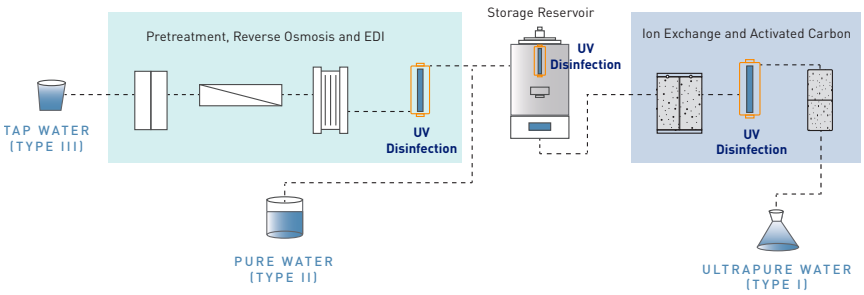
Crystal IS™
High Performance UVC LEDs

# Klaran UVC LEDs For Lab Water

**For manufactures of Type I – III Lab water equipment, Klaran UVC LEDs deliver efficient germicidal irradiation for maximum DNA inactivation.**

As the most commonly used medium in any laboratory environment, clean, quality water is critical for experiments and core processes. Lab water purification systems typically use a combination of methods, including reverse osmosis, membrane filtration, and ultraviolet (UV) irradiation to ensure the highest quality production of pure water, and range from large centralized systems to small bench top units. Traditionally, these systems have used mercury lamps for the generation of UVC energy, however the landscape is beginning to change. New, higher power deep UV (UVC) light emitting diodes (LEDs) are emerging as a viable alternative for a market space primarily dominated by mercury lamps.

FIGURE 1



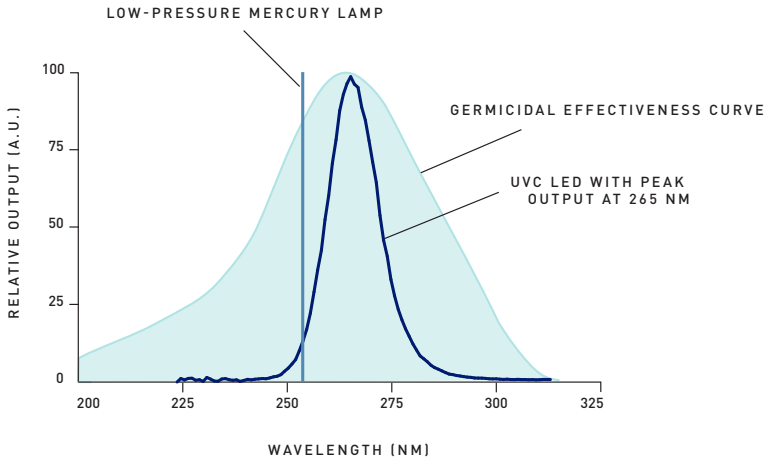

*Lab water purification system showing various points of UVC disinfection throughout the system.*

## Emission tailored to DNA deactivation

In UV disinfection, light in the range of 250–280 nm (UVC) disrupts the DNA of microorganisms rendering them unable to reproduce. The action spectrum for bacteria is commonly reported as 265-267 nm peak wavelengths, although wavelength susceptibility may vary among a large number of bacterial and viral strains. Traditional lab water disinfection systems rely on low-pressure mercury lamps to access the deep UV wavelengths. These monochromatic light sources emit a discrete wavelength at 253.7 nm. Even though there is sufficient emission to provide adequate DNA disruption and it has become the industry standard over the last several decades, 253.7 nm is not the optimum germicidal wavelength.

Unlike low-pressure mercury lamps, UVC LEDs have a continuous emission across a specified range. Crystal IS UVC LEDs are tailored to overlap the germicidal effectiveness curve to provide more efficient disinfection.

FIGURE 2




*The emission spectra of a low-pressure mercury lamp and Crystal IS Klaran UVC LED compared the germicidal effectiveness curve.*

## Small footprint enables innovative flow cell designs

A typical lab water system makes use of a flow cell reactor for UVC disinfection—water flows into the cell is disinfected by UVC light and flows out of the cell free of target microbes. The efficiency of the flow cell system is largely dependent on the size and shape of the cell. The UV intensity, amount of water to be disinfected, flow rate and internal reflectivity of the cell are all important parameters to consider for efficient flow cell design.

Traditional disinfection systems using mercury lamps must adapt to the shape of the UV bulb—a long, cylindrical tube. This shape dictates the footprint of the UV unit in the water system—limiting the system designer's options in overall size and configuration of the disinfection reactor. UVC LEDs are a point light source in a durable, compact package, which allows for a multitude of arrangements and footprints. The decrease in the size required for the UV reactor allows for development of smaller bench top units and integration of UV disinfection at more stages of the process.

## Instant on/off and long lifetime decrease operating and maintenance costs

Mercury lamps can take from 50 seconds to 10 minutes to warm up in order to reach the required germicidal intensity. In addition, frequent on/off cycles can diminish lifetime by 50% or more. Consequently, mercury lamps in these systems are kept on all day—increasing power consumption and the frequency of lamp replacement. Typically each year these fragile bulbs need to be replaced and because they contain mercury they must be carefully disposed.

UVC LEDs reach their full brightness in under a microsecond, which makes them ideal for on-demand disinfection applications. As on/off cycles do not impact their lifetime, UVC LED-based systems take advantage of the full operating life of the LED for disinfection use. This efficiency also reduces the power consumption of the system and may significantly extend the lifetime of the unit. In some cases annual replacement of UV source is no longer required as the intermittent operation enables the LED lifetime to match the lifetime of the product.

## Innovation using high performance Klaran UVC LEDs

High performance UVC LEDs offer a more advantageous UV light source, allowing manufacturers to migrate from mercury lamps to a solid-state lighting solution. The robustness of UVC LEDs allows for more environmentally friendly and energy efficient lab water systems. Innovators in laboratory water purification solutions are turning to these powerful light sources to provide customers with differentiated systems for their labs. These systems offer customers reduced operating costs and footprint without sacrificing the performance and water quality they require.

### THE Klaran UVC LED ADVANTAGE

- **Compact footprint**
- **Instant on/off**
- **Low power consumption**
- **Mercury-free construction**

**We invite you to learn more about our UVC LEDs.**

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