

---

---

**Cinematography — Relative and absolute  
sound pressure levels for motion-picture  
multi-channel sound systems —  
Measurement methods and levels  
applicable to analog photographic film  
audio, digital photographic film audio and  
D-cinema audio**

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

*Cinématographie — Niveaux de pression sonore relatifs et absolus pour  
les systèmes de films cinématographiques sonores multicanaux —  
Méthodes de mesure et niveaux applicables aux films sonores  
photographiques analogiques, aux films sonores photographiques  
numériques et à l'audio de D-cinéma*



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 22234:2005](https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90ab-e5f84de7ad0b/iso-22234-2005)

<https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90ab-e5f84de7ad0b/iso-22234-2005>

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 22234 was prepared by Technical Committee ISO/TC 36, *Cinematography*.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 22234:2005](https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90abe5f84de7ad0b/iso-22234-2005)

<https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90abe5f84de7ad0b/iso-22234-2005>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 22234:2005

<https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90ab-e5f84de7ad0b/iso-22234-2005>

# Cinematography — Relative and absolute sound pressure levels for motion-picture multi-channel sound systems — Measurement methods and levels applicable to analog photographic film audio, digital photographic film audio and D-cinema audio

## 1 Scope

This International Standard specifies the measurement methods and wide-band sound pressure levels for motion-picture control rooms, review rooms, and indoor theatres. Together with ISO 2969, it is intended to assist in standardization of reproduction of motion-picture sound in such rooms.

## 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.

ISO 2969:1987, *Cinematography — B-chain electro-acoustic response of motion-picture control rooms and indoor theatres — Specifications and measurements*

IEC 60268-17:1990, *Sound system equipment — Part 17: Standard volume indicators*

IEC 61672-1:2002, *Electroacoustics — Sound level meters — Part 1: Specifications*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **absolute sound pressure**

spatially averaged sound pressure level of a single channel of a theatrical sound system measured with broadband pink noise at the reference electrical level as a stimulus

NOTE The 0 dB (reference) level for sound pressure is 20  $\mu\text{N}/\text{m}^2$ .

### 3.2

#### **average responding meter**

meter which provides a voltage indication proportional to the average value of the rectified signal, with ballistics as described in IEC 60268-17

### 3.3

#### **bass extension**

technique of taking low-frequency information from a film sound-track, processing it, and sending it to a sub-woofer, as opposed to an LFE channel

NOTE See A.3.

### 3.4

#### **B-chain final chain**

that part of a motion-picture sound reproduction system, as shown in Figure 1 for a typical film system, commencing at the input terminals of the main fader and terminating in the listening area defined in Figure 2 in which sound pressure level measurements are taken

NOTE See A.7.

### 3.5

#### **electroacoustic response**

⟨B-chain⟩ spatially averaged frequency response measured in one-third octave bands as described in ISO 2969

NOTE The electroacoustic response is expressed in decibels.

### 3.6

#### **LFE channel**

discrete low-frequency effects channel, normally having an upper bandwidth between 80 Hz and 125 Hz

### 3.7

#### **pink noise**

stochastic signal having a continuous spectrum with equal energy per equal logarithmic interval of frequency, and with a Gaussian probability distribution of instantaneous amplitude

### 3.8

#### **reference electrical level**

voltage measured by an average responding voltmeter of wide-band pink noise using a measurement band pass filter of 22 Hz to 22 kHz bandwidth when the test signal is at reference recorded level, and when the fader is at its normal setting

iTeh STANDARD PREVIEW

(standards.iteh.ai)

ISO 22234:2005

NOTE See A.5 and A.7. <https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90ab-e5f84de7ad0b/iso-22234-2005>

### 3.9

#### **reference recorded level**

level of pink noise equivalent to 50 % modulation on an analog photographic sound-track, or the equivalent level on a digital photographic sound-track or a digital cinema (D-cinema) sound-track (typically in each case 20 dB below 100 % modulation)

### 3.10

#### **relative sound pressure level**

sound pressure level of one channel when compared with another during reproduction of the wide-band test signal of 3.1, as opposed to the sound pressure level in one frequency range when compared with another

