INTERNATIONAL STANDARD

ISO 11315-2

First edition
1997-11-15

Photography — Projection in indoor rooms —

Part 2:
Screen luminance test for still and video projection

Photographie — Projection en salles —

Partie 2: Essai de luminance de l'écran pour projection fixe et vidéo

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Reference number
ISO 11315-2:1997(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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 11315-2 was prepared by Technical Committee ISO/TC 42, *Photography*.

ISO 11315 consists of the following parts, under the general title *Photography — Projection in indoor rooms*:

— *Part 1: Screen illumination test for still projectors*

— *Part 2: Screen luminance test for still and video projection*

— *Part 3: Projection reflecting screens*

— *Part 4: Reflecting projection screens — Classification and measurement of reflected screen luminance levels and sound attenuation*

Annexes A and B of this part of ISO 11315 are for information only.

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Photography — Projection in indoor rooms —

Part 2:
Screen luminance test for still and video projection

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1 Scope

This part of ISO 11315 specifies the measurement of screen luminance level, as seen by a (seated) viewer for all types of purely optical still projection in darkened projection rooms. Since the optical characteristics of the surface of this screen have a direct bearing on luminance, the screen shall be considered an integral part of the projection system for this part of ISO 11315.

A standardized light-measuring system allows comparison of screen luminance values for different projection systems used alternately in practical use.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of 11315. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11315 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2910:1990,	*Cinematography - Screen luminance for the projection of motion-picture prints in indoor theatres and review rooms.*
ISO 11315-1:1997,	*Photography - Projection in indoor rooms - Part 1: Screen illumination test for still projectors.*
CIE No. 15.2:1986,	*Colorimetry* (2nd edition).
CIE No. 69:1987,	*Methods of Characterizing Illuminance Meters and Luminance Meters - Performance, Characteristics and Specifications.*

3 Definitions

For the purposes of this part of ISO 11315, the following definitions apply.

3.1 luminance: The quotient of the flux leaving, arriving at or passing through an element of surface and propagated in directions defined by an elementary cone containing the given direction by the product of solid angle of the cone and the area of the orthogonal projection of the element of surface on a plane perpendicular to the given direction.
[CIE-Publ. No. 17]

3.2 screen: A light-reflecting or light-transmitting surface with defined optical properties for the purpose of projection. In this part of ISO 11315, screen means the screen-picture area of the complete installed projection screen only appropriate to the print format (slide) and projection system in use.

3.3 theatrical projection: An indoor public projection system (e.g. in multi-purpose halls, auditoriums of universities, cinemas, etc.)

3.4 viewing area: A limited area for the — preferably seated — viewers. It allows good viewing conditions independent of the relative dimensions of the projection screen area. (See annex A, A.5.)

3.5 still projection: All projection methods with one or more projectors for slides, overhead-projection transparencies, episcopic pictures for projection and transparent LCDs.

3.6 uniformity ratio, g_2: The ratio of the lowest measured illuminance/luminance to the highest measured illuminance/luminance, e.g. L_{min}/L_{max} (x 100 in %).
[CIE-Publ. No. 17]

4 Test method for determining the screen luminance

The distribution of luminance over the screen surface from a complete projection installation (i.e. including projector and screen in a projection room) is influenced by impinging light generated by the projector (not by room lighting), and the properties of the screen.

The luminance towards the viewing area is directly dependent on the angle of the reflected (or transmitted) light by the screen surface as well as on the viewing position. It is expressed as a curve by the luminance factor indicatrix (see note below). To achieve this, the luminance distribution shall be determined at three test points (see figure 1) for three selected viewing positions.

NOTE — The luminance factor indicatrix will be covered in ISO 11315-4 which is being prepared.

