OSRAM AirZing™ PRO 5030 UNIV - FAQs

1. What is UV-C?

UV-C is a part of the non-visible portion of the electromagnetic spectrum, with wavelengths between 200-280nm, and is part of the complete UV spectrum that is defined into distinct categories, including UV-A (320-400nm), UV-B (280-320nm), UV-C (200-280nm) and V-UV (100-200nm).

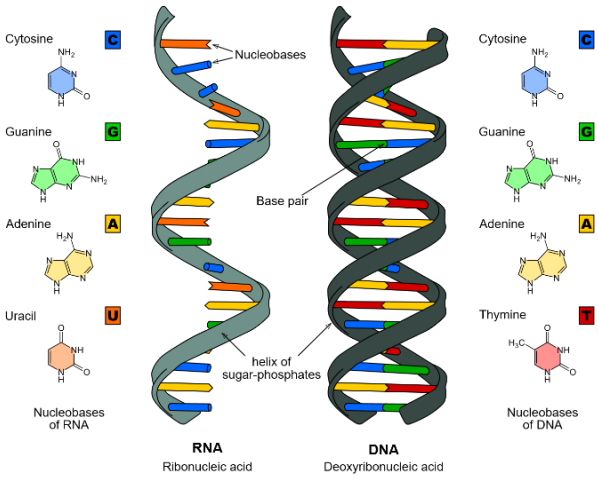
Ultraviolet radiation is emitted by the sun, but UV-C is completely absorbed within the ozone layer and is not part of the sun's energy that reaches the Earth's surface. UV-C radiation is created using artificial light sources, with the first UV-C light source being introduced to the world 200 years ago.

The effectiveness of UV-C germicidal lamps (that emit radiation at 253.7nm) to combat viruses and bacteria has been studied over many years and gained greater market acceptance, particularly in water purification applications. More recently, there has also been broader use of UV-C germicidal lamps in hospitals and other public spaces for air and surface disinfection to combat Hospital Acquired Infections (HAIs) and to reduce the need for harsh chemicals.

2. How does UV-C work against viruses and bacteria?

The germicidal effects of UV-C have been studied for many years. The cell nucleus of microorganisms (bacteria and viruses) contains thymine, a chemical element of the DNA / RNA. This element absorbs UV-C at a specific wavelength of 253.7 nm and changes to such an extent (formation of thymine dimers) that the cell is no longer capable of multiplying and surviving.

- UV-C (253.7nm) penetrates the cell wall of the microorganism
- The high energy photons of the UV-C are absorbed by the cell proteins and DNA / RNA
- UV-C damages the protein structure causing metabolic disruption
- DNA/RNA is chemically altered so organisms can no longer replicate
- Because microorganisms are now unable to metabolize and replicate, the UV-C light has effectively and safely disinfected the UV-C workspace.



Credit to Author: Sponk. File: *Difference DNA RNA-EN.svg*
Published under licenses under Creative Commons Attribution-ShareAlike 3.0 Unported (CC BY-SA 3.0).
Description: Comparison of a single strand of RNA with a double helix of DNA with its corresponding nitrogenous bases.

3. Will the AirZing™ kill SARS-CoV-2?

Every day the world learns more and more about the SARS-CoV-2 virus and the COVID-19 disease that it causes, and studies related to UV-C and the novel coronavirus are actively being sought by scientists and industry experts. Industry information on UV-C and its effectiveness against viruses and bacteria can be found on websites for the IUVA (International Ultraviolet Association) and the IES (Illuminating Engineering Society).

The AirZing PRO fixture is equipped with an OSRAM PURITEC® HNS® lamp that emits shortwave UV-C radiation at a 253.7nm wavelength. Industry studies over many years have shown that UV-C at this wavelength is effective in deactivating viruses. According to information provided by the IUVA Fact Sheet, this includes coronaviruses like SARS-CoV-1 and MERs. Recent university studies, like the one conducted by the University of Milan, have shown that UV-C is also effective directly against the SARS-CoV-2 virus. All bacteria and viruses have their own susceptibility to UV-C, with defined UV Dose guidance provided by scientific sources. Industry experts are still working to define and publish the UV Dose required to reach 99% deactivation of SARS-CoV-2, so this is still a work in progress.

