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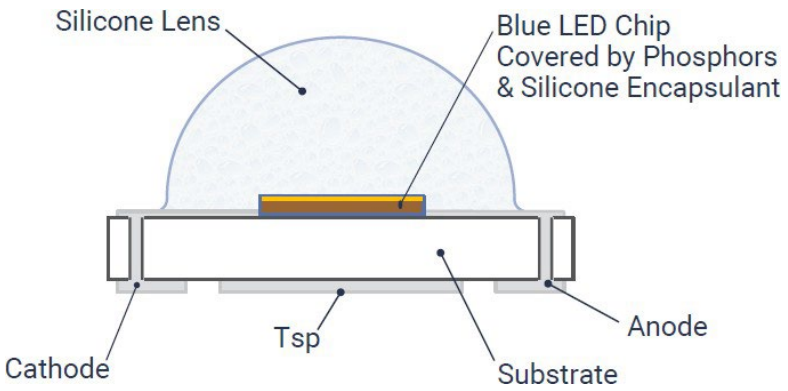
PROTECTION AGAINST VOLATILE ORGANIC COMPOUNDS (VOC) IN OUR PRODUCTION CHAIN

The definition VOC (Volatile Organic Compounds) refers to a range of chemical compounds that are formed by molecules featuring functional groups characterised by volatility that are typical, for example, of common organic aprotic and apolar solvents, like paint and petrol thinners.
These compounds include hydrocarbons (that contain only the elements, carbon and hydrogen) and compounds containing oxygen, chlorine or other elements as well as carbon and hydrogen, like aldehydes, ethers, alcohols, esters, chlorofluorocarbons (CFC) and hydrochlorofluorocarbons (HCFC).
Italian legislation defines Volatile Organic Compounds as organic compounds that have a vapour pressure of 0.01 kPa or more at a temperature of 20 °C.

According to recent research, the presence of VOCs, that are incompatible with Solid State LED (SSL) luminaires, can have a negative impact on the performance, reliability and duration of these lighting systems.
Glues, certified coatings, O-rings, sealants and impregnation compounds are materials that are commonly used in the construction of LED lamps and luminaires, and all of them may contain VOCs that are chemically incompatible with LEDs, and may, therefore, risk lowering light flux levels or altering light colour.

More specifically, the phenomenon of chemical incompatibility involves a process that takes place inside the LED structure on account of external contaminants.
The structure of the white light LED (the one used for lighting systems) consists of a chip that produces blue light covered by a layer of phosphorus that converts it into white light. All this is protected by a silicone shell. Even if the silicone is highly transparent, it is so stable and resistant it cannot be harmed by UV rays and the LEDs are therefore guaranteed a long life. It is, however, gas permeable, so it can be damaged by VOCs.



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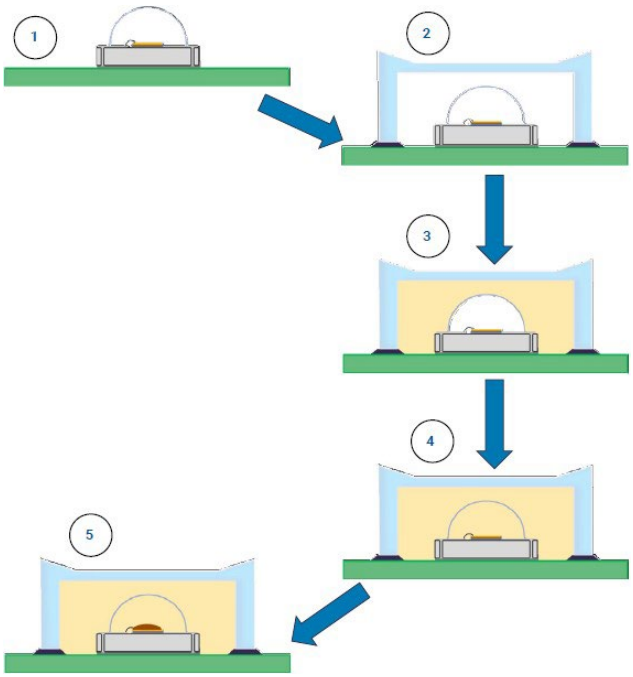
If they are highly concentrated, VOCs can penetrate and inhabit the silicone inside the LED. Often it is the sealants used to ensure the luminaire is watertight that release the VOCs that contaminate the silicone.
Then, with the intervention of other factors, like LED energy and the rise in temperature of the luminaires, discolouration phenomena like the one indicated below may be triggered, and this can have serious repercussions on the luminaire's lifetime expectations.



