INTERNATIONAL STANDARD

ISO 7832

First edition
1987-11-01

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Cinematography — Photoelectric output factor of photographic-type audio-level test films — Measurement and calibration

Cinématographie — Facteur de sortie photoélectrique des films d'essai de niveau sonore de type optique — Mesurage et étalonnage

Reference number
ISO 7832 : 1987 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7832 was prepared by Technical Committee ISO/TC 36, *Cinematography.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Cinematography — Photoelectric output factor of photographic-type audio-level test films — Measurement and calibration

1 Scope and field of application

This International Standard specifies a method of measuring and calibrating the photoelectric output factor of single-channel photographic-type audio-level test films in all gauges, using a calibrating sound reproducer. It is applicable to both variable area and variable density type sound records with a silver audio track.

It also specifies the performance of a calibrating audio reproducer.

Calibrated audio-level test films are employed to measure the precise output level of photographic sound reproducers, and the photoelectric output factor of different sound records.

They are also employed to establish a reference level on a standard program level meter, chosen to be appropriate for the installation in use.

2 References

ISO 2939, *Cinematography — Picture image area and photographic sound record on* 35 mm *motion-picture release prints — Positions and dimensions.*

ISO 4243, *Cinematography — Picture image area and photographic sound record on* 16 mm *motion-picture release prints — Positions and dimensions.*

ISO 4244, *Cinematography — Photographic sound record on* 8 mm *Type S motion-picture prints — Position and width dimensions.*

ISO 6025, *Cinematography — Photographic-monophonic sound test films — Specifications.*

3 Definitions and symbols

For the purpose of this International Standard the following definitions apply.

3.1 voltage outputs (V_1, V_2, V_3, V_4) : The output voltage levels from the calibrating sound reproducer, measured at a point in the circuitry where the voltage relationship to the amplitude of the sound record is essentially linear.

3.2 maximum photoelectric output (MPO) : The voltage difference obtained between full illumination of the photoelectric receptor by the scanning beam, and complete occulting of the scanning beam, as defined by V_1 and V_4 in figures 1 and 2.

3.3 peak-to-peak voltage (PV) : The voltage difference observed for a sound level test film between the maximum output at the crest of a sine wave (+ peak) and the minimum output at the trough of a sine wave (− peak), as defined by V_2 and V_3 in figures 1 and 2.

3.4 photoelectric output factor (POF) : (When reproducing an audio level test film on a calibrating reproducer.) The ratio of the peak-to-peak output voltage (PV) from the film as defined in 3.3 to the maximum output of the reproducer, as defined in 3.2.

NOTE — An ideal test film would have a photoelectric output factor of 1,0 which is a theoretical value that cannot be obtained in photographic sound recording due to sound track image density and base and fog density.

4 Method of measurement

4.1 The photoelectric output factor shall be measured on a calibrating reproducer, as described in clause 7, with the required instrumentation arranged in accordance with the annex and figures 3 and 4.

4.2 The signal frequencies of the test film shall be as specified in ISO 6025.

5 Method of calibration

Two alternative methods of calibration are given.

5.1 d.c. Method

Calibration is carried out by comparing the steady-state values of full scanning beam illumination on the phototransducer with complete occultation (see figure 1 and clause A.2 of the annex).

5.2 a.c. Method

Calibration is carried out by means of an occulting shutter interrupting the scanning beam illumination on the photoelectric transducer, the shutter operating at the same nominal frequency as that of the audio-level test film (see figure 2 and clause A.3 of the annex).

6 Calibration procedure

Calibration requires electrical measurements, which show the peak-to-peak voltage output obtained, using a true peak reading voltmeter, when running an audio-level test film through a calibrating reproducer. This voltage is expressed as a percentage of the maximum output of the reproducer.

6.1 With the calibrating reproducer conforming to ISO 2939, ISO 4243 or ISO 4244, and with no film in the reproducer, measure the voltage difference between V_1 and V_4, as defined in 3.2.

6.2 With the audio-level test film running through the calibrating reproducer, measure the peak-to-peak voltage difference between V_2 and V_3, as defined in 3.3.

