Cinematography — Magnetic sound test films excluding striped release prints — Basic technical characteristics

0 Introduction

Two types of magnetic test films have been in wide use. They have differed in the manner of measuring the magnetic flux level, and in the detailed procedures of measurement that had been anticipated for their application to systems evaluation and adjustment. It has now been possible to achieve agreement as follows:

Type 185 — Magnetic flux levels are measured by the procedures of ANSI S4.6[2] and IEC 94-3[3]. The reference level is 185 nWb/m. The frequency series is 6 dB below reference level. These films were developed for use with a mains frequency of 60 Hz, and for measurement with SVI meters conforming to ANSI C16.5[6].

Type 320 — Magnetic flux levels are measured by the procedures of DIN 45 520[4]. The reference level is 320 nWb/m. The frequency series is 10 dB below reference level. The calibrations differ from those obtained by type 185 test film, and generally give a result about 1 dB higher for identical flux levels. These films were developed for use with a mains frequency of 50 Hz, and for measurement with SPP meters conforming to IEC 268-10[7].

A compromise format has been developed that provides the functional advantages of both previous series, and meets the needs each had served. This International Standard describes that universal format.

1 Scope and field of application

This International Standard specifies basic technical characteristics for the magnetic sound test films for checking, adjusting and measuring sound reproducing channels of motion-picture installations.

It also specifies types and technical characteristics of magnetic test films made on 35 mm, 17,5 mm and 16 mm motion-picture films.

This International Standard includes test films intended for the checking, adjusting and measuring of

a) inclination angle (azimuth) of the magnetic head gaps;

b) output level balance of multi-channel systems;

c) frequency response of the sound reproduction channel;

d) non-uniformity of film velocity (flutter).

2 References

2.1 Cutting and perforating of film stocks

ISO 69, *Cinematography — 16 mm motion-picture raw stock film — Cutting and perforating dimensions.*

ISO 491, *Cinematography — 35 mm motion-picture film and magnetic film — Cutting and perforating dimensions.*

2.2 Position and dimensions of sound records

ISO 162, *Cinematography — Head gaps and sound records for three-, four-, or six-track magnetic sound records on* 35 mm *and single-track on* 17,5 mm *motion-picture film containing no picture — Positions and width dimensions.*

ISO 4242, *Cinematography — Recording head gaps for two sound records on* 16 mm *magnetic film — Positions and width dimensions.*

2.3 Recorded characteristics of the magnetic sound record

ISO 266, *Acoustics — Preferred frequencies for measurements.*

ISO 1188, *Cinematography — Recorded characteristic for magnetic sound on full-coat* 16 mm *motion-picture film — Specifications.*

ISO 1189, *Cinematography — Recorded characteristic for magnetic sound records on* 35 mm *motion-picture film excluding striped release prints — Specifications.*

3 Specifications common for all types of magnetic sound test films

3.1 Test films shall be made on motion-picture raw stock film, the cutting and perforating dimensions of which are in accordance with the following ISO Standards:

- for 35 mm film: ISO 491
- for 16 mm film: ISO 69

3.2 The location and width dimensions of sound records shall be in accordance with the following ISO Standards:

- for 35 mm film: ISO 162
- for 16 mm film: ISO 4242

3.3 Magnetic recording characteristics for multifrequency test film shall be in accordance with the following ISO Standards:

- for 35 mm film: ISO 1189
- for 16 mm film: ISO 1188

3.4 Test films shall be splice-free, except where a splice is intended on part of the test film.

3.5 Test films shall be recorded at the following frame rates:

- for 16 mm, 17,5 mm and 35 mm test films: at either 24 or 25 frames per second

Use at other frame rates is admissible, in which case the frame rate shall be stated. All frequency tolerances refer to the stated frame rates.

3.6 Within the multifrequency films, each frequency shall be identified by voice announcements preceding that frequency segment. The peak level of voice announcements shall not exceed the peak level of modulation of the test signal.

3.7 Each test film shall be provided with written identification on the outside of the container, stating function of the film, nature (acetate or polyester) and thickness of the base, frame rate, date, and place of recording.