### 3.11

#### **wide-band pink noise**

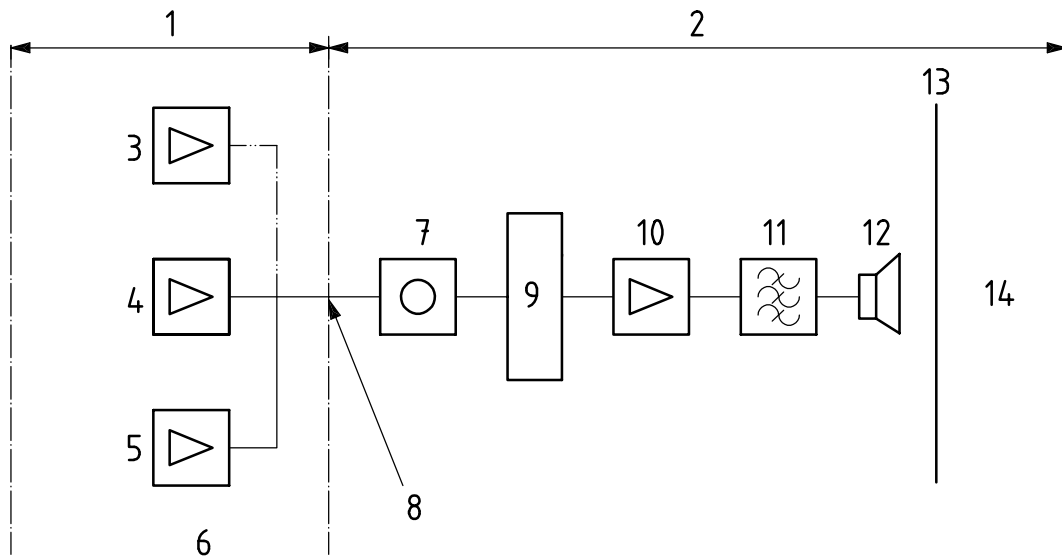
pink noise having a bandwidth exceeding the normal acoustic frequency range

NOTE A suitable test signal should have a frequency response flat to within 0,5 dB when measured in one-third octave bands with centre frequencies from 25 Hz to 20 kHz with an integrating averaging technique.

### 3.12

#### **wide-band sound level meter**

meter which conforms to IEC 61672-1

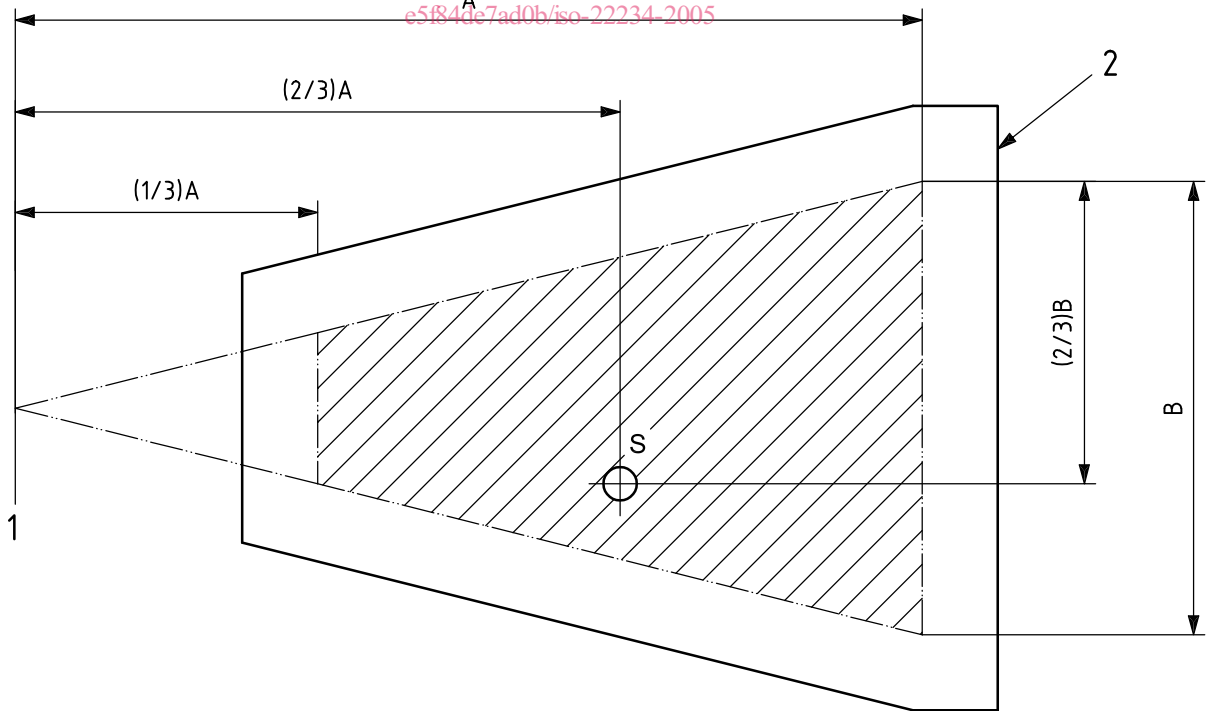


**Key**

- |                                |                                    |
|--------------------------------|------------------------------------|
| 1 A-chain                      | 8 insertion point for test signals |
| 2 B-chain                      | 9 B-chain equalizer                |
| 3 non-sync                     | 10 power amplifier                 |
| 4 magnetic                     | 11 crossover network               |
| 5 photographic                 | 12 loudspeakers                    |
| 6 preamplifiers and equalizers | 13 screen                          |
| 7 main fader                   | 14 auditorium acoustics            |

**Figure 1 — Complete film-based theatrical sound reproduction system**

<https://standards.iteh.ai/catalog/standards/sist/563c9da9-9275-4877-90ab-e5f84de7ad0b/iso-22234-2005>



**Key**

- |                          |
|--------------------------|
| 1 screen                 |
| 2 limits of seating area |

**Figure 2 — Plan view, theatre auditorium**

## 4 Test methods

### 4.1 Electroacoustic response

The electroacoustic response of each channel should be measured and confirmed to comply with ISO 2969 before measurement of relative and absolute sound pressure levels.

