

mini™ UVC

Frequently Asked Questions

BLUEBOTICS
— Your Vehicle Navigation Partner



FAQ

General FAQ

How does the mini™ UVC work?

The mini™ UVC is an autonomous mobile robot equipped with powerful ultraviolet C lights, which are scientifically proven¹² to destroy microorganisms (including the SARS family of viruses).

The mini™ UVC moves autonomously through your site, disinfecting surfaces automatically to make the space safer for both your staff and the general public.

Is UVC light effective against the virus which causes COVID-19?

UVC light is endorsed by the IUVA³ as part of a toolkit for fighting COVID-19.

Ultraviolet C light disrupts a microorganism's DNA, inactivating or destroying them. Exposure to UVC light at wavelengths of 253.7 nm⁴ destroys up to 99.99% of viruses and bacteria⁵. The mini™ UVC is equipped with germicidal 254 nm UVC lights.

Research on the COVID-19 virus is still ongoing, but ultraviolet C has been proven to destroy similar viruses, and scientists have concluded: "Since coronaviruses do not differ structurally to any great extent, the SARS-CoV-2 virus — as well as possible future mutations — will very likely be highly UV sensitive, so that common UV disinfection procedures will inactivate the new SARS-CoV-2 virus without any further modification."⁶

How long does the mini™ UVC take to clean?

The mini™ UVC can disinfect surfaces one meter away at a rate of 4.2 meters per minute.⁷

The time needed for UVC light to disinfect surfaces depends on the size and complexity of your site and the proximity of the UVC lamps. Using a robot such as the mini™ UVC — rather than a static germicidal lamp — has clear advantages, as a robot can move closer to a surface to disinfect it faster, and can automatically and accurately track what has been disinfected.

If a space needs to be cleaned more rapidly, a number of mini™ UVC robots can work together. A fleet of mini™ UVC robots can even work with other automated vehicles powered by the same ANT® navigation software, and can be managed within ANT® server software.

Can the mini™ UVC disinfect very large or complex spaces?

Yes. The mini™ UVC is an efficient way to disinfect large or complex spaces, as it can work automatically and autonomously. Unlike germicidal UVC light wands, which must be used by staff wearing personal protective equipment, the mini™ UVC can disinfect a site autonomously, saving time and human resources.

In a larger or more complex space, or when time is short, a number of mini™ UVC robots can work together, all managed with the same ANT® server software. A mini™ UVC, or fleet of mini™ UVCs, will automatically and accurately track which areas have been disinfected, ensuring no areas are needlessly double-cleaned, or skipped altogether.

What about cluttered areas or shadows?

Ultraviolet C light is most effective at short distances, and shadowed areas require a much longer exposure time for effective disinfection⁸. Because the mini™ UVC moves through a site, it is more likely to expose every surface to germicidal UVC light than a static UVC lamp. Disinfection points can be set to ensure key areas are exposed to light, and complex spaces can be circled to ensure every point is covered.

Is the mini™ UVC a substitute for manual cleaning?

No. The mini™ UVC is extremely effective at disinfecting surfaces. Therefore, it should be used in addition to, not as a replacement for, manual cleaning.

Can the mini™ UVC clean the air?

The mini™ UVC will destroy up to 99% of viruses, bacteria and fungi on surfaces. There is some evidence that ultraviolet C can also destroy virus particles in the air⁹, although more research is needed.

Is ultraviolet C light safe?

When used with care, the mini™ UVC can make your environment safer for you, your staff and the general public.

Ultraviolet C has been used to disinfect surfaces since it was discovered in 1878, and is commonly used to purify drinking water in Europe and the United States. UVC has been safely used to purify drinking water in Switzerland since 1955.

UVC light is chemical-free and has no after-effects on surfaces: it is safe to enter an area immediately after it has been disinfected by a mini™ UVC.

Direct contact with UVC light, however, can be dangerous. This is why the mini™ UVC is equipped with **a number of safety features listed below (page 4)**.

The mini™ UVC destroys up to 99% of viruses, bacteria and fungi on surfaces, but is not a substitute for manual cleaning, physical distancing and mask wearing.

Can the mini™ UVC work around people?

Yes, with care.

The mini™ UVC is equipped with **a number of safety features listed below (page 4)**, and we strongly recommend instituting safety protocols. For example, visually confirming the area is empty before running a mini™ UVC, or programming the mini™ UVC to shut off automatically when a certain door is opened.

UVC light is blocked by walls and glass, so a person can safely work in a room adjacent to a mini™ UVC. UVC light disinfects surfaces, but it dissipates instantly: it is safe to enter an area immediately after it has been disinfected by a mini™ UVC.

Short exposure to UVC light may cause eye discomfort (photo-keratoconjunctivitis) or burns (erythema), but is unlikely to cause permanent damage¹⁰.

The ACGIH and ICNIRP limit for 8-hour continuous exposure to UVC radiation at 254 nm is 6 mJ·cm⁻². For example, five seconds exposure at 10 meters (say, accidentally opening a door while the UVC light is activated on the far side of a room), or five seconds exposure from one meter (say, hitting the robot's emergency stop button) are within acceptable levels of exposure (0.10 and 2.57 mJ·cm⁻² respectively). Distance from the light source and limited exposure time also reduces the chance of harm.