3.8 If multi-track test films are made on a single strip of motion-picture film, the individual records shall be made in accordance with this International Standard, including the specific International Standards referenced in clause 2, applicable to the film stock and to each sound record.

3.9 It shall be clearly stated which of the recording formats (see 2.2 and 2.3) are intended for evaluation with this test film.

3.9.1 In the event that the test film is recorded with a magnetic head extending the full width of the film, or extending to any greater width than the normal for the specific format, the test film shall nevertheless meet the requirements of this International Standard when reproduced in accordance with the International Standard for the specific format.

3.9.2 Test films recorded to a wider track width than the reproducing head will cause the head to gather fringe effect flux at long wavelengths. A correction shall, therefore, be applied to simulate the normal effect on the head of a standard width track. The values and application of such corrections shall be clearly stated.

3.10 This International Standard specifies the minimum requirements for magnetic sound test films. Additional test signals may be added if desired; if added they shall be identified as described in 3.6.

3.11 The test signals for measurement and adjustment of azimuth, reference level, and frequency response may be presented as individual test films, or they may be grouped with two or more functions within a single test film. A flutter test film should be a separate film.

3.11.1 The frequency response is defined for all possible frequencies within the appropriate bandwidth, by specification of one or more time constants to define the response curve.

3.11.2 The relative short-circuit flux levels for multifrequency test films are given in table 3 and represent the appropriate time constant characteristic. The test film levels (after application of incremental corrections supplied when necessary with each individual test film) shall agree within the tolerances defined in this International Standard.

3.11.3 If additional specific frequencies are to be included within the test film, they shall be chosen from the 1 3 octave and 1/6 octave series of ISO 266.

3.11.4 Test films for use in equipment sensitive to a.c. stray fields at the mains frequency may include other signal frequencies that are not simple multiples of the mains frequency.

NOTE — In countries where the power mains are operated at 60 Hz, the frequencies of 63 Hz and 125 Hz may be replaced by 50 Hz and 100 Hz, to minimize the effects of narrow band noise caused by stray a.c. fields at the mains frequency.

3.12 If a pink noise section is included on the test film, the pink noise shall be recorded in such a way that the level within a 1/3 octave band with the centre frequency equal to any of the frequencies given in the appropriate series in table 3 shall be within the tolerances set out in table 3. The recorded level of the pink noise shall not be sufficient to cause saturation of the tape.

3.13 An alternative test film, enabling the azimuth setting of a single track head to be determined without physically changing its setting, comprises alternate short sections of a high-frequency recording with azimuth positions at equal angles in opposite rotations from the correct position. A correctly aligned reproducing head will give equal outputs from both alternating sections. The absolute values of the angles shall not differ by more than 2 min.

Table 1 — Characteristics of test signal for checking and adjusting azimuth

	Unit	Film	
		35 mm/17,5 mm	16 mm
Frequency	kHz	12,5	10,0
Frequency tolerance	%	± 3	± 3
Output uniformity	dB	± 0,5	± 0,5
Azimuth tolerance	min	± 3	± 3
Optional additional azimuth values (see 3.13)	angular minutes	- 20 - 20	- 10 - 10
Modulation		10 dB below reference level, Type 320	
Minimum duration of signal	s	100	100

Table 2 — Characteristics of test signal for checking and adjusting reference level electrical output

	Unit	Film	
		35 mm/17,5 mm	16 mm
Signal frequency	Hz	1 000	400
Frequency tolerance	%	± 3	± 3
Reference level 320 [1]			
Short-circuit flux	nWb·m	320	320
Flux tolerance	nWb·m	± 15	± 15
Reference level 185 [1]			
Short-circuit flux	nWb·m	185	185
Flux tolerance	nWb·m	± 10	± 10
Output uniformity	dB	± 0,5	± 0,5
Harmonic distortion, total	%	< 2	< 2
Flutter, IEC weighted [2]	%	< 0,1	< 0,1
Duration of signal	s	60	60

1) Because of the differences in calibration procedures, reference level Type 185 is actually only about 3,8 dB below reference level Type 320.

