



# WHITEPAPER

Safe assembly of water resistant/proof LED strips for indoors and outdoor



# CONTENT

Before the installation of an IP65, IP67 or IP68 certified LED strip you should ask yourself the following questions:

- 03 Which class of protection is required for my project?
- 06 How many meters of lightstrip do I need at a time?
- 09 What lighting performance and color temperature should it be?
- 10 How do I best attach the LED strip in wet environments?
- 11 What should I consider regarding the power supply?
- 12 How do I want to control the LED illumination?
- 13 What features should the adequate LED strip have?

# WHICH CLASS OF PROTECTION IS REQUIRED FOR MY PROJECT?

An IP certification means that the device is protected to a certain extent against the ingress of foreign objects and/or liquids. It is awarded by the International Electrotechnical Commission (IEC) and the two digits after the abbreviation IP define the type of protection. The first code number indicates the degree of protection against the penetration of solid foreign bodies such as sand and dust, the second code number stands for the protection against the penetration of liquids, e. g. water. IP58 and IP68 are completely equivalent in terms of water resistance, as the first digit does not give any statement about its waterproofness..

The higher the number of the first or second field, the better the protection of the device. Accordingly, the protection provided by an IP68 certified device is greater than that provided by an IP67 or IP58 certification. LED strips with IP67 and IP68 certification are dustproof and waterproof.

But what exactly is the difference between 7 and 8?

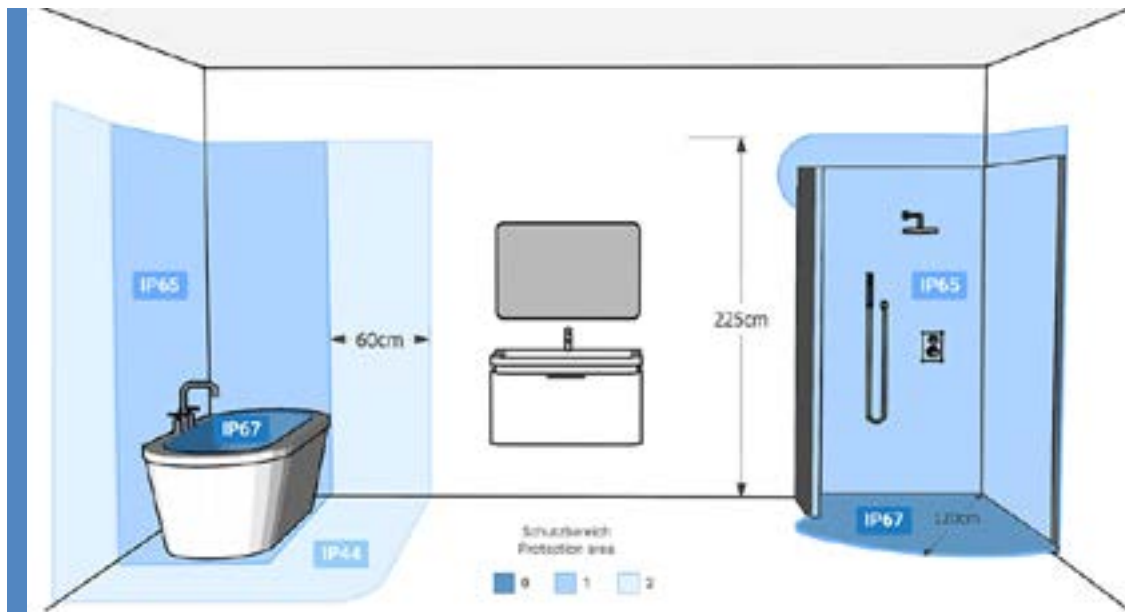


1. Code number	Protection against ingress of solid objects	2. Code number	Protection against water/wetness
0	No protection	0	No protection
1	Protected access against solid foreign bodies (> 50 mm)	1	Protection against vertically falling dripping water
2	Protected access against solid foreign bodies (> 12,5 mm)	2	Protection against dripping water falling at an angle of up to 15 degrees
3	Protected access against solid foreign bodies (> 2,5 mm)	3	Protection against spray water falling at an angle of up to 60 degrees
4	Protected access against solid foreign bodies (> 1 mm)	4	Protection against splash water (all sides)
5	Protected access against dust deposition	5	Protection against water jets (all sides)
6	Dustproof	6	Protection against strong water jets
7	-	7	Protection against temporary immersion
8	-	8	Protection against submersion for an indefinite period of time

