



MK OptiLight®

Lighting makes the difference.

LED lighting for presenting jewellery and watches in display cases, store windows and at the point of sale



member
of



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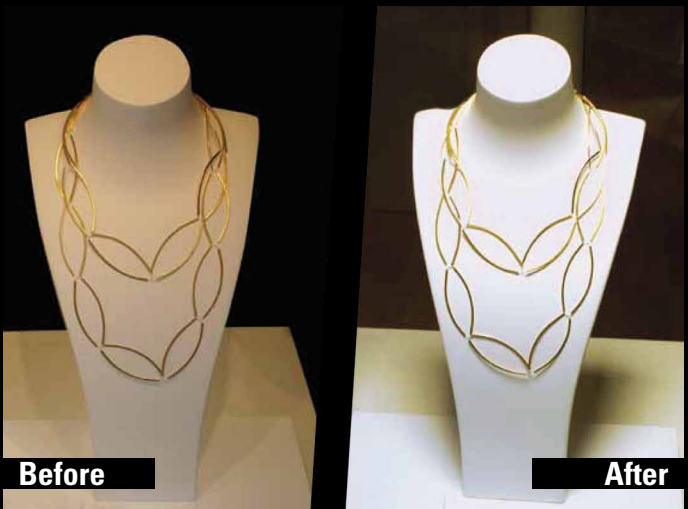
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Benefits of

MKOptiLight®

- Specially developed for the presentation of jewellery and watches in showcases, shop windows, and at the point of sale
- Complete portfolio of products and services from consulting to installation
- We use only high-power LEDs
- We use only high-CRI LEDs
- Light temperature deviations of only +/- 150 K
- Up to 75% energy and cost savings compared to traditional light bulbs
- Special flat light for shadowless lighting
- Spots in various light temperatures for decorative staging
- Long life of up to 50,000 hours
- Safe technology with no UV radiation
- Optimal price-performance ratio



LED technology - the future of lighting

Good lighting means that the light meets not just a single quality criterion, but takes all pertinent characteristics into account:

- Colour – warm white, medium white or cool light
- Colour rendering index (CRI)
- Brightness
- Limited glare characteristics - no direct or reflected glare



The overall perception of the sales area affects the consumer's experience and desire to make a purchase. That's why it is important to create an atmosphere that attracts all our senses and is unique. Lighting is one of the most important design elements for achieving this goal. Products like watches and jewellery are difficult to illuminate properly. Excellent colour rendering and a light colour that is appropriate for the product are prime prerequisites for an environment that makes people want to buy.

Goods like exquisite jewellery and fancy watches must be properly lit. While this was done mostly with low-volt halogen lights in the past, today's solutions use LED-based lighting. Thanks to its lack of UV and infrared radiation, LED lights are also gentle on the exhibits, and their small size makes it possible to build intricate solutions.

MKOptiLight® lights with their range of colour temperatures and their outstanding CRI meet all relevant quality characteristics. **MKOptiLight®**-LEDs set brilliant accents that let objects shine and sparkle and bring out their colours. They turn products into experiences.

Light colour

MKOptiLight® light colours

Light colour	Colour temperature (K)
Warm white	2.400 / 2.700
Medium white	4.000 / 4.300
Cool white	6.500



Warm white Medium white Cool white

We perceive our surroundings not only as light and dark, but in the form of colours.

Light emitted by lamps has a colour of its own, the so-called light colour, which is measured in Kelvin (K). The higher the K value, the "cooler" the colour.

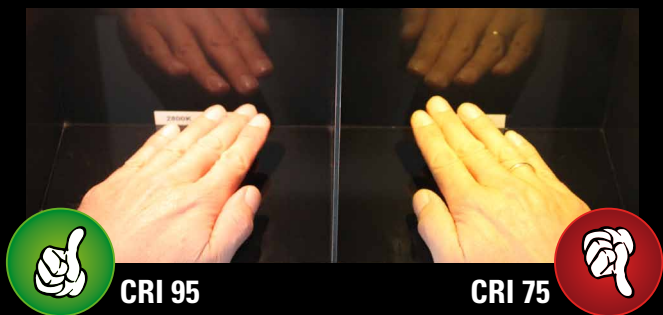
Light colours are categorized into three groups:

- **Warm white light (ww)**
for gold-coloured objects
- **Medium white light (mw)**
for gold-coloured and silver-coloured objects
- **Cool white light (cw)**
for silver-coloured objects

Colour rendering index CRI

MKOptiLight® delivers a high CRI

Make jewellery and watches look their best

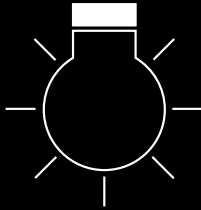


Good artificial light must be able to render colours correctly. The colour rendering index describes the effect it has on coloured objects. Different light sources have different colour rendering properties that don't always reflect the true colours of the object being illuminated. Human faces, for example, may look sickly under certain lights, vegetables may look disgusting, and jewellery may look tawdry and cheap.

Even light from bulbs of the same colour may exhibit different colour rendering properties due to differences in their spectral make-up. That's why it is impossible to draw conclusions regarding a lamp's colour rendering properties based on its light colour.

The colour rendering index (CRI) indicates how naturally colours are rendered. It is also referred to as the Ra value. In general: The lower the index, the worse the colours of illuminated objects are rendered. Sunlight has the best colour rendering properties and therefore the highest CRI value (100). For indoor applications, the CRI value should not be lower than 80, which is why MüllerKälber uses high-CRI LEDs with CRIs of up to 95.

