INTERNATIONAL STANDARD

ISO 11315-1

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Photography — Projection in indoor rooms —

Part 1:
Screen illumination test for still projectors

Photographie — Projection en salles —

Partie 1: Essai de luminosité de l'écran pour projecteurs fixes

Reference number
ISO 11315-1:1997(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 11315-1 was prepared by Technical Committee ISO/TC 42, *Photography*.

It cancels and replaces ISO 8341:1989, of which it constitutes a technical revision.

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 1:
Screen illumination test for still projectors

1 Scope

This part of ISO 11315 specifies a laboratory measuring method for determining the utilised flux of the projector and the uniformity of screen illuminance in darkened projection rooms for all types of purely optical still projection.

A standardized uniform light-measuring system allows comparison of screen illuminance 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 ISO 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.

CIE No. 15.2:1986, *Colorimetry* (2nd edition).

CIE No. 17.4:1987, *International Lighting Vocabulary* [Same edition as IEC 50(845): *International Electrotechnical Vocabulary,* Chapter 845: *Lighting*.]

CIE No. 18.2:1983, *The Basis of Physical Photometry*.

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 illumination: The application of visible radiation (light) to an object.
[CIE-Publ. No. 17]

3.2 luminous flux; light output: The quantity derived from radiant flux by evaluating the radiation according to its action upon a selective receptor, the spectral sensitivity of which is defined by the standard spectral luminous efficiencies.
[CIE-Publ. No. 17]

3.3 utilised flux: The luminous flux received on one side of the reference surface.
[CIE-Publ. No. 17]

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

3.5 dark-room projection: An indoor room without any additional room lighting, except safety-lights for steps, emergency exits, etc.

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

4 Preparation for photometric measurements

4.1 Preconditioning

Before the commencement of any test, the projector shall be conditioned by being kept under the environmental conditions of the testing laboratory for at least 8 h.

4.2 Projector set-up (light path)

While making the tests, the projector shall be operated with its normal components (e.g. light source, heat filter, condenser, lens), but without projection material (i.e. slides, films, etc. in the picture area or aperture plate).

4.3 Voltage, current and frequencies

4.3.1 The projector shall be operated from an adjustable power supply adjusted to within ± 0,5 % of the rated voltage of the projector.

While adjusting the supply for tungsten lighting or non-controllable discharge lamps, the voltage shall be measured at the supply socket to which the recommended power supply cord of the projector is connected. The frequency of the power supply shall match the manufacturer's rating for the projector.

For controllable xenon-discharge lamps, the current shall be the nominal value (according to the data of the lamp-manufacturer) ± 0,5 %. In the case of xenon discharge lamps with a relatively vast luminous flux, the measurement shall be made through a highlight film (approximately $D = 0,1\text{-}0,15$ where D is the film thickness, in millimetres) and with half of the nominal current. The value of the nominal luminous flux shall be calculated from the above parameters.

4.3.2 If the projector (equipped with tungsten lighting or non-controllable discharge lamps) is suitable for use at different voltages and/or frequencies, the measurements for determining the luminous flux shall be made either at each adjustable voltage ± 0,5 % and its related frequency, or at least at a selection of characteristic voltages and frequencies. When selecting the voltages and frequencies, consideration shall be given to the main usage of the projector in practice, and the conditions under which extreme differences of the test results might be expected. The measurements for determining the uniformity of screen illuminance can be made at any position of the voltage selector with the respective line voltage ± 0,5 % and the related frequency.

4.3.3 For determining the input voltage of the tungsten lamp, the voltage at the lamp holder shall be measured with the lamp operating, and after the time specified in 4.8 has elapsed. (When a lamp is provided by a switching power supply, use a true r.m.s voltmeter.)

4.4 Lamp adjustment

The lamp shall be adjusted in the projector according to the operating instructions.

4.5 Cleanliness

The optical elements of the projector shall be free from dust and other contamination.

4.6 Ambient temperature

The ambient temperature in the testing laboratory shall be 23 °C ± 2 °C.

4.7 Projector alignment

The projector shall be positioned so that the projection of its optical axis is normal to the plane of the screen. (See annex A, note.)