6.3 Calculate the photoelectric output factor, POF, of the audio-level test film using the following equation:

$$\text{POF} = \frac{\text{PV}}{\text{MPO}}$$

7 Calibrating reproducer

7.1 The calibrating reproducer shall comply with the flutter specification of ISO 6025 for the audio-level test film being calibrated.

7.2 The location, azimuth, and focus of the scanning beam shall be aligned using the appropriate photographic test film.

7.3 The width of the scanning beam at the film plane shall be within 1 % of the nominal value specified in ISO 2939, ISO 4243 or ISO 4244.

7.4 Uniformity of illumination across the width of the scanning beam, together with the point-to-point photon efficiency of the phototransducer, shall be constant within ± 5 % when using a snake track test film.

NOTE — The use of calculated corrections to avoid errors is not permitted.

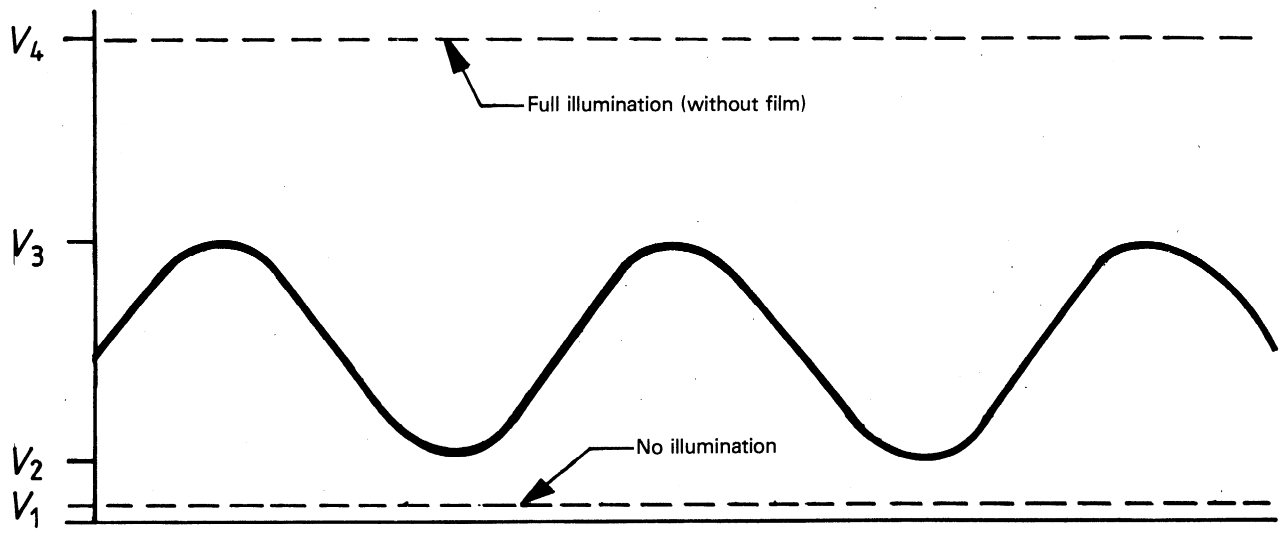


Figure 1 — Calibration waveforms — d.c. method

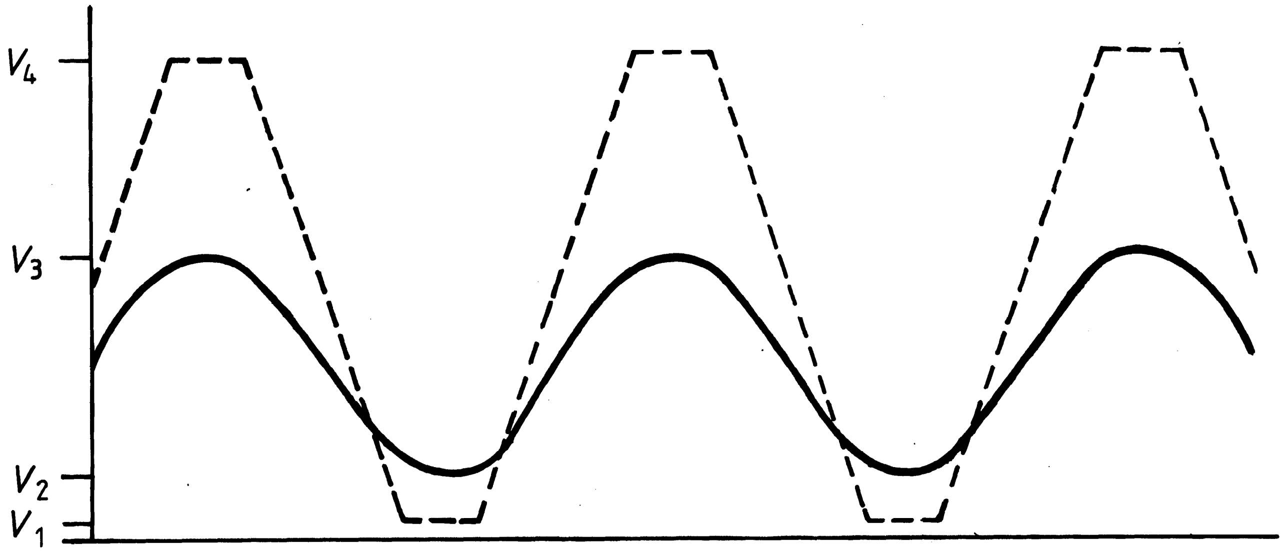
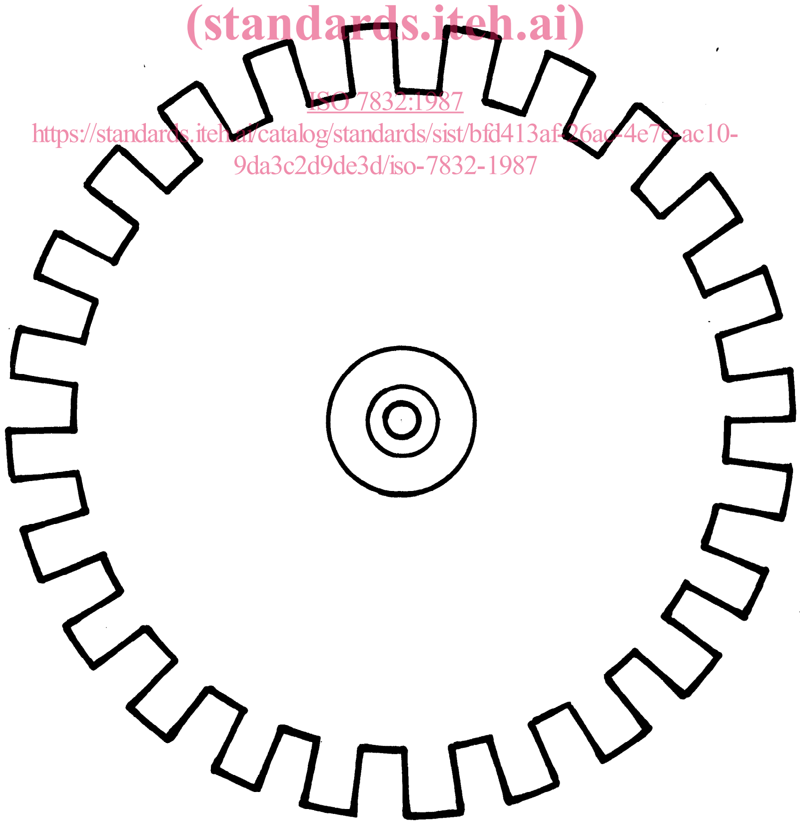


Figure 2 — Calibration waveforms — a.c. method



NOTE — This shutter wheel is designed to give equal on-and-off durations, and may be conveniently driven by any small d.c. motor. The shutter, containing 24 elements as shown, generates a 400 Hz tone at 1 000 r/min, and a 1 000 Hz tone at 2 500 r/min.