The 7 in IP67 is called „protection against temporary immersion“. You could not use this LED strip permanently under water, because it is not completely waterproof, only for a certain period of time. There are exact specifications as to how long this temporary submersion has to last for a device to obtain protection class IP67. The 8, on the other hand, certifies protection against permanent immersion.

Since outdoor luminaires are exposed to wind and weather, i. e. dust and especially precipitation, they must be well protected so that dangerous incidents do not occur.

The required protection class depends on the conditions of the location of the outdoor luminaires: An exterior wall light under the canopy is less at risk from moisture than an LED in the garden. An outdoor light at the entrance is less disrupted by dust than a light next to the garden path. An underwater luminaire for a garden pond or pool must definitely be protected against permanent submersion and therefore requires protection class IPX8.



Protection class IP44 is enough for luminaires that are to be mounted on a roofed house wall. They are protected against solid foreign bodies with a diameter of 1 mm and are resistant to splashing water, which is why the rain does not cause any damage.

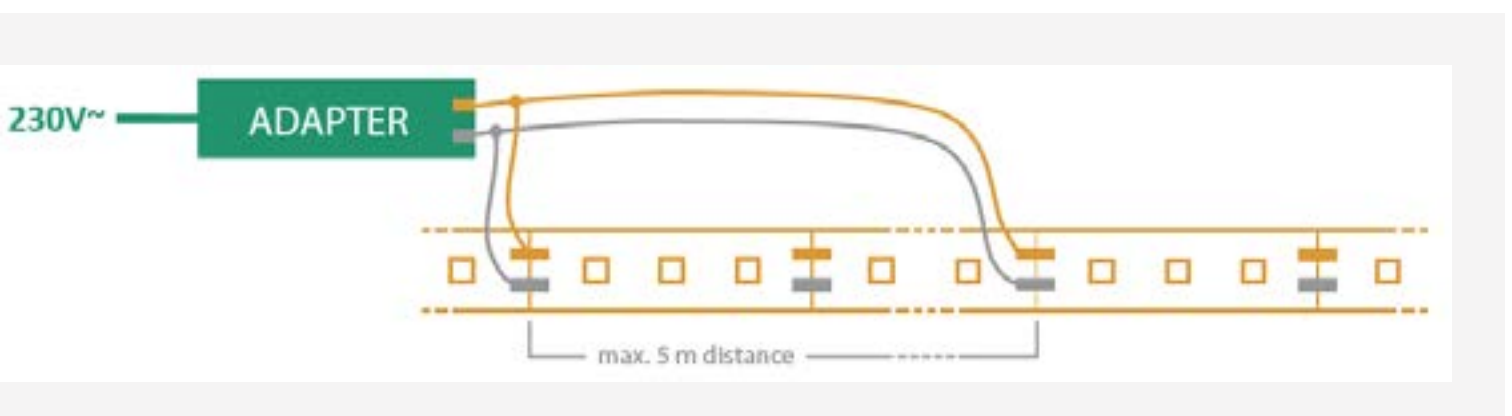
Path luminaires or spotlights located under a projection on the floor should comply with IP protection class 65, because in this case they are protected against water jets and dustproof. They can easily be sprayed with a garden hose.

Floor luminaires that are not covered should be marked with protection class IP67. Then they also withstand heavy rain and can be completely under water at times. In the bathroom it depends on the distance to the bathtub/shower: In the shower area or direct bathtub surroundings, protection class IP65 is required. If the luminaires are not in the immediate periphery of the water sources, IP44 certification is enough.