4.8 Stabilization

If the lamp is fed via a transformer or a ballast resistance, the light measurements shall be started, at the earliest, 20 min after having switched on the lamp, running under normal test conditions. If the lamp is fed directly by the mains voltage, the measurements can be started after 5 min.

4.9 Ambient light

The illumination of the screen due to ambient light should not exceed 1 % of the screen illuminance due to illumination projected through the projector lens during the measurement. For the reduction of stray light, the use of a black screen is recommended.

5 Light-measuring equipment

5.1 General
The photometric properties of projectors are described by the luminous flux (see 6.4.2) and by its uniformity on the projection screen (see clause 7).

5.2 Photometer
The photometer used shall have a spectral response characteristic corresponding to the CIE 1931 Standard Colorimetric Observer as specified in CIE No. 15.2:1986 (E-1.3.1). (This response correlates with the colour sensation of the human eye.)

A physical receiver shall assess the illuminance in accordance with the spectral luminous efficiency for photopic vision $V(\lambda)$ as specified in IEC 50(845):1987, term 845-01-22 or CIE Publ. No. 18. The illuminance shall comply with class B as specified in CIE-Publ. No. 69.

The effective diameters of the photo-electrical component shall be specified in the test results (see clause 8).

5.3 Use of light meter
The light-sensing element of the meter shall be positioned at the plane of the screen with a tolerance of + 20 mm and parallel to it so that it measures directly the incident projected light.

6 Measurement of useful luminous flux (light output)

6.1 The useful luminous flux is calculated from the average screen illuminance and the respective projection area.

6.2 The effective projection area (see figure 1) $A = w \times h$

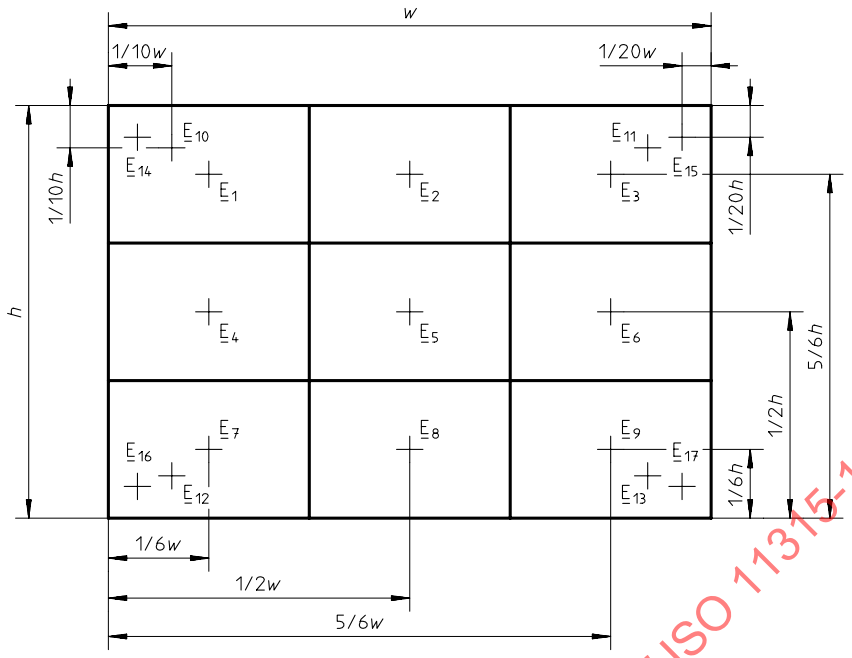
where

A is the effective projection area, in square metres;
w is the effective projection width, in metres;
h is the effective projection height, in metres.

A shall be confined by using a suitable mask positioned in the picture area and brought to focus (e.g. an empty slide mount).

6.3 For determining the average screen illuminance, the projected light shall be measured at nine points ($\underline{E}_1$ - $\underline{E}_2$ - $\underline{E}_3$ - $\underline{E}_4$ - $\underline{E}_5$ - $\underline{E}_6$ - $\underline{E}_7$ - $\underline{E}_8$ - $\underline{E}_9$) on the screen as shown in figure 1.

Do not deduct the unlighted corner areas (e.g. of an overhead projector) from the calculated area.