Figure 3 — Shutter wheel

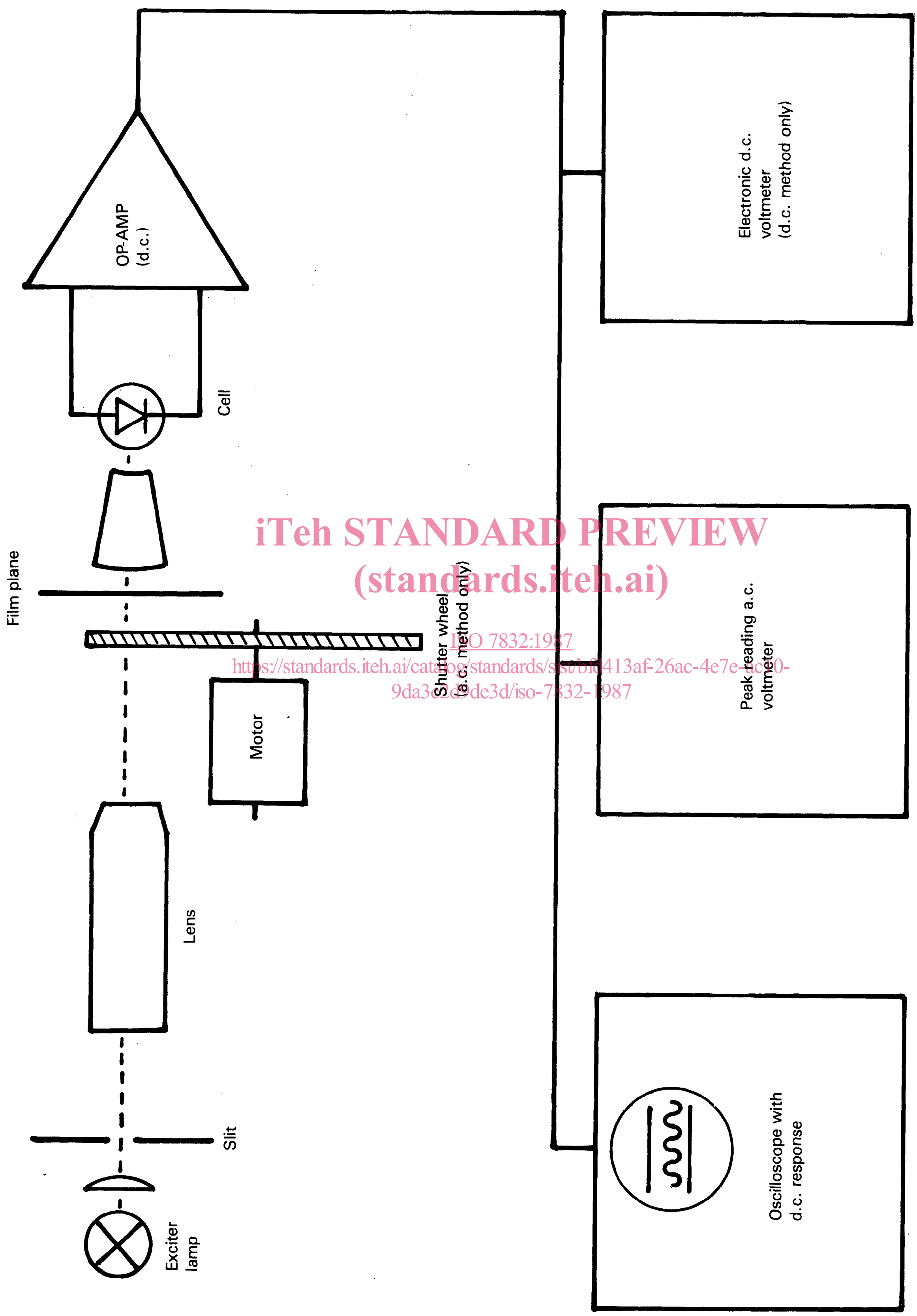


Figure 4 — Equipment required to establish photoelectric output factor

Annex

d.c. and a.c. calibration

(This annex forms an integral part of the standard.)

A.1 Instruction

A.1.1 When using the d.c. method of calibration, it is essential that the combination of phototransducer and amplifier give the same output at 0 Hz or d.c. and the relevant measuring frequency as specified in ISO 6025, and that the combination have a linear voltage versus illumination relationship. If a silicon cell is used as the phototransducer, it shall be connected to a zero input impedance operational amplifier.

A.1.2 When using the a.c. method of calibration, a specially designed shutter wheel finished in non-reflecting black (see figure 3) shall be inserted in the path of the scanning beam. The width of the shutter blades shall be the same as the distance between them, and their dimensions shall be considerably larger than those of the scanning beam at the point of interruption.