# HOW MANY METERS OF LIGHTS-TRIP DO I NEED AT A TIME?

LED light strips can be operated up to a length of 30m in one piece with an LED driver. The possible number of meters in a piece depends on the voltage: For LED strips with a higher voltage (24V or 230V) longer lengths can be realized. With a supply voltage of 12 Volt, only a continuous length of approx. 5m is possible, as otherwise the LEDs further away from the supply point will not shine as brightly.

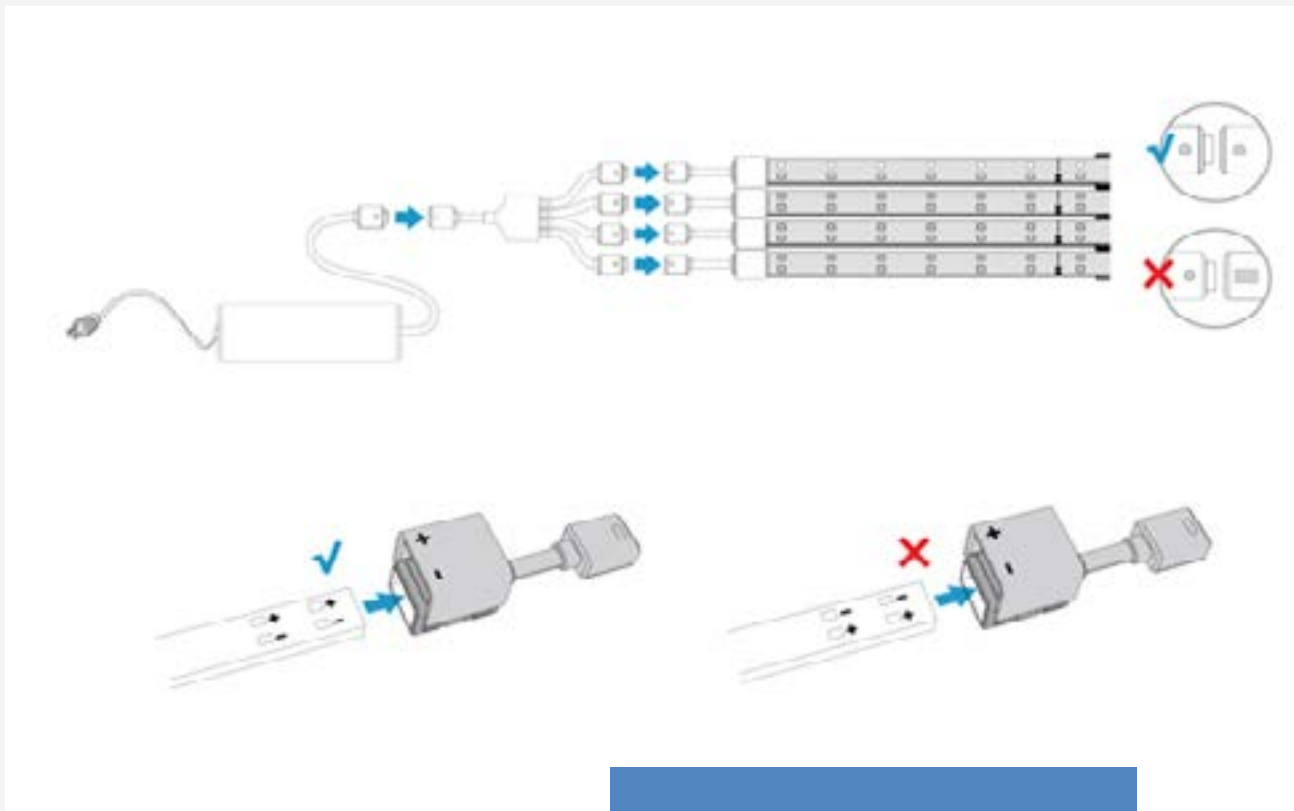
Therefore, one should consider how many supply points are available for the planned project and choose the length of the light strip accordingly. If, for example, there is only one feed point for lighting a pool, the product variant with the longest number of metres in one piece should be used, so that the entire pool length can be covered by a single strip if possible.





