders which can distinguish between fields shall record the first field on track A.

## Section 4. Tape characteristics

## 12 Dimensions of video tape

### 12.1 Magnetic tape thickness

The maximum allowable thickness of the magnetic tape, including the coating, shall be 25.0  $\mu\text{m}$ .

### 12.2 Magnetic tape width

The width of the magnetic tape shall be  $12.65 \pm 0.02$  mm.

## 13 Leader tape and trailer tape

### 13.1 Automatic stop

The leader tape and trailer tape of the width and thickness specified in Sub-clauses 13.2 and 13.3 shall contain a metal foil providing a conductivity per centimetre of more than 200 S (see Clause 9).

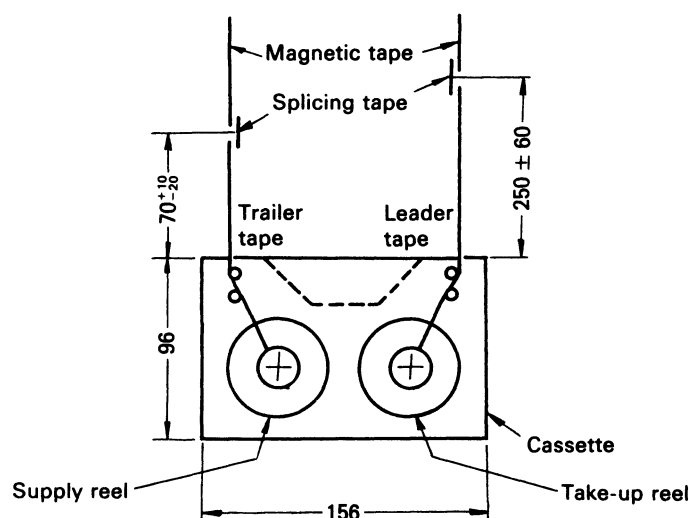
### 13.2 Dimensions of leader tape and trailer tape

The maximum allowable thickness of the leader tape and trailer tape shall be 45  $\mu\text{m}$ .

The width of the leader tape and trailer tape shall be  $12.65 \pm 0.03$  mm.

The length of the exterior part of leader tape for the completely empty take-up reel shall be  $250 \pm 60$  mm and that of the trailer tape for the completely empty supply reel shall be  $70^{+10}_{-20}$  mm (see figure below).

Leader tape and trailer tape yield strength shall be 30 N or more.



*Dimensions in millimetres*

### 13.3 Splicing

The spliced portion shall withstand a tension of 15 N. The attachment of the leader tape and trailer tape to the hub shall be capable of withstanding a force of 20 N.

## 14 Magnetic tape properties

### 14.1 Magnetic orientation

The magnetic coating shall be longitudinally oriented.

### 14.2 Coercivity

The coercivity shall be approximately  $44 \times 10^3$  A/m to  $60 \times 10^3$  A/m.

### 14.3 Yield strength

The yield strength shall be 20 N or more.

## Section 5. Recording characteristics

### 15 FM recording of luminance component (see Figure 16, Figure 17 and Figure 18, pages 23, 24 and 25)

#### 15.1 Low-pass filter

The luminance component of the composite video signal shall be separated by a filter system. The chrominance component of the composite video signal shall decrease by 26 dB or more at the colour subcarrier frequency (fsc) and by 15 dB or more within the range of  $f_{sc} \pm 0.5$  MHz after passing this filter system.

#### 15.2 Pre-emphasis

Response characteristics in the case of a tape speed of 40 mm/s for 525 line-60 field.

| Frequency | 50 kHz         | 100 kHz       | 200 kHz       | 500 kHz       | 1 MHz          | 2 MHz          | 4 MHz          |
|-----------|----------------|---------------|---------------|---------------|----------------|----------------|----------------|
| Response  | $0.3 \pm 0.06$ | $1.1 \pm 0.2$ | $3.2 \pm 0.5$ | $8.3 \pm 0.7$ | $11.9 \pm 0.8$ | $13.9 \pm 0.8$ | $14.6 \pm 0.8$ |

Unit: decibels.

Response characteristics in the case of the tape speeds of 20 mm/s and 13.3 mm/s for 525 line-60 field.

| Input level (dB) | Frequency     |               |                |                |                |                |
|------------------|---------------|---------------|----------------|----------------|----------------|----------------|
|                  | 50 kHz        | 200 kHz       | 500 kHz        | 1 MHz          | 2 MHz          | 4 MHz          |
| - 17             | $1.9 \pm 0.4$ | $7.4 \pm 0.8$ | $13.4 \pm 1.4$ | $19.1 \pm 2.2$ | $22.3 \pm 2.5$ | $17.9 \pm 2.5$ |
| - 14             | $1.9 \pm 0.4$ | $7.4 \pm 0.8$ | $13.4 \pm 1.4$ | $18.3 \pm 2.2$ | $20.9 \pm 2.5$ | $17.5 \pm 2.5$ |
| - 11             | $1.9 \pm 0.4$ | $7.4 \pm 0.8$ | $13.3 \pm 1.4$ | $17.0 \pm 2.2$ | $19.0 \pm 2.5$ | $16.3 \pm 2.5$ |
| - 7              | $1.9 \pm 0.4$ | $7.3 \pm 0.8$ | $11.7 \pm 1.4$ | $14.1 \pm 2.2$ | $15.3 \pm 2.5$ | $13.4 \pm 2.5$ |
| - 3              | $1.9 \pm 0.4$ | $7.0 \pm 0.8$ | $10.3 \pm 1.4$ | $12.1 \pm 2.2$ | $12.1 \pm 2.5$ | $10.1 \pm 2.5$ |

Response characteristics in the case of 625 line-50 field.

| Input level (dB) | Frequency     |               |                |                |                |                |
|------------------|---------------|---------------|----------------|----------------|----------------|----------------|
|                  | 50 kHz        | 200 kHz       | 500 kHz        | 1 MHz          | 2 MHz          | 4 MHz          |
| - 17             | $0.2 \pm 0.4$ | $4.6 \pm 0.5$ | $11.4 \pm 1.2$ | $16.3 \pm 1.2$ | $17.6 \pm 2.0$ | $15.0 \pm 2.0$ |
| - 14             | $0.2 \pm 0.4$ | $4.6 \pm 0.5$ | $10.7 \pm 1.2$ | $15.6 \pm 1.2$ | $16.8 \pm 2.0$ | $14.6 \pm 2.0$ |
| - 11             | $0.2 \pm 0.4$ | $4.6 \pm 0.5$ | $10.3 \pm 1.2$ | $14.2 \pm 1.2$ | $15.8 \pm 2.0$ | $13.8 \pm 2.0$ |
| - 7              | $0.2 \pm 0.4$ | $4.6 \pm 0.5$ | $9.6 \pm 1.2$  | $13.0 \pm 1.2$ | $14.3 \pm 2.0$ | $12.6 \pm 2.0$ |
| - 3              | $0.2 \pm 0.4$ | $4.6 \pm 0.5$ | $8.5 \pm 1.2$  | $11.7 \pm 1.2$ | $13.3 \pm 2.0$ | $11.6 \pm 2.0$ |

NOTE 1 Measurement signal is a sine wave inserted after the low-pass filter.

NOTE 2 Response characteristic is the ratio of peak-to-peak output level at each frequency to the peak-to-peak output level at 10 kHz (in decibels).

NOTE 3 With an input signal of a 100 % white signal, the demodulated voltage from sync. tip to peak white is taken as 0 dB.