Key

w Effective projection width

h Effective projection height

Figure 1 - Screen illuminance measuring points on the screen
(for the selection of test points, see 7.3)

6.4 Calculating the useful luminous flux

6.4.1 The arithmetical average of the nine readings (E_X) of screen illuminance is given by $\overline{E}$, in lux:

$$\overline{E} = \frac{\sum_{x=1}^{9} E_x}{9}$$

6.4.2 To determine the effective luminous flux of a projector, the illumination is measured at a number of specified positions on the screen. A mean value (useful luminous flux) is calculated, which is then multiplied by the used area of the screen, in square metres.

The utilised luminous flux Φ of the projector is given in lumens:

$$\Phi = \overline{E} \times A$$

where *A* is the effective projection area on the projection screen *w* x *h* (see 6.2).

6.4.3 The effective projection area *A* shall be in the range from 1 m² to 2 m². In order to determine the projection area used for the test, the normal usage for which the projector is designed shall be noted.

7 Uniformity of screen illuminance

By combining the screen illuminance at various positions, the uniformity of its distribution on the screen is established by the uniformity ratio g_2.

NOTE — The highest measured illuminance E_{max} is normally measured at point $\underline{E}_5$ (see figure 1).

7.1 Determining the uniformity of screen illuminance

For determining the uniformity of screen illuminance, intensities of illuminance at different corner points are set in proportion to the intensity of the illuminance at the centre of the screen.

7.2 Alternative types of different measuring positions

Three different types of measuring points are defined (see figure 1) and any or all of them can be used:

a) type 1: corner points

$\underline{E}_1$ - $\underline{E}_3$ - $\underline{E}_7$ - $\underline{E}_9$ at $\frac{w}{6}, \frac{h}{10}$

(for all kinds of projectors);

b) type 2: corner points

$\underline{E}_{10}$ - $\underline{E}_{11}$ - $\underline{E}_{12}$ - $\underline{E}_{13}$ at $\frac{w}{10}, \frac{h}{10}$

(for all types of slide projectors);

c) type 3: corner points

$\underline{E}_{14}$ - $\underline{E}_{15}$ - $\underline{E}_{16}$ - $\underline{E}_{17}$ at $\frac{w}{20}, \frac{h}{20}$

(for all types of slide projectors).

7.3 Calculating the uniformity of screen illuminance

From each type of corner point, the point with the lowest intensity of illuminance is chosen. The illuminance value at this point is calculated as a proportion of the illuminance value at the centre point (E_5).

The resulting values, $g_{2\text{-}6}$ or $g_{2\text{-}10}$ or $g_{2\text{-}20}$, serve as indications of the uniformity of screen illuminance:

Measuring position

a) type 1: $g_{2\text{-}6} = \frac{E_{\min(1,3,7,9)}}{E_5} \times 100\ \%$

(for all types of projectors);

b) type 2: $g_{2\text{-}10} = \frac{E_{\min(10,11,12,13)}}{E_5} \times 100\ \%$

(for all types of slide projectors);

c) type 3: $g_{2\text{-}20} = \frac{E_{\min(14,15,16,17)}}{E_5} \times 100\ \%$

(for all types of slide projectors).

8 Test results

Give results of the tests according to this part of ISO 11315 in the form of the example in table 1.

Table 1- Report of tests results - Example of presentation of results for a slide projector

Test subject			Projector manufacturer / model name / number/ serial number	
Rated voltage			100 V, 120 V, 230 V, 240 V	
Frequency			50 Hz or 60 Hz	
Nominal lamp			24 V / 250 W Halogen	
Manufacturer and type number of lamp			MNO comp. Type No. 1234	
Lens			(name), f = 3,5/85 mm	
Picture aperture format			nominal 24 mm x 36 mm actual 22,5 mm x 34,3 mm	
Voltage selector position V	**Projector input** V	Hz	**Lamp input** V	**Luminous flux** lm
100	100	50	22,95	710
120	120	60	23,00	720
220/230	230	50	24,00	810
240	240	60	23,05	730
Uniformity of screen illuminance			$g_{2\text{-}6}$ = 75 % $g_{2\text{-}10}$ = 68 % $g_{2\text{-}20}$ = 62 %	