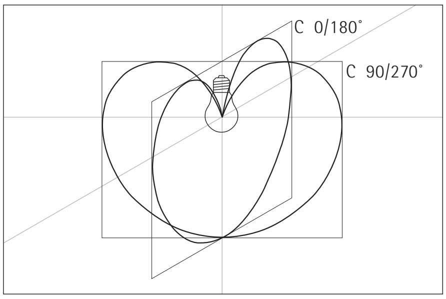
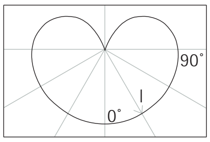
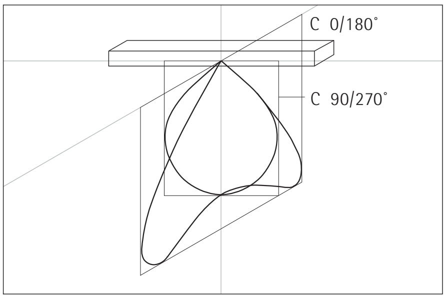
fined as the standard; since 1979 the candela has been defined by a source of radiation that radiates 1/683 W per steradian at a frequency of $540 \cdot 10^{12}$ Hz.

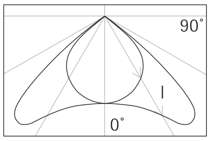
The distribution of the luminous intensity of a light source throughout a space produces a three-dimensional graph. A section through this graph results in a *luminous intensity distribution curve*, which describes the luminous intensity on one plane. The lumious intensity is usually indicated in a polar coordinate system as the function of the beam angle. To allow comparison between different light sources to be made, the light distribution curves are based on an output of 1000 lm. In the case of symmetrical luminaires one light distribution curve is sufficient to describe one luminaire, axially symmetrical luminaires require two curves, which are usually depicted in one diagram. The polar coordinate diagram is not sufficiently accurate for narrow-beam luminaires, e.g. stage projectors. In this case it is usual to provide a Cartesian coordinate system.



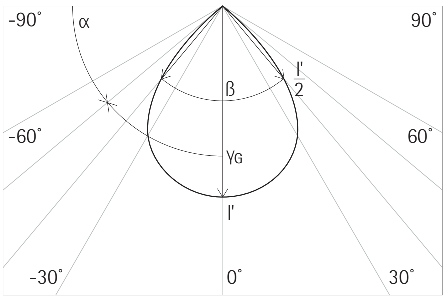


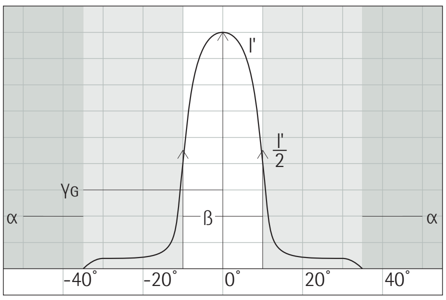
Luminous intensity distribution of a light source having rotational symmetry. A section through the C plane produces the luminous intensity distribution curve.





Luminous intensity distribution body and diagram (for planes C 0/180° and C 90/270°) of an axially symmetrical luminaire.





Luminous intensity distribution curve standardised to 1000 lm, represented in polar coordinates and Cartesian coordinates. The angle within which the maximum luminous intensity I' is reduced to I'/2, identifies the beam spread β. The cut-off angle α is the limiting angle of the luminous intensity distribution curve.

$$\mathbf{I = I' \cdot \Phi}$$

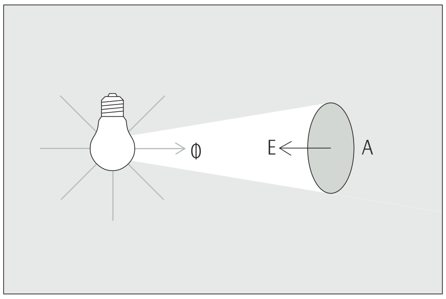
$[I] = cd$

$[I'] = cd/klm$

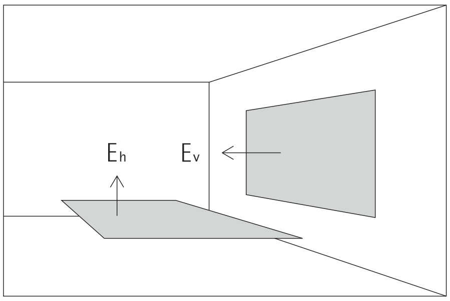
$[\Phi] = klm$

Conversion of 1000 lm-related luminous intensity I' to effective luminous intensity I.

