THE LED SCIENCE

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*LED stands for **'light emitting diode',** or an electronic semiconductor component. As the current flows through the diode in a forward direction, it emits light, without losing energy and without harmful UV radiation.*

HISTORY

The physical effect of light emission was discovered in 1907, and in 1962 the first LED in red was created. Ten years later green, yellow and orange were also available. The blue version, however took twenty more years before it could be created. The first white LED was produced in 1995. The white light comes from blue via colour conversion (using phosphorisation substances).

The main breakthrough in LED came after 2000 when white lights became efficient enough for accent lighting use. The first products such as luminous letters, refrigerated cabinets and pocket torches with LED came to market.

Today LEDs have sufficient light output to be used for general lighting and to replace incandescent lamps and halogen lamps.

Experts are convinced that this trend will only further develop in coming years, and the ban on incandescent lamps is just part of the reason. The high quality of LED lighting offers more than just an adequate substitute, it offers a sustainable alternative.

DISTINCT ADVANTAGES

The LED is essentially different from all other light sources, and many of its properties are unique. DIWEKIYO makes use of these specific LED qualities as a starting point for creating a high quality and efficient lighting solutions.

The distinctive qualities of LED lamps:

+ Economical energy consumption
+ Long service life – LED light sources have an operational life of up to 100 000 hours. After this period the LED continues to illuminate at a lower intensity
+ Decreased operational expenses
+ No toxic materials that need to be disposed of as hazardous waste
+ High color stability
+ No harmful emissions IR and UV-free light
+ Quick return on investment
+ Reduced CO2 emissions
+ Fully recyclable

SERVICE LIFE

The average lamp in a household operates for about 2.7 hours daily. It can be assumed that 1,000 hours of operation correspond to one year. On the basis of this assumption you can calculate the following service life:

+ 10 to 25 years for an LED lamp
+ 4 to 8 years for an energy-saving lamp
+ 1 year for an incandescent lamp

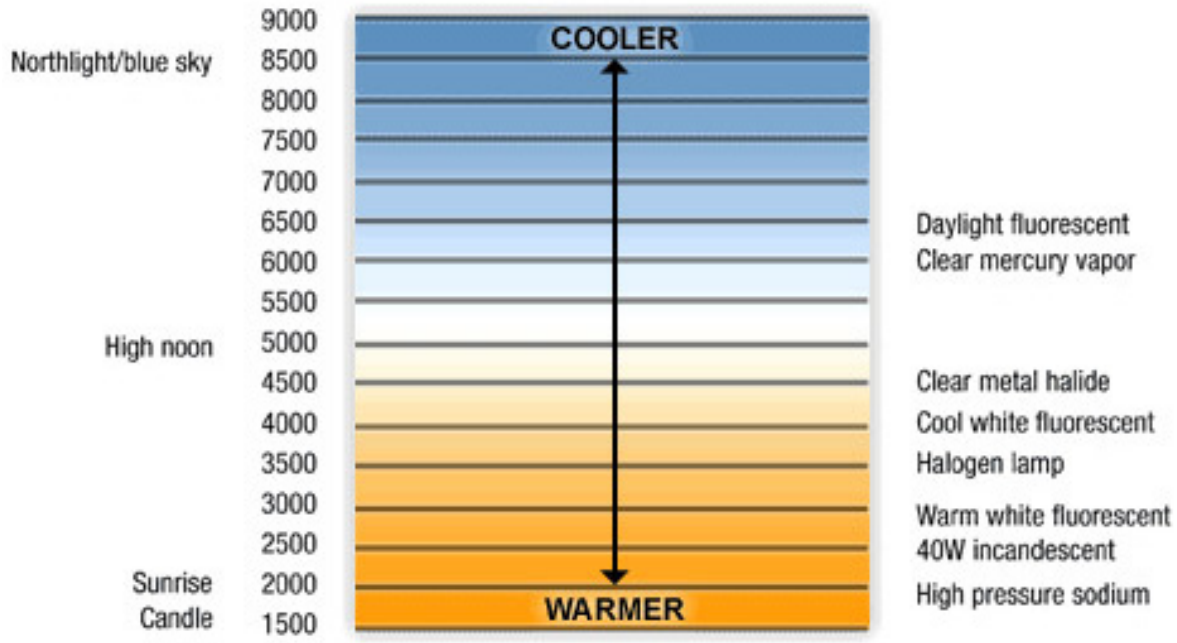
COLOR TEMPERATURE [K]

The unit Kelvin [K] from temperature readings on thermometers is also used as a unit of measure for the color temperature of light. The lower the value, the 'warmer' the light appears.

