MASSPHOTON | MuscatPhoton



Swimming Pool UVC LED Water Disinfection Solution

Safe · Mercury-Free · Compact · Intelligent

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Executive Summary

For decades, the core of pool water treatment has merely been to ensure clear water quality and meet residual chlorine standards. However, recent scientific research (including studies supported by the WHO) has revealed a grim reality: chlorine disinfection by-products (DBPs) are becoming an invisible killer to swimmers' health.

We have launched the "Comprehensive Solution for Pool Disinfection and Healthy Environment with UVC LED", which replaces traditional mercury lamp UV systems with high-power UVC LED solid-state light sources. This achieves efficient pathogen inactivation and chloramine photolysis in the critical sterilization wavelength band of 270–280 nm, helping pools maintain safety and hygiene under lower residual chlorine conditions, while reducing the risks of disinfection by-products and mercury pollution.

Market Pain Points and Demand Analysis

Health Crisis

Chlorine reacts rapidly with nitrogen compounds in water (such as sweat and urine) to form monochloramine, dichloramine, and especially the extremely harmful trichloramine (NCl_3).Long-term exposure significantly increases the risk of asthma, respiratory diseases, and even cancer.

Regulatory Lag

Despite confirmed risks, many pools globally still rely on decades-old technologies, using high chlorine levels to mask water issues, leading to deteriorated indoor air quality.

WHO Initiative

The WHO explicitly encourages pool operators to take measures to significantly reduce chlorine by-product concentrations in both water and air, creating a truly healthy aquatic environment.

Mercury Pollution

Traditional UV lamps contain mercury, which, once broken, can contaminate water bodies and the environment, necessitating careful handling. With the implementation of the Minamata Convention, global restrictions on mercury-containing products are tightening, making mercury-free solutions a key trend for pool disinfection systems.



Solution

The UVC LED Disinfection Module is a critical upgrade component for pool circulation systems. Installed at key nodes in the circulation loop, it utilizes high-power UVC LED arrays to deliver instant, deep physical disinfection to flowing water.

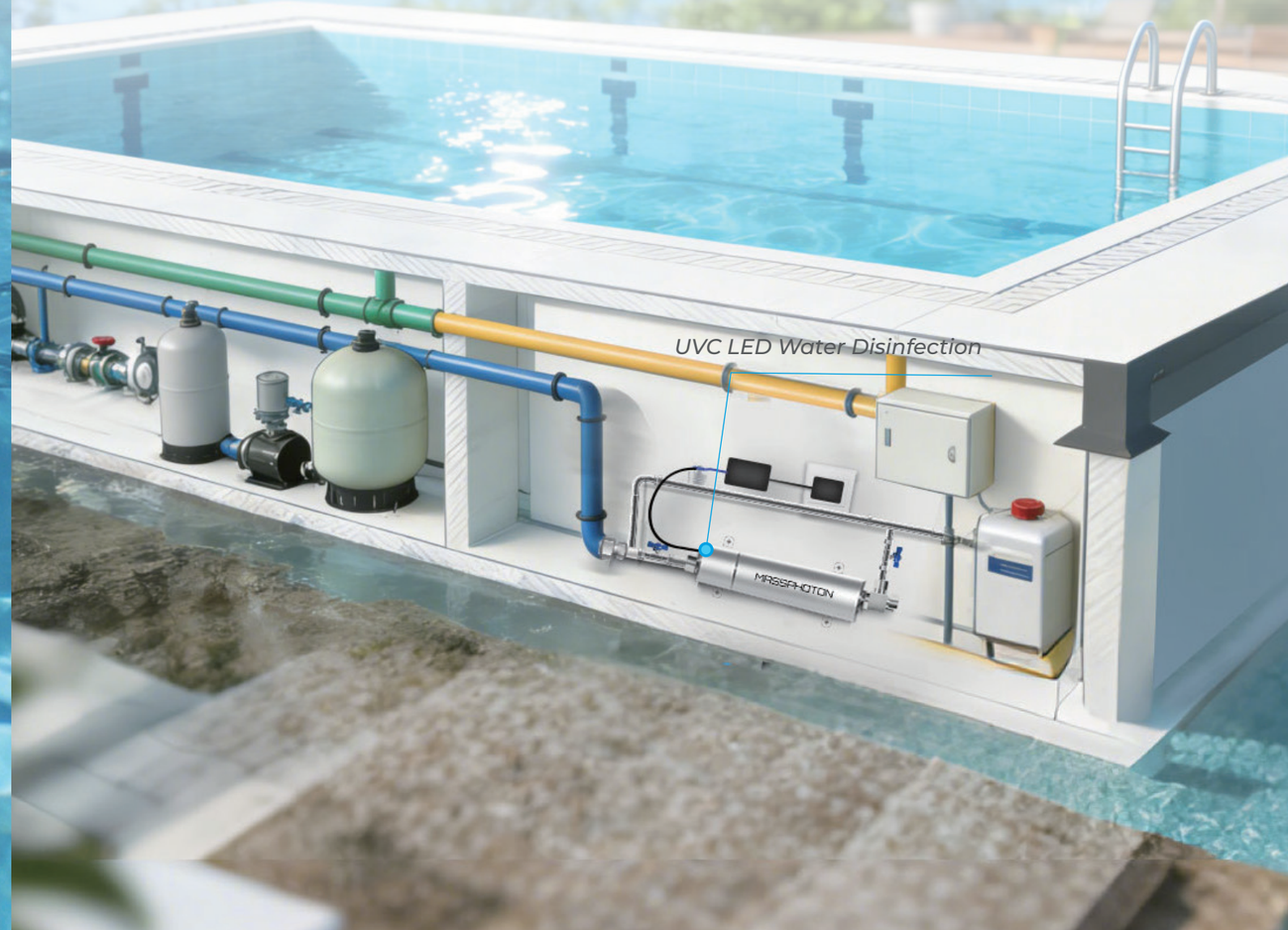
UVC LED disinfection systems optimized for swimming pool water treatment

Operating principle:

As water passes through the reactor, it receives a high UVC dose that disrupts microbial DNA/RNA and breaks chloramine bonds via photolysis. Coupled with chlorine control, operators can maintain microbial safety while progressively optimizing (reducing) set-point free chlorine levels to minimize DBP formation.