Illuminance



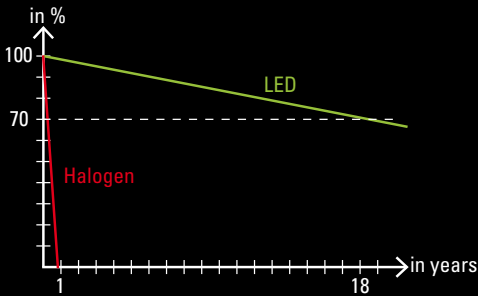
The lower the environment's reflectiveness, the higher the illuminance or illumination intensity must be.

The illuminance indicates in lux (lx) the luminous flux (measured in lumen = lm) hitting a surface from a light source. One lux is equal to one lumen per square metre.

With the same illuminance, a white room looks brighter than a dark room since the white room reflects the light more effectively. This means: The lower the level of reflectiveness, the higher the illumination intensity must be.

This finding enables us at MüllerKälber to design optimized lighting systems for display cases, shop windows and points of sale. For you, this means that your jewellery will always be presented in the best light.

Long life



And LED light that operates 11 hours a day, 250 days a year last for roughly **18 years**.

Even then, the LED does not break, but outputs **70%** of its original light intensity.

With a life of roughly 50,000 hours, LEDs last 25 times as long as halogen bulbs, which have a life of about 2,000 hours, and 50 times as long a traditional incandescent bulbs, which burn out after about 1,000 hours. And since the useful life of an LED is defined as the time until the luminous flux (lumen) decreases to 70% of its original value, the LED is still far from dead even after so many years. For practical purposes, this means that LEDs are virtually maintenance-free since there are no bulbs to be changed.

On the other hand, the longevity of an LED depends to a large extent on the ambient and operating temperatures. The colder the temperature, the more efficient the LED. And warmer temperature can shorten its efficiency and life significantly. Consequently, MüllerKälber pays close attention to excellent heat management for all its powerful LED lighting systems.

Glare and reflexions



For jewellery and precious stones: Clear lamp covers

For watches: Opaque lamp covers

Avoid unwanted reflections with frosted glass bottoms or inserts

Glare can be caused by direct or reflected light. Either makes it difficult to see the object being presented.

- Direct glare can be caused by windows or by unsuitable or incorrectly mounted lamps
- Reflected glare can be caused by shiny surfaces such as display case bottoms or even watch faces.

It is important to base your choice of lighting on the objects you want to display. Jewellery with precious stones, for example, looks best with spot lights that make it sparkle, which calls for clear lamp covers. This effect can be further enhanced if the spot lights move.

With watches, on the other hand, you want to avoid these reflections since they make it almost impossible to see the watch faces. As a result, opaque lamp covers that diffuse the light are recommended.

MKOptiLight® solutions feature exchangeable lamp covers. You can also prevent unwanted reflections on the bottom of the display case by selecting frosted glass or an insert made of fabric or leather.

Energy and CO²

75 %

energy savings

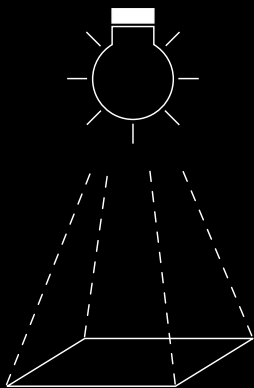


Lighting accounts for approx. 20 percent of the world's power consumption. This is the equivalent of 1,900 million tons of CO² emissions per year or 475 million round-trip flights between Munich and New York.

The old incandescent light bulb translates only about 5% of the energy they consume into light; the rest is wasted heat. LEDs are up to 10 times more efficient than traditional incandescent light bulbs and up to 6 times more efficient than halogen bulbs. And since they are so efficient, LED lamps save huge amounts of energy, which is good for the environment.

If we were to equip all lamps with LEDs, we would achieve energy and cost savings of up to 75%. MüllerKälber tests this claim regularly in trials and during trade fairs.

Lux and lumen



Luminous flux is measured in **lumens**.

It is the intensity of the light emitted by a source into the entire space.

Illuminance is measured in **lux**.

It is the luminous flux per unit area, i.e. it measures how brightly an area is lit.

Lighting engineers like to call their field the "science of lux and lumens". Both terms are units of measurement for essential lighting values.

Luminous flux is measured in lumens (lm). It describes the visible light emitted by a lamp in all directions.

Light intensity is measured in lux (lx). It indicates how much light (or luminous flux, to express it in more technical terms) hits a certain area.

For example, the farther a lamp is removed from an object, the weaker the light hitting the object. The object's illuminance is inversely proportional to the square of the distance from the light source.

A jewellery shop's display window requires an illuminance of up to 8000 lx. Our consultants always take into account the dimensions and the distances of the areas to be lit. Since the illuminance is also heavily influenced by the optics and lenses being used, we offer a wide range of lenses to accommodate the specific situation.

Display window reflections and brightness

The greater the difference in brightness between the display window and its surroundings, the greater the reflection.

Active brightness control for perfect illumination day and night – automatically.



Light has a signalling effect: a bright display window arouses interest. Especially on bright summer days, many shop windows reflect so much daylight that you can't see what's behind them. And the greater the difference in brightness between the window's display area and the outside, the greater the reflection. That's why a shop window must be brightly lit during daylight hours, particularly when it is hit by direct sunlight. If you kept the same light level in the evening and night hours, the window would be overly bright, making it difficult to see the jewellery being displayed.

Our **MKOptiLight**[®] Window 3x3 can make a display window four times as bright as a conventionally lit display window – a level of brightness that is needed when the window gets hit by direct sunlight.

To control the display window's brightness, we have developed our active **MKSunControl**[®]. It uses an outdoor light sensor to automatically adjust the lighting level in accordance with the surrounding brightness.