

# UVC LED Technology



## *Frequently Asked Questions*

### *Are Phoseon UV LED products effective against the Novel Coronavirus (SARS-CoV-2)?*

YES, with one small caveat. We have tested our UV LED systems against other viruses, and they work very well. Our systems have proven to be fast and efficient. However, we have not run any tests specifically on SARS-CoV-2. Frankly, it was not in the news and not a concern more than a few months ago, and getting into a lab for testing purposes is challenging these days as they are focused on other things. What we know is scientifically and structurally concerning SARS-CoV-2 we have very high confidence in our lamps effectiveness in killing the virus. Testing would need to be done in determining dosage and overall effectiveness.

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### *What UV LED systems do you have available ready to use?*

The KeyPro™ family of UV LED products for disinfection is available today. The KeyPro KP100 is a lab or bench top instrument completely self-contained. It has touch panel controls, safety interlocks to avoid light exposure and it will treat anything that fits inside the chamber. Our free space lamps, the KeyPro Explorer, and the KP200 and KP300 lamps are also available and ready to use. However, these lamps require protective measures or shielding and some require and are intended to be installed in supporting machinery.

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### *Are there any precautions necessary to use your lamps?*

Yes. Shielding is required to eliminate possibility of looking at light directly or exposing to skin directly. Officially: Warning RISK GROUP 3 UV EMITTED FROM THIS PRODUCT Avoid eye and skin exposure to unshielded product.

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### *Do you have 220nm LEDs?*

No. LEDs with wavelengths below 250 nm are still in very early research and have power in the nanoWatt range. With current technology the lowest commercially viable wavelength is 254nm. I say commercially viable because there have been made some lower wavelength LED chips, but these are not in production anywhere in any amounts and are not efficient enough to be of any use in a system.

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### *What 220nm source do you have?*

Phoseon is a systems provider. We buy and package raw LED chips into usable systems. We do not sell the raw LEDs nor do we sell LEDs only mounted on a simple board or in a TO can (TO stands for “transistor outline” - which refers to standardized drawings from JEDEC a semiconductor trade organization). The reason being is that LED utilization is not straight forward. Yes, electricity can be connected and light comes out, but control of energy flow, heat load handling, optimized spacing, and conditioning the output are very complex engineering tasks which if performed incorrectly can lead to low output, short life, and poor overall performance. Phoseon’s expertise is in the engineering design of LED systems. We hold nearly 300 patents around LED systems and can build systems with the highest performance and the longest life. We would be happy to discuss building a system for your needs. Simply contact us and tell us what you are trying to do.

### *Does Each LED emit only a single wavelength?*

Each LED has a peak wavelength associated with it. This is where the intensity is the highest. On either side the intensity drops off rather quickly as in a Gaussian distribution following curve. This is different for each wavelength, but it is common for a lot of LEDs for the width of the peak at half max (FWHM - full width at half maximum is a common term for describing peak width) may be close to 10nm, but the highest intensity is centered on the peak wavelength. LEDs are typically referred to only as their peak wavelength, but their emission is actually wider.

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### *What are the best wavelengths to use for disinfection?*

The peak wavelength for disinfection is actually 265nm. For many decades mercury lamp systems have been available for disinfection utilizing one of the emission peaks of mercury, 254nm. This wavelength is close enough to the absorption peak to be effective. Our systems utilize 275nm LEDs. Similar to mercury lamps, our wavelength is also off the peak absorption, but we can build very high power systems at this wavelength that makes them perform better than similar mercury lamp systems. With either the 254nm or the 275nm wavelengths precautions need to be taken to avoid skin and eye contact...think really bad sunburn. Our KeyPro KP100 instrument for example has a built in safety switch on the door to turn off the light if the door is opened. There have been studies surrounding 220nm wavelength. It can be used to disinfect, but it has the added benefit that it is safe for the skin and eyes. Unfortunately, as mentioned in the previous question, 220nm LEDs are simply not available. Our recommendation would be to use one of our 275nm high power systems and take the necessary precautions to avoid contact with the light.

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### *Can I treat a room with your systems?*

The short answer, yes, but not very well. There are 2 important factors when designing UVC disinfection systems. First is dosage. Without getting too technical, you can think of dosage as light power over time. Roughly speaking if you have a lamp with twice the output power you need half the time to treat a surface, and vice versa. Every microorganism has a specific dosage and intensity threshold needed to disinfect. It's different for every one! The challenge created with distance is that the available power of the incident light reduces by the square of the distance away from the lamp, or in other words, you lose more power the further you move away from the source. So much so that travelling more than a few feet brings the power to a level that it is really unusable. The second challenge is shadows. As you can imagine, the light only works on surface that the light touches...makes sense. So if there are items that cast shadows, then the areas in shadows are not treated at all. Our recommendation is always to have the treated surface as close to the lamp as possible and if possible scan the lamp over the surface to avoid shadowing as much as possible. Our KP100 utilizes this exact technology and is very effective.

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### *Can you sterilize?*

"Sterilize" has an exacting definition when talking the science of disinfection. We have all seen the various commercials touting "this" cleaner concoction kills 99% of all germs...or 99.9% of all bacteria, etc. There is a reason why marketers use these numbers. They are referring to log reduction rates. In the examples above, 99% reduction is 2 log reduction. 99.9% is 3 log reduction. It is not hard to figure out, the number of 9's you have gives you the log reduction rate for whatever you are using to disinfect be it chemical, heat, or UVC light. Back to sterilization. The basic definition for sterilization is reaching log 6 reduction, or 99.9999% reduction in organism (it's more complicated than this, but for ease of answer we will leave it there). Suffice to say, that's a high mark. Plus this number is specific to the organism you are testing, so the same lamp could reach 5 log reduction for one organism, but maybe only 2 log for another given the same dosage. Bottom line, with so much tied up in the scientific definition, we avoid using the term sterilization unless we have specifically tested and proven this fact. However, in the real world people use the terms sterilization, disinfection, deactivation, germicidal interchangeably. Does our system disinfect? ABSOLUTELY.