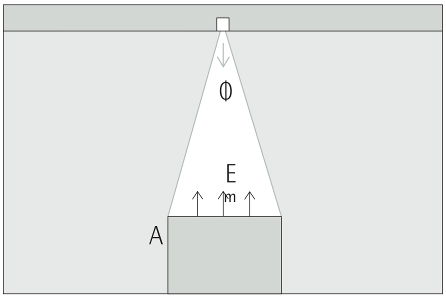
Illuminance E indicates the amount of luminous flux from a light source falling on a given surface A.



Horizontal illuminance E_h and vertical illuminance E_v in interior spaces.

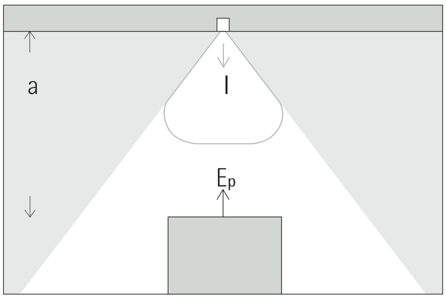


Average illuminance E_m is calculated from the luminous flux Φ falling on the given surface A.



$$E_m = \frac{\Phi}{A}$$

The illuminance at a point E_p is calculated from the luminous intensity I and the distance a between the light source and the given point.



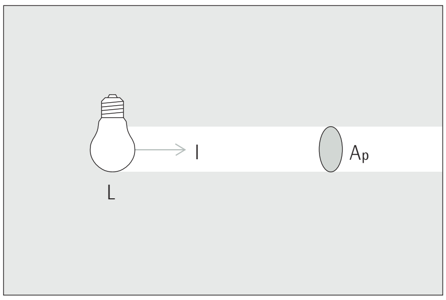
$$E_p = \frac{I}{a^2}$$

$[E_p] = lx$

$[I] = cd$

$[a] = m$

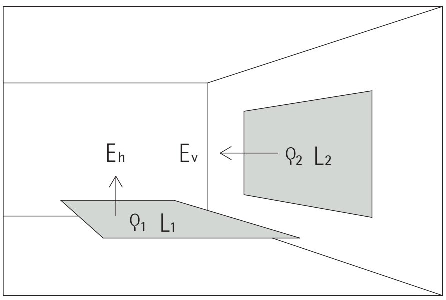
The luminance of a luminous surface is the ratio of luminous intensity I and the projected surface area A_p.



$$L = \frac{I}{A_p}$$

$$[L] = \frac{cd}{m^2}$$

The luminance of an illuminated surface with diffuse reflectance is proportional to the illuminance and the reflectance of the surface.



$$L_1 = \frac{E_h \cdot \rho_1}{\pi}$$

$$L_2 = \frac{E_v \cdot \rho_2}{\pi}$$

$$[L] = \frac{cd}{m^2}$$

$[E] = lx$

2.2.5 Illuminance

Illuminance is the means of evaluating the density of luminous flux. It indicates the amount of luminous flux from a light source falling on a given area. Illuminance need not necessarily be related to a real surface. It can be measured at any point within a space. Illuminance can be determined from the luminous intensity of the light source. Illuminance decreases with the square of the distance from the light source (inverse square law).

2.2.6 Exposure

Exposure is described as the product of the illuminance and the exposure time. Exposure is an important issue, for example, regarding the calculating of light exposure on exhibits in museums.

2.2.7 Luminance

Whereas illuminance indicates the amount of luminous flux falling on a given surface, luminance describes the brightness of an illuminated or luminous surface. Luminance is defined as the ratio of luminous intensity of a surface (cd) to the projected area of this surface (m^2).

In the case of illumination the light can be reflected by the surface or transmitted through the surface. In the case of diffuse reflecting (matt) and diffuse transmitting (opaque) materials luminance can be calculated from the illuminance and the reflectance or transmittance.

Luminance is the basis for describing perceived brightness; the actual brightness is, however, still influenced by the state of adaptation of the eye, the surrounding contrast ratios and the information content of the perceived surface.