All LED lamp manufacturers - having conducted the necessary laboratory tests - indicate in their Datasheets a series of chemical substances that, if highly concentrated, can damage LEDs (“Moisture Sensitivity”).

As a result of our experience and the research we have conducted, our Research & Development department can now guarantee two important aspects of our production chain:
1. the environment in which the luminaires are produced;
2. the materials used in the components produced by our suppliers.

In reference to point 1, we, Cariboni Group S.p.a., can confirm that our luminaires are produced in an environment that contains no Volatile Organic Compounds (VOCs) that may harm LED components and reduce the luminaire's performance.
In particular, none of the chemical substances, listed by our LED manufacturer are used in our production line environments.
In reference to point 2, thanks to the inquiries made at our suppliers by our Quality Department, we can guarantee that none of our components, such as lenses, wired plates and seals, contain any of the compounds listed below:

- methyl acetate, ethyl acetate or acetone (e.g. nail varnish remover);
- acids (acetic, hydrochloric, nitric and sulphuric acid);
- cyanoacrylates (e.g. "superglue"), epoxy adhesives (Lord Circalok® 6150 or Lord MD-161, Lord MT 125);
- glycol ethers and propylene glycol monomethyl ethers (e.g. electronic cleaners);
- formaldehydes or butadiene (e.g. PLIOBOND® adhesive);
- chlorine, including detergents and sprays containing bleach or ammonia;
- turpentine, diesel, dichloromethane, MEK, MIBK, tetracloromethane, toluene or xylene;
- silicone oil;
- halogenated hydrocarbons (containing the elements F, CI, Br).

Moreover, to safeguard against VOCs, simplify maintenance and avoid contact with the LED optic system, our latest products have been designed so the optical assembly and the electrical component compartment are always kept separate.
This feature is particularly important for luminaires designed for installation in critical environments (like industrial production departments or urban areas) where heat, cold and damp, together with the existence of VOCs, may affect their performance.

The luminaires are therefore protected in two stages:
1. during production as the environments and the materials used during assembly are protected;
2. during maintenance (after-sales), by keeping the optical assembly and the ballast compartment separate, which reduces the chance of luminaires installed in critical environments being affected by VOCs.

Below are some examples of our production lines.

M48 – modular system

LED module
Having secured the product each individual LED module can be replaced using a simple tool to loosen the securing screws on the electrical connection cover between the individual modules. This operation is made easier by the absence of electrical wires running between the modules.

Wiring plate
To make maintenance easier and avoid interfering with the LED optic system, the electrical component compartment has been separated from the optic assembly and can be accessed from the top of the device by

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loosening the captive closure screws.
The plate can be removed easily by releasing the catches that secure it to the luminaire structure and disconnecting the quick electrical connectors that cannot be reversed because of their shape and colour.

KAI – street fixtures

LED module

The cover the LED modules are fixed to can be released by opening the clips that seal the closure and make it watertight.
The entire unit can be removed rapidly and using no tools at all.

Wiring plate

The electrical component compartment can be accessed from the top of the device using no tools at all. By opening the two closure clips, the cover can also be tipped back so the wiring plate can be accessed.
The plate can be removed easily by releasing the catches that secure it to the luminaire structure and disconnecting the quick electrical connectors that cannot be reversed because of their shape and colour.

KALOS – urban furniture

To ensure that maintenance is user-friendly but the LED optic system is not damaged, the electrical component compartment has been kept separate from the optical assembly and can be accessed by removing the top of the wiring compartment (1). The luminaire wiring plate can be accessed by loosening the closure screws on the cover and removing it.
The plate can then be easily removed by loosening the lock screws on the wiring compartment and disconnecting the quick electrical connectors that cannot be reversed because of their shape and colour.

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AGATHOS – old town centres

AGATHOS, the lantern that combines classic design with modern LED technology, also guarantees user-friendly maintenance by keeping the LED optical assembly separate from the component compartment.
The electrical component compartment can be accessed from the top of the lantern by loosening the lock screws on the head of the wiring compartment. This can be tipped back to create a wide angle for accessing the electronic components that are fixed to a plate. The plate can be easily removed by undoing the catches that secure it to the structure of the fixture and disconnecting the quick electrical connectors that cannot be reversed because of their shape and colour.

NEWTON – projection

Separate optical assembly and ballast unit.
The electrical component compartment can be accessed from the rear by loosening the lock screws with a normal tool. During these operations the optical assembly is kept protected by the flat glass closure screen.