Installation position:

Installed “after filtration and before heating” to treat the entire return flow, with an optional bypass loop for flexible retrofits and maintenance.



Product Introduction / Advantages

As the physical core of pool water treatment, the UVC-48LP/75LP not only provides a robust barrier against chlorine-resistant pathogens but also offers unique chloramine photolysis capabilities to fundamentally improve water chemical balance and air quality. Its industrial-grade durability and fully intelligent monitoring system make it the ideal upgrade solution for replacing traditional mercury lamps and building a green, safe pool environment.

Mercury-Free Safety

Uses mercury-free UVC LED technology to completely eliminate mercury leakage risks. Non-toxic and environmentally friendly, fully compliant with stringent global regulations, safeguarding water and environmental safety from the source.

High-Efficiency Sterilization

The inactivation rate of bacteria, viruses, and microorganisms is as high as 99.999% (5-log). Precisely destroys pathogen DNA in the deep UV band, building a solid health defense.

Energy Efficient

Compared to traditional low-pressure mercury lamps, the low-power mode saves up to 90% energy consumption, significantly reducing usage costs while promoting a green, low-carbon lifestyle.

Chloramine Photolysis

The optimized UVC spectrum effectively photolyzes chloramines in pool water, reducing total chlorine levels, eliminating “pool odor”, and improving indoor pool air quality.

Eco-Compliance

Completely eliminates mercury leakage risks, complying with the Minamata Convention and the world's strictest environmental standards.

Smart Monitoring

Integrated sensors monitor UV intensity, flow status, and temperature in real time. LED lifespan exceeds 15,000 hours, reducing maintenance frequency and cost.



Product Parameters

MP-UVC-48LP

Model	MP-UVC-48LP
Flow Rates(@16 mj/cm²)	90 LPM（24 GPM）
Flow Rates(@30 mj/cm²)	48 LPM（12 GPM）
Flow Rates(@40 mj/cm²)	36 LPM（9.5 GPM）
Water Pressure	0.1-0.8 MPa (Max 1.6 MPa)
Water Pipe Fitting	1"
Power Adapter Input	100~240 V 50/60 Hz
Power Adapter Output	24 V, 2.7 A
UV-C LED Emission Wavelength	270-280 nm
UV-C LED Lifespan	≥ 15,000 Hours
Exterior Material	Aluminum
Target Microorganisms	E. coli, among others
Disinfection Efficiency	(*) Up to 99.999% or 5.0 Log
Operating Temperature	5 ℃ to 40 ℃
Product Dimensions	φ70 mm * 338.5 mm (φ2.8 in * 13.3 in)

MP-UVC-75LP

Model	MP-UVC-75LP
Flow Rates(@16 mj/cm²)	140 LPM（36 GPM）
Flow Rates(@30 mj/cm²)	75 LPM（19 GPM）
Flow Rates(@40 mj/cm²)	56 LPM（14 GPM）
Water Pressure	0.1-0.8 MPa (Max 1.6 MPa)
Water Pipe Fitting	1"
Power Adapter Input	100~240 V 50/60 Hz
Power Adapter Output	24 V, 4 A
UV-C LED Emission Wavelength	270-280 nm
UV-C LED Lifespan	≥ 15,000 Hours
Exterior Material	Aluminum
Target Microorganisms	E. coli, among others
Disinfection Efficiency	(*) Up to 99.999% or 5.0 Log
Operating Temperature	5 ℃ to 40 ℃
Product Dimensions	φ83.6 mm * 458 mm (φ3.3 in * 18.0 in)

Test Conditions

(*) The actual disinfection efficiency subjects to the water quality.
The above test results are based on the following test conditions with test strain of Escherichia coli (8099), with 5 × 104 to 5 × 105 CFU/mL dechlorinated sterile test water.

pH	UV transmittance	Turbidity	Temperature	TDS
7.5 ± 0.5	98 ± 2%	< 1.0 NTU	20 ± 2.5°C (68 ± 5 °F)	200 to 500 mg/L

Core Value of Solution

- ## From "Chemical-Dominant" to "Physical + Chemical Synergy":

  Instead of solely relying on high-concentration chlorine, the physical inactivation and photolysis capabilities of UVC LED are utilized to significantly reduce chemical usage (by up to 50%), achieving a milder and purer water quality.

- ## From "Passive Waiting" to "Instant Defense"

  Abandoning the traditional preheating waiting time of mercury lamps, it achieves instant disinfection of water flow, especially adapting to the operational logic of modern variable frequency energy-saving pumps.

- ## From "Potential Risk" to "Absolutely Green"

  Completely eliminating mercury pollution hazards and reducing the formation of disinfection by-products, protecting not only swimmer health but also complying with increasingly stringent global environmental regulations and Sustainable Development Goals (ESG).

Water is the origin of life;

Purity is our answer to the future.