2) Weighted flutter measurements should be made in accordance with IEC Publication 386 [5]

ISO 4834-1986 (E)

Table 3 — Characteristics of test signal for the checking and adjusting of frequency response

	Unit	Film	
		35 mm/17,5 mm	16 mm
Reference frequency	Hz	1 000	400
Recorded output level of reference frequency [2]		10 dB below reference level Type 320	
Time constant characteristic	µs	35	70
Frequency series in order of their location in the test film:		Relative short-circuit flux with respect to operating level:	
31,5 Hz	dB	+ 0,21	+ 0,13 [1]
40 Hz	dB	+ 0,21	+ 0,13
63 Hz (See 3.11.4)	dB	+ 0,20	+ 0,13
125 Hz (See 3.11.4)	dB	+ 0,20	+ 0,12
160 Hz [1]	dB	+ 0,20	+ 0,11
250 Hz	dB	+ 0,19	+ 0,08
400 Hz	dB	–	0,00 [2]
500 Hz	dB	+ 0,15	–
1,0 kHz	dB	0,00 [2]	- 0,64
2,0 kHz	dB	- 0,56	- 2,36
4,0 kHz	dB	- 2,28	- 5,99
6,3 kHz	dB	- 4,45	- 9,25
8,0 kHz	dB	- 5,92	- 11,13
10,0 kHz	dB	- 7,46	- 12,95
12,5 kHz	dB	- 9,12	- 14,81
14,0 kHz	dB	- 10,00	–
16,0 kHz [1]	dB	- 11,06	–
Frequency tolerance		± (3 % + 2 Hz)	± (3 % + 2 Hz)
Output deviation within each frequency	dB	± 0,3	± 0,5
Short-circuit flux tolerance	dB	± 0,5	± 0,5
Output uniformity All frequencies	dB	± 0,5	± 0,5
Duration of signal at reference frequency	s	20	20
Duration of signal at all other frequencies	s	8	8

1) Optional frequencies.

2) Reference frequency and normalization point for the response curve.

NOTE — The series proceeding from low frequency to high frequency is normal practice.

Table 4 — Characteristics of test signals for measuring non-uniformity of film velocity of movement (flutter)

	Unit	Film	
		35 mm/17,5 mm	16 mm
Frequency at stated velocity	Hz	3 150 for all formats	
Tolerance on frequency	Hz	± 25 for all formats	
Recorded output level		Equal to reference Type 320	
Output uniformity	dB	± 1 for all formats	
Total weighted wow and flutter content, measured according to IEC Publication N 386 [7]	%	< 0,04	< 0,07

NOTE — This test film may not be suitable for use with some older flutter meters.

4 Bibliography

Characteristics of test materials

[1] IEC Publication 94.2, *Calibration.*

Test methods for calibration tapes and standardization

[2] ANSI S4.6, *Method of measuring recorded flux of magnetic sound records at medium wavelengths.*

[3] IEC Publication 94-3, *Methods of measuring the characteristics of recording and reproducing equipment for sound on magnetic tape.*

[4] DIN 45 520, Jan. 1973, *Magnetbandgeräte.*

[5] IEC Publication 386, *Method of measurement of speed fluctuations in sound recording and reproducing equipment.*

[6] ANSI C16.5, *Standard practice for volume measurements of electrical speech program waves.*

[7] IEC Publication 268-10, *Programme level meters.*

Annex

Additional data

(This annex does not form part of the standard.)

The magnetic flux of reference level 185 is measured by the method given in ANSI S4.6[2], where a special reproducing head with two symmetrical gaps is used. The magnetic film to be measured is run in contact with the front gap and then in contact with the rear gap. The flux can be calculated from the two EMF values and the data of the head.

The magnetic flux of reference level 320 is measured according to DIN 45 520[4], where a search coil senses the flux of a very long wavelength recording. The recording head is then fed with the same current, but at the reference frequency to produce a recording for calibrating a high-efficiency reproducing head.

The azimuth tolerances specified are valid when phase relationships among several records are not critical. For phase-sensitive material, a smaller azimuth tolerance and/or a tolerance on time-coherence of the signals may be required, and written identification of this should be included on the film.