A.1.3 The measuring instruments required include a d.c. voltmeter, a peak reading a.c. voltmeter, and an oscilloscope with a d.c. response, connected as shown in figure 4. It is essential to allow the system sufficient time to warm up before any measurements are taken.

A.2 d.c. Calibration

A.2.1 The photoreproducer shall, for constant illumination, have equal electrical peak output at the measuring frequency as specified in ISO 6025 and at 0 Hz.

A.2.2 The combination of the phototransducer and its operational amplifier shall be evaluated for drift and shown to have nominal effect (± 5 %) over the time interval required for measuring.

A.2.3 With no film in the reproducer, measure the maximum photoelectric output (MPO) by comparing the output voltage for direct illumination of the phototransducer by the scanning beam, with the output voltage obtained by complete occulting of the scanning beam, using a d.c. voltmeter.

A.2.4 With the audio-level test film running through the reproducer, measure the peak-to-peak amplitude of the output signal voltage using a peak reading a.c. voltmeter.

A.2.5 Repeat the measurement described in A.2.3 to verify that the drift is within the tolerance specified in A.2.2.

A.2.6 Calculate the photoelectric output factor (POF) using the procedure described in 6.3.

A.3 a.c. Calibration

A.3.1 Provision shall be made on the calibrating reproducer for the scanning beam to be interrupted by a mechanical shutter (see figure 3 and A.1.2), designed so as to give equal on-and-off durations at a nominally constant frequency.

A.3.2 The shutter shall have provision for speed adjustment, so that the frequency of interruption of the scanning beam matches the frequency of the sound record on the audio-level test film (± 5 %).

A.3.3 With no film in the reproducer, and the shutter operating, measure the peak-to-peak amplitude of the output signal voltage using a peak reading a.c. voltmeter. This amplitude reading shall be defined as the maximum photoelectric output (MPO) of the reproducer.

A.3.4 With the audio-level test film running through the reproducer, and the shutter removed or locked open, measure the peak-to-peak amplitude of the output signal voltage on the same peak reading a.c. voltmeter.

A.3.5 Repeat the measurement described in A.3.3 to verify that the drift is within the tolerance specified in A.2.2.

A.3.6 Calculate the photoelectric output factor (POF) using the procedure described in 6.3.

NOTE — If a theoretically derived photoelectric output factor is required, the result can be calculated for variable-area sound records from the following factors :

a) Transmission factor (T) :

A numerical difference obtained between the lightest (T_{hi}) and darkest (T_{lo}) sections of the sine wave on the sound record print, using a correctly adjusted densitometer ($T_{hi} - T_{lo}$).

b) Reduction factor (R) :

The ratio between 100 % modulation of a variable-area sound record and the width of the reproducer slit, as defined by the appropriate International Standard for the gauge. This reduction factor does not apply to variable-density sound records, since the track width is greater than the width of the reproducer slit.

c) Film modulation (M) :

For variable-area sound records, the modulation of the test film measured geometrically in relation to 100 % modulation as defined in the appropriate International Standards referenced in clause 2.

d) The theoretical photoelectric output factor is determined by the equation :

POF (theoretical) $= T \times R \times M$

A.4 Precautions applicable to both calibration methods

A.4.1 Measurements

It is advisable to take at least two or three separate measurements, and compute the mean value.

A.4.2 Scanning beam

The tolerance affecting the accuracy of the scanning beam, as specified in 7.3 and 7.4, should be strictly adhered to for accurate measurement. A slit which exceeds the correct length, as specified in ISO 2939, ISO 4243 or ISO 4244, could conceal the effect of non-uniform illumination and prevent accurate measurement.

A.4.3 Harmonic distortion

The accuracy in measuring the photoelectric output factor of an audio-level test film is not significantly affected by harmonic distortion contained within the test film, provided that total harmonic distortion as measured at the output of the reproducer is not greater than 3 %.

A.4.4 Peak measuring a.c. voltmeter

Peak-to-peak voltage measurements should be made with a true peak measuring voltmeter. Measurements made with an average meter corrected to give pseudo-peak values will not be correct.

NOTE — Audio-level test films showing considerable wear may no longer retain their original photoelectric output factor.

UDC 778.57 : 53.089.6 : 778.554.45

Descriptors : cinematography, motion-picture film, photographic recording, sound reproduction, tests, reference sample, calibration.

Price based on 6 pages