### 4.2 Measuring equipment

The sound pressure level of screen and surround channels should be made using a wide-band sound level meter set to C-weighting and slow response. The sound pressure level of the sub-woofer channel should be made using a one-third octave real-time analyser, or a sound level meter with a one-third octave filter set.

### 4.3 Test signal

The test signal should be wide-band pink noise, fed into the sound system one channel at a time. The pink noise should be inserted into the system prior to the main fader, or at an equivalent point. The fader should be set to its normal setting (see A.5 and A.7).

### 4.4 Sound pressure level

The sound pressure level should be measured in at least one position for each screen and surround channel and the measurements for each channel then spatially averaged. If a single location only is selected, it should be position S as shown in Figure 2. All measurement locations should be within the normal seating area as shown in the hatched area in Figure 2. The sub-woofer sound pressure level should be measured in at least four positions and averaged over time intervals of no less than 30 s.

### 4.5 Screen channels

The relative sound pressure level of each screen channel should be within 0.5 dB of the absolute sound pressure level.

### 4.6 Surround channel(s)

If there is one single surround channel, then the sound pressure level when playing the test signal should equal that of the absolute sound pressure level. If there are two independent surround channels, left and right, then each should display a sound pressure level such that when they are simultaneously fed the same in-phase test signal the sum should equal the absolute sound pressure level. For two surround channel systems, the individual sound pressure level for each channel will usually be 3 dB below the absolute sound pressure level. (See A.8.) This procedure will ensure compatibility for theatres with fewer surround playback channels where the surround information is combined. With three or more surround channels, the individual channel reproduction levels should be set up to be equal to one channel of a two surround channel system.

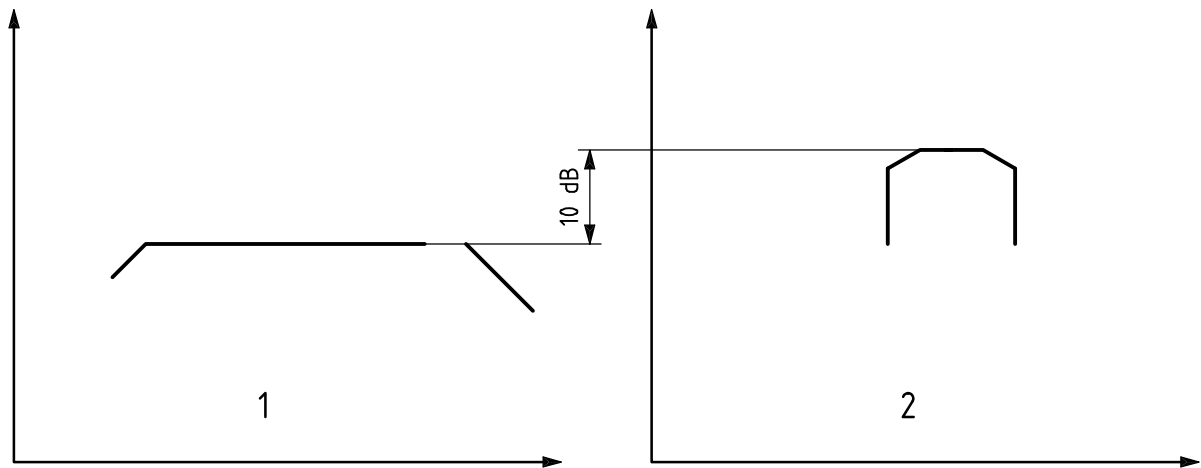
### 4.7 Sub-woofer LFE channel, playback of discrete digital photographic sound-track or D-cinema sound-track

The sub-woofer channel, when compared with a wide-band screen channel, should show 10 dB of "in-band" gain when viewed on a real-time analyser, i.e. a level in its pass band 10 dB higher than the level in the pass band of the screen channel. See Figures 3 and A.1.

### 4.8 Sub-woofer channel, for playback of matrix-encoded analog photographic sound-track with bass extension playback processing

The bass extension sub-woofer channel, when compared with a wide-band screen channel, should show the same level, i.e. should show no "in-band" gain when viewed on a real-time analyser. See Figures 4, A.2 and A.3. If the test signal is applied to both the centre screen channel and the sub-woofer channel simultaneously, the analyser should show 3 dB of "in-band" gain in the frequency area common to both transducers.





**Key**

- 1 RTA display, single screen channel, wide-band pink noise
- 2 RTA display, sub-woofer, wide-band pink noise

**Figure 3 — Measurement of subwoofer sound-pressure level, digital LFE sound track, using real-time analyser**

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)



**Key**

- 1 RTA display, single screen channel, wide-band pink noise
- 2 RTA display, sub-woofer, wide-band pink noise

**Figure 4 — Measurement of subwoofer sound-pressure level, analog photographic sound track with bass extension playback processing, using real-time analyser**

**5 Reference level**

The reference level defined as in 3.1 and measured as specified in this International Standard should be 85 dB (C-weighted), for normal theatrical operation.