Optical radiation	λ(nm)
UV-C	100 ≤ λ < 280
UV-B	280 ≤ λ < 315
UV-A	315 ≤ λ < 380
Light	380 ≤ λ < 780
IR-A	780 ≤ λ < 1400
IR-B	1400 ≤ λ < 3000
IR-C	3000 ≤ λ < 10000

Wavelength ranges of ultraviolet radiation (UV), visible radiation (light) and infrared radiation (IR). UV and IR radiation are further subdivided into A, B and C categories, in accordance with DIN 5031 Part 7.

Lamp	Φ_e (W/klm)		
	UV	Light	IR
A, R, PAR	0.05–0.10	5–7	35–60
QT	0.10–0.15	5–6	25–30
T, TC	0.05–0.15	3–5	6–10
HME	0.20–1.00	2–3	10–15
HIT	0.20–1.00	2–5	6–10
HSE	0.01–0.05	2–3	4–6

Relative radiation flux Φ_e of different lamp types in relation to a luminous flux of 10^3 lm, classified according to the different wavelength ranges: UV (280 nm-380 nm), light (380 nm-780 nm), IR (780 nm-10000nm).

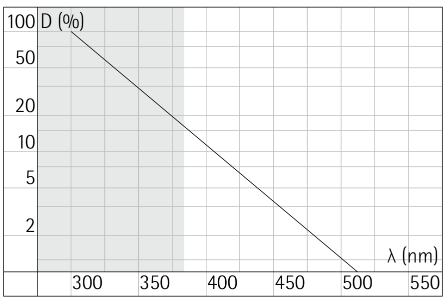
$$E_e = \Phi_e \cdot \frac{E}{1000}$$

$$[E_e] = \frac{W}{m^2}$$

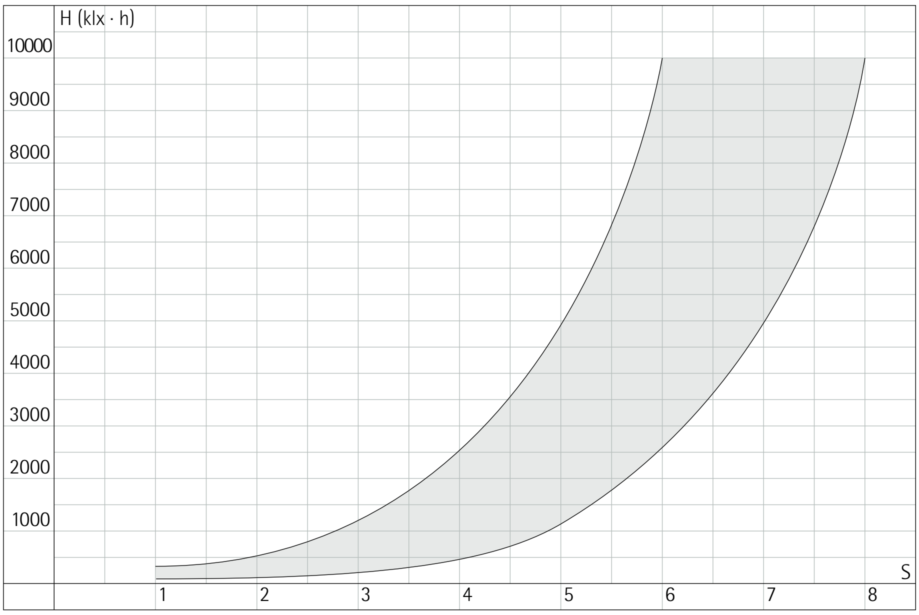
$$[\Phi_e] = \frac{W}{klm}$$

$$[E] = lx$$

Correlation of the irradiance E_e on an exhibit at a given illuminance E and the relative radiation peformance of a lamp Φ_e.



Relative damage factor D of optical radiation as a function of wavelength λ. Damage decreases exponentially through the wavelengths including the majority of the range of visible radiation.