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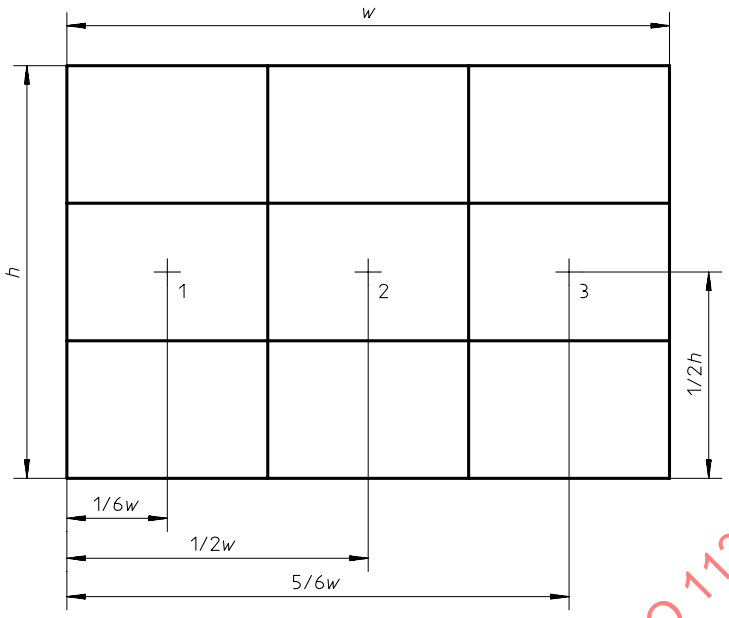

Key

w Width of the projected image

h Height of the projected image

NOTE — The final location of relevant test points is determined by the screen ratio actually used during projection.

Figure 1 - Location of the test points (1 - 2 - 3) on the screen

Luminance shall be measured from three positions of the measuring device in the viewing area (see figure 2, B-A-C) to three test points (1 - 2 - 3) on the screen.

5 Measurement of screen luminance

5.1 Preconditioning

The preparation procedure shall be the same as for the measurement of screen illumination according to ISO 11315-1:1997, subclause 4.1.

5.2 Measuring device

The screen luminance shall be measured with a luminance meter having a recommended field angle not greater than 1,5° and the spectral sensitivity of a Standard Colorimetric Observer (CIE-Publ. No. 15.2).

The measuring inaccuracy shall not exceed ± 10 %. The luminance meter shall comply with the requirements of class B (CIE-Publ. No. 69).

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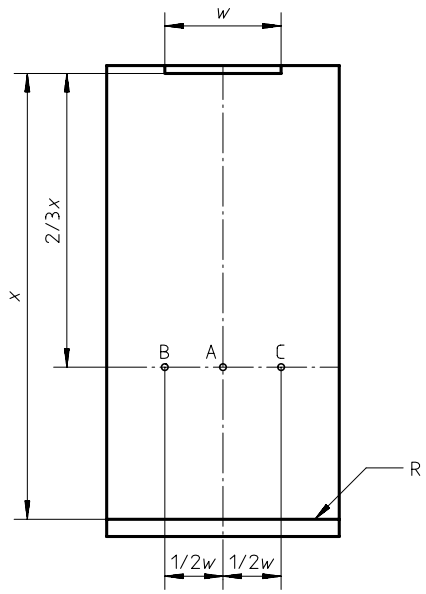

Key

w	Screen width
x	Distance from screen to last row of seats
B-A-C	Position of measuring device
R	Last row of seating

Figure 2 - Position of measuring device in viewing area

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5.3 Position of measuring device in the viewing area

The measurements shall be taken with the luminance meter located approximately 1 m above the floor on the longitudinal axis of the projection room in the centre of the main seating area and at a position 2/3 of the distance from the screen to the last row of seats. To ensure satisfactory performance in all parts of the projection room, measurements shall also be taken with the luminance meter located approximately 1 m above the floor at two points on a transverse line across the projection room, at a position 2/3 of the distance from the screen to the last row of seats (measured from the screen) and a distance of 1/2 of the screen's width to each side of the longitudinal axis of the projection room.

5.4 Test points on the screen

The screen luminance shall be measured as shown in figure 1 at three test points (1 - 2 - 3).

5.5 Measurement of luminance in the centre of the screen (L_2)

The screen luminance is determined by the luminance value L_2, measured at the central test point 2 on the screen (see figure 1), and shall be measured from the test position A in the viewing area.

5.6 Measurement of luminance at points 1 and 3

The screen luminance at points 1 and 3 is determined by luminance values L_1 and L_3 measured from the test positions B and C in the projection room.

This results in the following values:

From position B: L_{1B} and L_{3B}
From position C: L_{1C} and L_{3C}

6 Uniformity ratio g_2 of screen luminance

Calculate the uniformity ratio g_2 from the following equation:

$$g_2 = \frac{\min.\{L_{1B}, L_{3B}, L_{1C}, L_{3C}, L_2\}}{\max.\{L_{1B}, L_{3B}, L_{1C}, L_{3C}, L_2\}} \times 100\ \%$$

(calculated to one decimal place)

7 Test results

Give the results of the test according to this part of ISO 11315 in the form of the example below.

to test point on screen	from position	luminance cd/m²
2 (centre)	A (centre)	L_2 = ...
1	B	L_{1B} = ...
3	B	L_{3B} = ...
1	C	L_{1C} = ...
3	C	L_{3C} = ...
uniformity ratio g_2		= ... %

8 Uniformity of luminance distribution

Over the complete screen surface, the screen luminance shall appear to be even and substantially symmetrical about the screen centre. This shall be checked from multiple positions of the viewing area.