While short exposures can be tolerated, we **do not** recommend **any** exposure to UVC light without personal protective equipment.

How does the mini™ UVC move around?

The mini™ UVC uses proven **ANT® natural feature navigation technology** to move around.

With ANT® navigation there is no need to change the environment: the vehicle can navigate without laying magnetic tape, or wires. The installation process takes an approved technician or integrator hours or days, depending on the site.

It 'knows where it is,' can avoid obstacles, follow routes, and even interface with automatic doors and elevators.

The mini™ UVC is easy to use. Before deploying it for the first time, the mini™ UVC is manually driven through your space to create a map in the ANT® lab software. Then, just define routes and disinfection points, and set how often mini™ UVC should disinfect your site. The mini™ UVC will do the rest.

Day-to-day, the mini™ UVC can be managed from a windows-based laptop or tablet by any trained technician.

Is the mini™ UVC fully autonomous?

The mini™ UVC can be operated 100% autonomously, semi-autonomously (for example, if staff are needed to open doors), or manually via a joystick (personal protective equipment required).

With the easy-to-use ANT® server software, the mini™ UVC can be set to automatically and autonomously disinfect your site on a regular basis.

Can the mini™ UVC work with other robots or vehicles?

Yes, using ANT® server software, the mini™ UVC can work alone, in a connected fleet of other mini™ UVC machines, or even alongside other ANT® driven vehicles for a fully integrated solution.

The mini™ UVC can also interact with elements of your site such as automatic doors and elevators. It can even be linked to external devices such as video cameras to verify progress or as a further safety measure.

How much does the mini™ UVC cost?

Get in touch with us through BlueBotics.com/UVC.

Where can I buy the mini™ UVC?

Get in touch with us through BlueBotics.com/UVC.

Technical FAQ

Disinfection and irradiation power

The mini™ UVC is equipped with eight 17.5 watt Engmotion Steril-ONE UVC disinfection lamps, with a total irradiation power of 140 UVC watts (254 nanometers). UVC light at wavelengths of 253.7 nm destroys up to 99% of viruses and bacteria¹².

Lamp lifetime

Up to 9,000 hours.

Safety features

The mini™ UVC is equipped with a number of safety features, including:

- Two keys, so the mini™ UVC can be manually locked when not in use
- An automatic 30 second wait time before the UVC light activates
- Voice alert and a flashing warning light (in addition to the UVC light which is blue when activated)
- Two safety laser scanners which allow the mini™ UVC to navigate around the environment, and automatically halt the vehicle if a person steps into its path
- By default, the mini™ UVC moves in a 'stop and go' pattern, and the UVC light is only activated when the mini™ UVC is stationary. Four main (and four auxiliary) 360° Panasonic human detectors with automatic shut off are activated when the mini™ UVC is stationary for more than two seconds
- Two emergency-stop buttons for instant shut-off

While short exposures to UVC light can be tolerated, we **do not** recommend **any** exposure without personal protective equipment. UVC light is blocked by walls and glass, so it is safe to work in a room adjacent to where a mini™ UVC is working.

Short exposure to UVC light may cause eye discomfort (photo-keratoconjunctivitis) or burns (erythema), but is unlikely to cause permanent damage¹³. The ACGIH and ICNIRP limit for 8-hour continuous exposure to UVC radiation at 254 nm is 6 mJ-cm⁻². For example, five seconds exposure at 10 meters (say, accidentally opening a door while the UVC light is activated on the far side of a room), or five seconds exposure from one meter (say, hitting the

robot's emergency stop button) are within acceptable levels of exposure (0.10 and 2.57 mJ-cm⁻² respectively). Distance from the light source and limited exposure time also reduces the chance of harm.

UVC light dissipates instantly, and when the lamp is switched off it is as safe as a standard household lightbulb.

Navigation & connectivity

The mini™ UVC navigates with **Autonomous Navigation Technology (ANT®) by BlueBotics**. This proven technology is currently drives over 2,000 vehicles worldwide.

The mini™ UVC can be configured via supplied ANT® lab software, or in your existing warehouse management or enterprise resource planning software via API. It can interface with on-site equipment (such as automatic doors and elevators) via **modbus** and **opc-ua** communication protocols.

Fleet operation

Connect multiple mini™ UVC robots via ANT® server software. mini™ UVC robots can also work with other ANT® driven vehicles.

Charging time

2 hours manual charge or 3 hours automatic charge

Operating time per charge

4 hours

Maximum speed

1.5 meters (4.9 feet) per second

Total dimensions

460 x 1,600 x 680 mm (W x H x L)

Lamp dimensions

28 x 900 mm (W x H)

References

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- 3 IUVA Fact Sheet on UV Disinfection for COVID-19, retrieved from <https://iuva.org/IUVA-Fact-Sheet-on-UV-Disinfection-for-COVID-19>
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- 7 This information is based on mathematical model supported by our own internal testing. However, as site layout and surface materials also affect time needed for complete disinfection, we are not able to give precise timings, and recommend verifying results with an independent laboratory in your area.
- 8 M. Lindblad, E. Tano, C. Lindahl, & F. Huss, Ultraviolet-C decontamination of a hospital room: Amount of UV light needed. October 30, 2019, retrieved August 27, 2020, from <https://www.sciencedirect.com/science/article/pii/S0305417919300920>
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