In order to adjust the length of the LED strips individually, the strips can be cut at certain intervals and also reconnected - either by soldering or simply by plugging them together using special connectors. Solder joints should be avoided especially in underwater areas as they do not keep impermeable for long and therefore represent a source of danger. But even in humid environments, it is preferable to work with connectors. These should also be protected with an appropriate IP certification.

When connecting, make absolutely sure that the positive and negative poles of all LED strips are connected correctly. Never connect positive and negative poles directly with each other, otherwise a short circuit will occur.



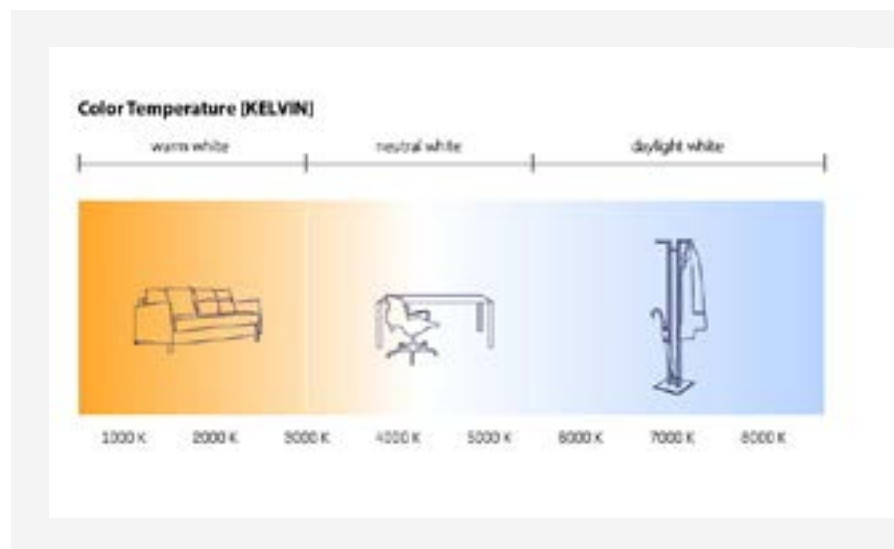
Never connect positive and negative poles directly with each other, otherwise a short circuit will occur.



# WHAT LIGHTING PERFORMANCE AND COLOR TEMPERATURE SHOULD IT BE?

This is primarily a matter of taste and depends on whether you want a warmer or colder light and how bright the strip should shine. For the color temperature, warmer light colors have a lower Kelvin number and colder light colors have a higher Kelvin number.

Warm white light lies between 2700 and 3300 K and is particularly suitable for living areas. Neutral white light in the range from 3300 K to 5300 K provides the ideal office light, while cold white light from 5300 K provides the optimum lighting for production halls, warehouses and workshops. Besides monochrome LED strips, there are also RGB/RGBW strips, which are provided with a chip and can generate many different colors. The RGBW LED strip has an additional chip, which is only responsible for white, or there is an additional diode in the chip, which produces white light.



The following applies to the light output: the higher the lumen value, the brighter the LEDs shine. The CRI (Colour Rendering Index) must not be ignored, because the higher it is, the better the colors are rendered. LED light sources with a higher Ra value reproduce the illuminated colors more naturally and more pleasantly for the human eye. The CRI should be at least 80 Ra.

# HOW DO I BEST ATTACH THE LED STRIP IN WET ENVIRONMENTS?

Basically, it should be noted: Use fastening material that sticks well! The LED strip can either be glued into the profile or, for some products, be clamped due to the special structure of the strip and the aluminium profile, which is clearly recommended for outdoor and underwater usages as the adhesive in the profile does not usually last long in wet environments. In the pool area, the profiles are drilled into the wall at best, but can also be stuck to the tiles using professional underwater gluing techniques and the right special adhesive.

In general, the respective system accessories (connectors, mounting clips, profiles, power supply units, etc.) should be suitable for the environment, i. e. waterproof/water resistant and rustproof. Apart from that, one must pay attention to a proper heat management. LED strips with higher power (10W/m at the latest) must be connected to a cooling system for efficient heat dissipation. This often requires passive cooling via special, sufficiently dimensioned heat sinks, which usually have to be purchased separately. Higher quality LED strips partly have an innovative cooling solution that does not require additional cooling.