9 Frequency of measurement

To account for changes in the light-handling properties of a projection system in the course of time (e.g. ageing of the lamp reflector, darkening of the bulb, misadjustment and reduction of the projection properties of the screen), it is recommended that the luminance measurement be repeated, at least in the centre of the screen, at intervals of three months.

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Annex A
(informative)

Measuring methods

A.1 General
It is becoming increasingly common today to use several alternative types of projection during a single show. This fact makes it necessary to set up a standardized technique for measuring light on a screen for all projection methods, in order to reach defined projection conditions during a presentation with different types of projectors.

All projection methods included in this part of ISO 11315 involve optical projection, i.e. the projection of an image onto a projection screen by optical means. Electronic projection methods which project images onto monitor-type screens (e.g. TV monitors, TV receivers, computers, etc.) do not fall within the scope of this part of ISO 11315. Furthermore, holographic systems are not within the scope of this part of ISO 11315.

Measuring methods are required for the

- screen illuminance: ISO 11315-1, for still projection (revision of ISO 8341:1989)
- screen luminance: this part of ISO 11315, for still projection; ISO 2910:1990, for motion-picture projection
- distribution of screen luminance: ISO 11315-3 for rear projection screens, still projection; ISO 11315-4 (which is being prepared) for front projection screens, still- and motion-picture projection

A.2 Recommended luminance level
For motion-picture projection see ISO 2910:1990.

A.2.1 Luminance level of screen centre
For all kinds of public projection, the luminance level of the screen centre L_2, 50 cd/m² ± 15 cd/m², for each format of interest will be recommended if possible.

A.2.2 Acceptable limits of screen luminance
The range of the screen luminance acceptable for indoor theatres is based on practical experience and limitations. It should be understood that the nominal light level in review rooms has been established at 50 cd/m² for all formats. Therefore, in order to reproduce the pictorial qualities seen in the review room, the value for theatres should also be 50 cd/m². However, satisfactory performances can be obtained within the stated limits. The lower limit of 35 cd/m² is dictated by the need to maintain sufficient luminance to perceive colour and detail, especially in dark pictures.

NOTE — Projection in semi-dimmed rooms (valid in the field of education, advertising and promotion) needs separate conditions for the relationship between the projection light and the dimmed light in the projection room.

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A.2.3 Evenness of luminance level
The limit of g_2 shall be at min. 50 %.

A.2.4 Spectral distribution of luminance
When using incandescent tungsten light, the light reflected (or transmitted) from the screen shall have a spectral distribution comparable to that of a black body at a colour temperature of 3 200 K ± 350 K.

When using Xenon-light sources, the light reflected (or transmitted) from the screen shall have a spectral distribution comparable to that of a black body at a colour temperature of 5 400 K ± 400 K.

A.3 Multiple projector adjustment

A.3.1 Luminance match for projection installations of same format
The luminance from all projectors intended for use in the continuous viewing of materials of the same format shall not vary by more than 10 cd/m² at the screen centre.

A.3.2 Luminance match for projection installations of different formats or different projection systems
The luminance from all projectors intended for use in the sequential viewing of materials of different formats or different projection systems shall not vary by more than 15 cd/m² at the screen centre.

A.3.3 Colour temperature match
The difference in correlated colour temperature of the light reflected (or transmitted) from the screen when using projectors intended for sequential operation shall not be more than 400 K.

A.4 Projection units

This projection system means the inclusion of a projector and a transmission screen in a single apparatus, in practice used as microfilm readers, devices for slide projection or editing tables. In practice, light measurements on this projection system are limited to luminance level only, measured from a standard position.

A.5 Distance of last row $6 \cdot w$

The relationship $6 \cdot w$ (distance of last row to the screen based on 6 times the screen's width w) is the result of many experiences for the perception of smallest details by a viewer in the last row during the projection. For all kinds of projection (education, advertising and promotion included), the value $6 \cdot w$ shall not be exceeded.

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