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British Standard Specification for
**Pre-recorded optical reflective videodisks
for 50 Hz/625 lines CCIR monochrome and
colour coding PAL systems**

[IEC title: Pre-recorded optical reflective videodisk system "Laser vision" 50 Hz/625 lines — PAL]

(Implementation of CENELEC HD 514 S1)

Vidéodisques optiques réfléchissants préenregistrés pour systèmes CCIR
noir et blanc 50 Hz/625 lignes et systèmes couleur PAL— Spécifications

Bespielte optisch reflektierende Bildplatten für CCIR-Schwarz/Weiß—
und Farbfernsehsysteme PAL (50 Hz, 625 Zeilen)

BS 6895 : 1987

National foreword

This British Standard has been prepared under the direction of the Electronic Equipment Standards Committee and is identical with IEC 856 : 1986 'Pre-recorded optical reflective videodisk system — "Laser vision" 50 Hz/625 lines — PAL', published by the International Electrotechnical Commission (IEC). This British Standard is also in agreement with Harmonization Document HD 514 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; attention is drawn especially to the following.

References to page numbers in the text relate to the IEC page numbers given in brackets at the bottom of each page.

Additional information. Copies of International Radio Consultative Committee (CCIR) documents may be purchased from International Telecommunications Union, Place des Nations, CH 1211, Geneva 20, Switzerland.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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Pre-recorded optical reflective videodisks for 50 Hz/625 lines CCIR monochrome and colour coding PAL systems

INTRODUCTION

The optical videodisk system functions as follows:

The information carrier is a disk structure consisting of a transparent substrate, of which one surface contains the information covered with a reflective coating.

Two such substrates are assembled, information surface against information surface to form an optical videodisk. One of these two substrates might also be a "blank", characterized by the absence of information, but in all other mechanical aspects conform to this standard.

The information on the disk is stored in a spiral track starting at the inside at a fixed diameter and moving to the outside.

The information is read out by a beam of light which passes through the transparent substrate and is reflected by the information on the encoded surface. The reflected beam is modulated by the information on the encoded surface.

Within the system two disk formats exist: the CAV disk and the CLV disk. CAV stands for Constant Angular Velocity and CLV for Constant Linear Velocity.

In the CAV format each revolution corresponds to one complete recorded video frame. Consequently during readout the disk will rotate at constant angular velocity. A disk thus recorded makes possible features such as still pictures, slow motion, etc.

In the CLV format the velocity of the information track relative to the readout beam is constant. Therefore the angular velocity decreases as the readout beam proceeds along the spiral track to the outside. A disk recorded in this way yields a longer playing time. Features such as still pictures, however, are not possible.

SECTION ONE — GENERAL

1. Scope

This standard applies to pre-recorded optical reflective videodisks compatible with 50 Hz/625 lines CCIR monochrome and colour coding PAL systems, and defines those parameters that effect the interchangeability of the disks, excluding limitations of the programming material and source.

2. Object

To serve as a reference for manufacturers intending to make disks or players compatible with the optical system described herein.

3. Standard atmospheric conditions for testing

Measurements and mechanical checks shall be carried out at any combination of temperature, humidity and air pressure within the following limits unless otherwise specified for certain parameters elsewhere in this standard:

Ambient temperature: 15 °C to 35 °C

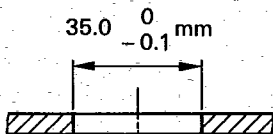
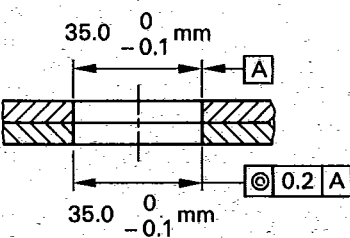
Relative humidity: 45% to 75%

Air pressure: 86 kPa to 106 kPa

Samples shall be conditioned in the testing environment for 24 h before testing.

SECTION TWO — DISK PARAMETERS

4. Mechanical parameters

Characteristics to be specified	Requirements	Method of measurement and/or conditions
4.1 Thickness in the programme area:		
4.1.1 Thickness of protective transparent layer, (A), Figure 1, page 31	See Figure 1a	
4.1.2 Thickness of double disk (B), Figure 1	min. = 2.2 mm, see Figure 1a max. = 2.8 mm	
4.2 Outer radius of disk (C), Figure 1 — 12-in version — 8-in version	150 ± 0.5 mm 100 ± 0.5 mm	To be measured at 20 ± 1 °C and 48% to 52% relative humidity
4.3 Centre hole (D), Figure 1		
4.3.1 Diameter of centre hole		To be measured with a maximum and a minimum plug gauge at 20 ± 1 °C and 48% to 52% relative humidity
4.3.2 Diameter of centre hole for disk assembled from two single disks		
4.3.3 Shape of edges of centre hole	Edges shall be free from burrs	
4.4 Label (E), Figure 1		
4.4.1 Inside diameter of label (F), Figure 1	min. = 35 mm max. = 38 mm	
4.4.2 Outside diameter of label (G), Figure 1	min. = 86 mm max. = 100 mm	
4.4.3 Thickness of label (H), Figure 1	Such that thickness of disk in clamping area (Sub-clause 4.5.3) is within specification	