A few key figures about color temperatures:

+ Candlelight: 1,500 Kelvin
+ 60 watt incandescent lamp: 2,680 Kelvin
+ Halogen lamp: 3,000 Kelvin
+ Morning/afternoon sun: 5,500 Kelvin

COLOR TEMPERATURE CHART



COLOR RENDERING [RA]

The so-called Color Rendering Index (Ra) was developed, in order to specify the color rendering of light sources. The principle is based on calculating light according to pre-defined wavelengths or colors (pastel color tones). The complete spectrum of light is not considered, but nevertheless the color rendering index is still a good guide for the quality of light.

Quality criteria of Ra values:

+ Incandescent lamps are the basis for the scale. They have a Ra value of 100.
+ Light sources with a color rendering index of 80 or more already indicate a very good lighting quality.
+ Lamps offered by DIWEKIYO achieve Ra values from Ra = 80 to Ra = 90.

LUMINOUS FLUX [LM]

The luminous flux specifies the quantity of light in lumens [lm] and is measured separately from distribution direction. The luminous flux is the overall quantity of light emitted in all directions by a light source. The luminous flux of an incandescent lamp (40 watt) consists of approximately 400 lumens. Because the lamp emits its light in all directions, a large part of the light is lost to the luminaire or lamp shade; only a small percentage of the luminous flux is used for actual illumination.

+ Luminous flux should not be directly compared to the brightness of a luminaire and depending on application could vary.
+ The brightness of a lamp is measured by the resulting illuminance value.

LUMINOUS INTENSITY [CD]

Luminous intensity stands for the part of the luminous flux emitted in a specific direction. The luminous intensity is largely influenced by the light controlling elements. A typical example is the 'lamp shade' of a luminaire which causes the light from the lamp to only radiate downwards. The unit for luminous intensity is the candela [cd].

Typical luminous intensities:

+ A standard candle has a luminous intensity of 1 cd.
+ An incandescent lamp with 100 watts emits 1,100 cd.

ILLUMINANCE [LX]

The illuminance is a measure of luminous flux falling onto a specified surface. It is measured in lux [lx] and is calculated from the luminous flux per square metre [lm/m²].

Illuminance represents the brightness of a luminaire. In many cases, LED lamps take advantage of the benefits of directed light. This is also the reason for the high performance effect of LED lamps: a LED lamp with 10 watts in a suspended luminaire achieves a higher illuminance than a 60 watt incandescent lamp.

Typical illuminance values:

+ Clear summer day: > 100,000 lx
+ Cloudy summer day: 20,000 lx
+ Dusk: 400 lx
+ Office: 500 to 1,500 lx
+ Starry night: 0.2 lx

LUMINANCE [CD/M2]

Luminance is a measure of the impression of brightness of a surface. Each surface absorbs a part of the luminous flux and reflects the residual part. The color and the type of surface define the quantity of light absorption and light reflection. Luminance is the impression of perceived brightness via the reflected component. For example, the light in a room with a black floor appears significantly darker than in a room with a white floor.

+ The luminance is measured in candelas per surface unit [cd/m²].
+ An even and harmonious distribution of brightness makes a room pleasant and visually interesting.

LUMINOUS EFFICACY [CD/M2]

All watt specifications on electrical devices (including lamps) define the power input, or consumption, but not the output. The efficiency of a luminaire is more precisely calculated by the luminous flux as a ratio of power input. The indicator known as luminous efficacy or efficiency is specified in lumen/watt [lm/W].

+ The higher the luminous efficacy, the more efficient the lamp.
+ LED lamps achieve over 60 lm/W; some specialized LED luminaires exceed 100 lm/W
+ Incandescent lamps achieve 12 lm/W, and halogen lamps 20 lm/W.
+ Most energy-saving lamps achieve between 40 and 50 lm/W.