

Definition

The lux is the SI unit of illuminance, the symbol is 'lx'.

1 lx = 1lm / m²
(One lux is equal to one lumen per square metre.)

Colloquially lux is the luminance with which an surface area (e.g. place, workplace) is illuminated.

Examples

Average luminance at a given light source:

| Light source | Lux |
|--------------------------------------------|---------|
| Starry sky at night without moon | 0,000.5 |
| Starlight (new moon) | 0,01 |
| Moonlight (full moon) | 0,25 |
| Candle at a distance of 1m | 1 |
| Twilight after sunset | 1 |
| Street lighting | 10 |
| Stair case lighting | 100 |
| Lighting in an office | 500 |
| Family living room | 200 |
| Lighting in a TV-Studio | 1.000 |
| Operation room | 10.000 |
| Shadow in the summer | 10.000 |
| Sunlight on an average day (min.) - cloudy | 20.000 |
| Sunlight on an average day (max.) - bright | 100.000 |

Average luminance of different lightning equipment:

| surface areas, places, sites | Lux |
|------------------------------|-----|
| stock rooms | 10 |
| road, speed <= 30km/h | 10 |
| road, speed <= 50km/h | 20 |
| working place: tunnelling | 30 |
| train platform | 50 |
| working place: office | 500 |

Methods for measuring

Luxmeter

Basically the luxmeter serves for measuring the illumination level.

Alternative Methods

Light meter (Photometer)

Alternatively to measure the illumination level a light meter can be used. Usually they are used in the field of photography and are often available as second hand products for attractive prices. Although the measurement is not very accurate it usually fits the fundamental requirements.

The reason for the inaccuracy is often found in the device-specific parameters, which are not optimised for the optical system used.

Measuring method: spot meter

A mid grey object is put onto the surface to be measured, for instance a mid grey object a grey card (rear of a notepad), the palm of one's hands or the so-called grey card that is usually used in photography (most accurate) can be used. Shiny, very bright or dark surfaces should not be used. The light meter is to be set to spot meter with a film speed of 21 DIN or 100 ASA. Now the mid grey object should be measured from a short distance – pay attention to shading of the hand or the light meter itself. Parameters such as shutter and shutter speed should be noted. The calculation using these two values is the same for both measuring procedures and described below.

Measuring method: reflected meter

The light meter is to be set to reflected meter method (use a calotte) with a film speed of 21 DIN or 100 ASA. The light meter should now be centred to the surface to be measured, whereas the calotte (with diffuser) should be focused towards the lighting source. Measuring should be performed and parameters as shutter and shutter speed should be noted. The computation using these two values is the same for both measuring procedures and described below.

Computation of the illuminance

$$E = \frac{345 \cdot k^2}{ISO \cdot t}$$

E: luminance in lx
k: shutter
t: shutter speed
ISO: film speed in ASA

Example: Shutter 4 was determined with 1/8s shutter speed

$$E = \frac{345 \cdot 4^2}{100 \cdot \frac{1}{8}} = 441,6lx$$

A value of 441,6 Lux is calculated for the measured surface.

If a light meter can only process DIN values the following table shows the correlation between DIN and ASA:

| DIN | ASA |
|-----|------|
| 15 | 25 |
| 18 | 50 |
| 21 | 100 |
| 24 | 200 |
| 27 | 400 |
| 30 | 800 |
| 33 | 1600 |

Attention: The shutter speed of light meters is given in fractions of seconds. These are only in whole numbers when extremely long shutter times are needed.

History

0100

| | |
|----------------------------|----------------------------------------|
| Technician | Peter Reiter |
| Date | 2007/03/27 |
| Reason of the changes | First version of this application note |
| Description of the changes | |

0101

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| Technician | Peter Reiter |
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0102

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