(Table continued on page 11)

Characteristics to be specified	Requirements	Method of measurement and/or conditions
4.4.4 Position of label	Should not overlap centre hole	
4.5 Clamping area (I), Figure 1, page 31		
4.5.1 Inside radius of clamping area	20.5 mm	
4.5.2 Outside radius of clamping area	41.5 mm	
4.5.3 Thickness of disk in clamping area including labels (J), Figure 1	min. = 2.2 mm max. = 2.9 mm	
4.6 Sense of rotation of disk seen from read side	Anticlockwise	
4.7 Rotation speed	Never to exceed one revolution per TV frame	
4.7.1 Angular velocity for CAV format	1 rotation/TV frame	
4.7.2 Linear velocity for CLV format	Between 8.4 m/s and 9.5 m/s	See Figure 20, page 53
4.7.3 Angular acceleration for CLV format	Maximum of -0.32 rad/s^2	See Figure 20
4.8 Maximum unbalance	1.5 N	Measured at 1 rotation/TV frame
4.9 Position of lead-in tracks	The space between starting radius of lead-in tracks and starting radius of programme area must be filled with lead-in tracks	
4.10 Starting radius lead-in tracks (K), Figure 1	$\leq 53.5 \text{ mm}$	
4.11 Starting radius programme area (L), Figure 1	$\geq 55 \text{ mm}$	
4.11.1 Minimum number of programme tracks	30	
4.12 Maximum radius programme area (M), Figure 1		
— 12-in version	145 mm	
— 8-in version	96 mm	
4.13 Position of lead-out tracks (N), Figure 1	The lead-out tracks follow directly after the end of the programme	

(Table continued on page 13)

Characteristics to be specified	Requirements	Method of measurement and/or conditions
4.14 Minimum size of lead-out area		
4.14.1 For CAV disks	2 mm	
4.14.2 For CLV disks	2 mm	
4.15 Track pitch anywhere between any two adjacent tracks	min. 1.4 μ m max. 2 μ m	
4.16 Vertical deviation of programme tracks during rotation at playback speed		Record supported in clamping area over a diameter of 80 mm and measured with the optical stylus (see Sub-clause 11.1)
4.16.1 Maximum distance (P) from reference plane to any point of tracks (see Figure 2, page 33)	+0.9 mm -1.2 mm	
4.16.2 Maximum vertical acceleration	100 m/s ² for $f < 1.1$ kHz	See Figure 2
4.16.3 Maximum vertical deviation	± 2 μ m for $f > 1.1$ kHz	See Figure 2
4.16.4 Maximum vertical velocity	0.18 m/s	See Figure 2
4.17 Maximum static deflection of disk (Q), Figure 3, page 33	-2.5 mm; +1.5 mm	Record supported in clamping area over a diameter of 80 mm and measured at outside diameter with reference to hub plane
4.18 Radial deviation of programme tracks during rotation at playback speed (see Figure 4, page 33)		Record supported in clamping area over a diameter of 80 mm and measured with the optical stylus (see Sub-clause 11.1)
4.18.1 Maximum deviation (ΔV) during one revolution (see Figure 4)	160 μ m	
4.18.2 Maximum radial deviation	± 0.1 μ m for $f > 2.2$ kHz	
4.18.3 Maximum radial acceleration	20 m/s ² for $f < 2.2$ kHz	

(Table continued on page 15)

Characteristics to be specified	Requirements		Method of measurement and/or conditions
4.19 Tangential deviation of programme tracks at nominal velocity	CAV	CLV	Record supported in clamping area over a diameter of 80 mm and measured with the optical stylus (see Sub-clause 11.1)
4.19.1 Maximum time base error at:			
radius 55 mm	12 μ s peak-to-peak (pp) at 25 Hz roll-off with 12 dB/octave	12 μ s peak-to-peak (pp) at 25 Hz roll-off with 12 dB/octave	
radius 145 mm	4.6 μ s peak-to-peak (pp) at 25 Hz roll-off with 12 dB/octave	12 μ s peak-to-peak (pp) at 9 Hz roll-off with 12 dB/octave	
4.19.2 Shift between two adjacent tracks	± 25 ns	not applicable	
4.20 Mass	(in 10^{-3} kg)		
4.20.1 Minimum			
8-in version	70		
12-in version	70		
4.20.2 Maximum			
8-in version	280		
12-in version	280		
4.21 Mass moment of inertia	(in 10^{-3} kg m ²)		
4.21.1 Minimum			
8-in version	0.36		
12-in version	0.36		
4.21.2 Maximum			
8-in version	3.2		
12-in version	3.2		
5. Optical requirements			$\lambda = 6\,328 \text{ \AA}$ (HeNe laser in air) and a numerical aperture = 0.40 ± 0.01
5.1 Refractive index	See Figure 1a, page 31		
5.2 Birefringence of transparent disk (double pass)	20° max.		
5.3 Reflectivity	$\geq 70\%$		Double pass through transparent substrate in unmodulated area. Includes transmission losses in the substrate