# WHAT SHOULD I CONSIDER REGARDING THE POWER SUPPLY?

The power supply, also known as transformer or LED driver, is one of the most important components for LED lighting. Choosing the wrong power supply can destroy the LED product. Apart from that, a power supply that is too weak can lead to high heat development, which entails dangers. It is therefore always advisable not to operate the power supply with a 100% load. This would not only cause the power supply to heat up but would also noticeably reduce its service life. It is better to allow 20 percent room for maneuver. 10m LED strips with a consumption of 4.8 W/m, for example, result in 48 W ( $10 \times 4.8 \text{ W} = 48 \text{ watts}$ ). But in this case the power supply should have an output power of at least 57.6 watts.

In addition, the power supply should run at the appropriate voltage depending on the technical data of the LED strip (usually 12 V or 24 V). If the product has e. g. an input voltage of 12 V DC, only a 12 V DC LED power supply may be used. If the voltage is too high or too low, the LEDs will be damaged.

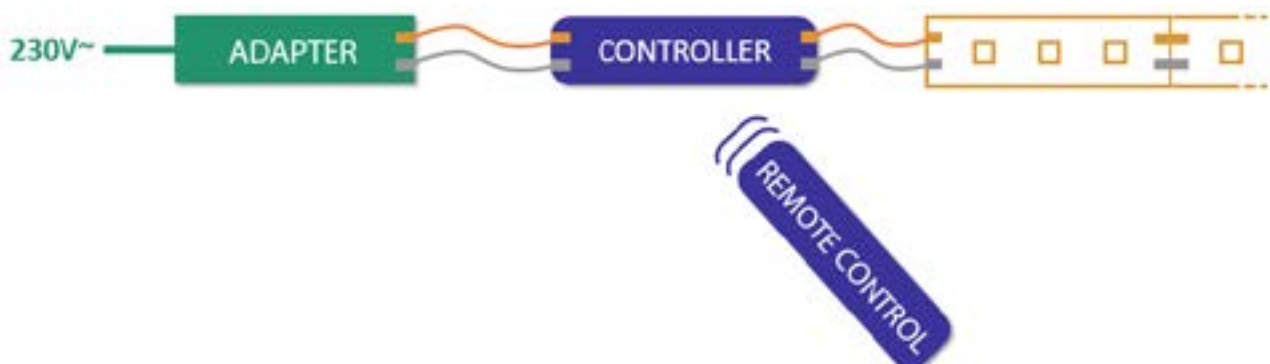


The power supply should have an output power of at least **57,6 watts.**

Besides that, the power supply should be placed as close as possible to the LED strip and must therefore be chosen or prepared according to the environment - i. e. be waterproof or water resistant if it is outdoors, underwater or near a water source.

# HOW DO I WANT TO CONTROL THE LED ILLUMINATION?

Before installing the lighting, one should consider how the LED lighting should ultimately be controlled: via remote control, switch, app or even a smart home system. Accordingly, the controller must be set up and considered when mounting the LED strips.



# WHAT FEATURES SHOULD THE ADEQUATE LED STRIP HAVE?

In the underwater area a certification for the protection class IP68 should exist, in the indoor and outdoor area the protection class IP67 or IP65 should be used according to the conditions. In the pool area, the light strips should be resistant to chlorine, UV and as the case may be to saltwater. In order to achieve the most exact length adjustment possible, the tape should be cut at short intervals. A simple assembly without soldering is generally recommended. The system accessories (connectors, mounting clips, profile, power supply unit) should also correspond to the ambient conditions.

The best would be an LED strip with integrated cooling solution, so that no additional heat sinks are needed and a relatively long, seamless and continuous length in one piece, which is desirable especially with a small number of feed points. Finally, the strip



should come in different versions regarding the Kelvin and lumen values so that the desired color temperature and brightness can be guaranteed.

# CONTACT

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