Range of exposure H as the product of illuminance E (klx) and exposure time t (h) for the visible fading of an exhibit as a function of the light fastness S of the exhibit (in accordance with DIN 54004) and the type of light source used. The upper tolerance curve applies to incandescent lamps, the lower one to daylight. Halogen lamps and discharge lamps lie within the band. Example: an exhibit classified as light fastness category 5 shows initial evidence of fading after approx. 1200 klxh under daylight, after approx. 4800 klxh under incandescent light.

do not have an outer envelope. They emit minimal ultraviolet radiation, emitting this freely through their quartz glass outer envelopes. Disturbing infrared or ultraviolet components produced by the selected lamps can in practice be reduced substantially through the use of suitable reflectors or filters.

Both infrared and ultraviolet radiation load on persons or objects produced by light sources used for interior lighting is negligible. The limit set for connected load is approximately 50W/m², above which the effect of the thermal load will have a noticable effect on the subjective feeling of well-being in the local area.

An exception exists in the case of special fluorescent lamps, so-called "full spectrum lamps", whose spectral distribution is very similar to the global radiation of the sun and daylight, producing a "natural" light. The UV and infrared components are increased at the expense of the visible radiation. There is no documentary evidence on the advantages of these lamps with regard to health or technical benefits in the quality of light.

3.3.2 Luminaire selection

The choice of light sources outlines the technical qualities of the lighting design concept and the limits to the lighting qualities that can be achieved. The lighting effects that can be obtained within this range depend on the choice of luminaires in which the lamps are to be used. The choice of lamp and luminaire is therefore closely related. Opting for a particular light source will reduce the choice of luminaire, and vice versa, the choice of luminaire will restrict the choice of lamp.

3.3.2.1 Standard product or custom design

In most cases the choice of luminaires will be confined to the standard products available, because they can be supplied at reasonably short notice, have clearly defined performance characteristics and have been tested for safety. Standard luminaires can also be used in special constructions, such as lighting installations that are integrated into the architecture (e.g. cove lighting or luminous ceilings). In the case of large-scale, prestigious projects consideration may also be given to developing a custom designed solution or even a new luminaire. This allows the aesthetic arrangement of luminaires in architecture or in a characteristically designed interior and the solution of specific lighting tasks to be effected in closer relation to the project than if only standard products are chosen.

Additional costs for development and time considerations must be included in the calculation of overall costs for the project.

3.3.2.2 Integral or additive lighting

There are two basic contrasting concepts for the arrangement of luminaires in an architectural space, which can allocate different aesthetic functions to the lighting installation and provide a range of lighting possibilities. On the one hand, there is the attempt to integrate the luminaires into the architecture as far as possible, and on the other hand, the idea of adding the luminaires to the existing architecture as an element in their own right. These two concepts should not be regarded as two completely separate ideas, however. They are the two extremes at either end of a scale of design and technical possibilities, which also allows mixed concepts and solutions.

In the case of integral lighting the luminaires are concealed within the architecture. The luminaires are only visible through the pattern of their apertures. The planning does not focus on the application of the luminaires themselves as design elements, but on the lighting effects produced by the luminaires. Integral lighting can easily be applied in a variety of environments and makes it possible to coordinate luminaires entirely with the design of the space.

Integral lighting generally presents a comparatively static solution. The lighting can only be changed using a lighting control system or applying adjustable luminaires. There are therefore limits to adapting integral lighting to meet the changing uses of a space. Integral lighting also requires certain conditions relating to the installation. This may mean a suspended ceiling to allow recessed mounting, or the provision of apertures for recessed mounting into ceilings or walls in new buildings. The most extreme cases are forms of lighting that use architectural elements to create lighting effects. These include luminous ceilings, cove lighting or backlit elements.
Recessed ceiling luminaires, i.e. the entire spectrum of downlights, from recessed downlights to washlights, recessed directional spotlights and specific louvred luminaires, are specifically designed as integral lighting elements. Floor and ceiling washlights in particular can be integrated into walls.