(Table continued on page 17)

Characteristics to be specified	Requirements	Method of measurement and/or conditions
6. Temperature and humidity requirements	Must satisfy all requirements following exposure to a temperature range of 5 °C to 45 °C at a relative humidity within the range of 5% to 90% for a period of 4 days	Parameters to be measured 20 ± 1 °C and 48% to 52% relative humidity after a recovery of 24 h following exposure to the specified environment

SECTION THREE — RECORDED PARAMETERS

7. Audio parameters

7.1 Channel applications

The disk shall contain two independent audio channels. This offers the possibility of:

- a) Stereophonic sound
- b) Monophonic sound — two independent audio programmes
- c) Monophonic sound — one audio programme on both channels
- d) Use of one or both channels for control or cueing information.

7.2 Audio subcarrier modulation of main carrier

7.2.1 Type of modulation

The audio subcarrier shall be symmetrical double-edge pulsewidth modulated on the main carrier. (See Philips F. Panter: Modulation, Noise and Spectral Analysis, page 542).

7.2.2 Audio subcarrier amplitude

The level of the audio subcarriers, in the recorded frequency spectrum, shall be -26 ± 1 dB with respect to the unmodulated main carrier.

8. Audio subcarrier frequencies

Channel I (left channel in stereo)

$$f = 43.75 \times f_H = 683593.75 \text{ Hz (nominal)}$$

Channel II (right channel in stereo)

$$f = 68.25 \times f_H = 1066406.25 \text{ Hz (nominal)}$$

8.1 Type of modulation

The audio signal shall be frequency modulated on the subcarriers with a maximum deviation of ± 100 kHz for 100% modulation. The instantaneous peak deviation at all times shall be less than ± 150 kHz.

8.2 *Polarity of modulation*

Both audio subcarriers shall have the same polarity of modulation which may be positive or negative.

8.3 *Pre-emphasis*

The audio signal prior to modulation shall have a pre-emphasis according to Figure 5, page 35.

8.4 *Audio compression*

The audio signal before pre-emphasis may be compressed at the option of the programme maker. In case of compression the system described in Appendix B shall be used.

9. **Video parameters**

9.1 *Video signal*

9.1.1 *Video signal standards*

The recorded video signal is a 50 Hz/625 lines PAL signal according to CCIR, Report 624 (1974) and additions as specified in Sub-clause 9.1.2.

9.1.2 *Video signal pilot burst*

On the synchronization level a pilot burst with a frequency of $240 \times f_H = 3.75$ MHz shall be superimposed. The peak-to-peak value is 6/7 of the difference between the blanking level and the peak white level $\pm 10\%$ (see Figures 6 and 6a, pages 35 and 37).

9.1.3 *Vertical Interval Test Signals (VITS)*

Vertical Interval Test Signals according to CCIR Recommendation 473-3, Annex I (see Figures 7 to 10, pages 39 to 41) may be inserted in the lines 19, 20, 332 and 333. The lines 22 and 335 shall be blanked before optical recording, to enable disk noise measurements.

9.1.4 *Address signals*

In the video signal, lines 6 through 18 and 319 through 331 are reserved for address or data signals. For signal specification, see Clause 10. The lines that are not specified have a video content set at the blanking level and are reserved for future applications. Lines 20, 21 and 333, 334 may contain subtitle data signals; in that case there are no VITS (see Sub-clause 9.1.3) on lines 20 and 333.

9.1.5 *Maximum video level*

The maximum luminance level of the video signal shall not exceed 110% and the maximum chroma saturation shall not exceed 100%.

9.1.6 Group delay pre-distortion

To equalize the group delay distortion of the playback low-pass filter, the video group delay shall be pre-distorted as follows (see Figure 11, page 43):

$f = 0.5$ MHz	$t_d = 0$ ns reference
$f = 2.0$ MHz	$t_d = -10 \pm 15$ ns
$f = 3.0$ MHz	$t_d = -35 \pm 15$ ns
$f = 4.0$ MHz	$t_d = -85 \pm 20$ ns
$f = 4.43$ MHz	$t_d = -135 \pm 20$ ns
$f = 4.8$ MHz	$t_d = -200 \pm 50$ ns

9.2 Video signal modulation

9.2.1 Type of modulation

The video signal shall be frequency modulated on the main carrier with positive modulation.

9.2.2 Blanking level frequency

The main carrier frequency corresponding to the 30% blanking level shall be $7.1 \text{ MHz} \pm 50 \text{ kHz}$.

9.2.3 Main carrier deviation

The 30% blanking level to +100% white level deviation shall be $800 \pm 20 \text{ kHz}$. White level is the highest frequency.

9.2.4 Video pre-emphasis

The video signal, prior to modulation, shall have a pre-emphasis as shown in Figure 12, page 45.

10. Vertical interval control and address signals

The code signals on the video disk provide special information, which can be utilized by the player to control special functions and provide picture frame or time information.

The CAV format has the following types of codes:

1. Lead-in
2. Lead-out
3. Picture numbers
4. Picture stop
5. Chapter numbers
6. Programme status code
7. Users code