4. How large of a room can I disinfect using the AirZing PRO 5030 UNIV?

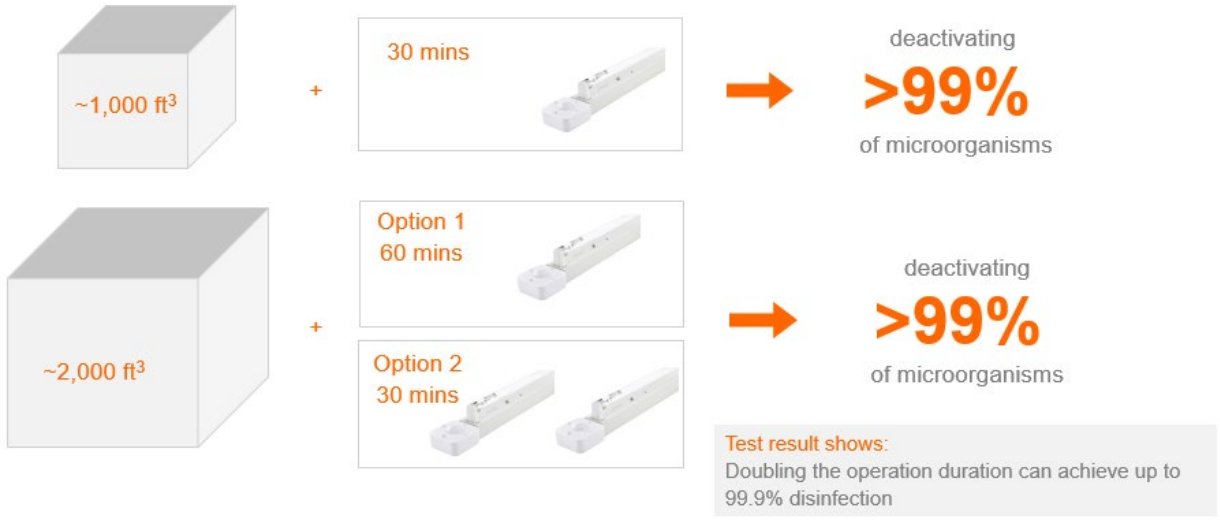
Based on testing, one AirZing fixture can deactivate 99% of microorganisms in a room that is approximately 2,000 ft^3 in 60 minutes. Using multiple fixtures in a space this size can allow for shorter exposure times. For example, with 2 fixtures this exposure time can be reduced to 30 minutes.

For a room with both high ceilings and a large square footage, where the exposure times would need to be greater than 60 minutes, the AirZing fixture would not be recommended for that space.

As you can imagine, just like with visible light, the further the light travels from the source, the less light energy it will have. For UV-C the amount of light energy or “irradiance” at a distance and the exposure time are the 2 key components in calculating the UV dose being delivered.

UV Dose = Exposure Time x UV Irradiance

For a large space a UV-C radiometer could be a helpful tool to accurately measure the amount of UV-C irradiance in areas of the room furthest from the fixtures. (Note: if you will be in the room during the UV-C measurement you must protect your skin and eyes from UV-C exposure. We recommend data storage radiometers so that data can be collected without a person in the room during the test.)



5. How do I determine the number of fixtures I need for my space?

As a general guide, the coverage area for one AirZing fixture is approximately 130-160ft^2 with a recommended exposure time of 60 minutes. To treat a larger space or to decrease the recommended exposure time additional fixtures can be used, using the same proportions.

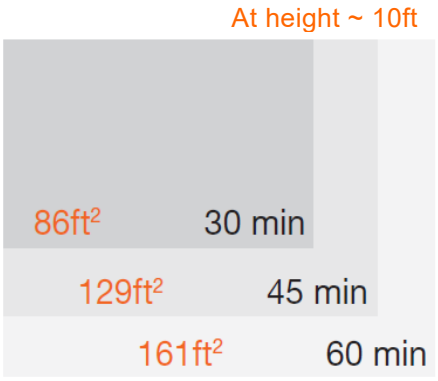
Example 1: If you have a space that is approximately 320ft^2 and you will be mounting the fixtures at a height of 9ft you could would want at least 2 fixtures and would plan for a 60-minute exposure time. If you wanted to reduce the time to 30 minutes you would need to add 2 additional fixtures for a total of 4 fixtures.

Example 2: If you only had 30 minutes to disinfect a room that is 500 ft^2 with a ceiling height of 9ft then you would want to go with 6 fixtures (500 ft^2 Total ÷ 86 ft^2 coverage per fixture in 30min = 5.8 or 6 fixtures).

The coverage area of one fixture is 129ft^2 – 161ft^2 (12-15m^2)

Exposure time for one fixture if the workspace is:

- < 86ft^2 (<8m^2) - 30 min recommended
- 86-129ft^2 (8-12m^2) - 45 min recommended
- 129-161ft^2 (12-15m^2) - 60 min recommended
- > 161ft^2 (>15m^2) - multiple fixtures recommended



6. What if my ceiling height is greater than the recommended installation height?

With high ceilings it may make more sense to wall mount the AirZing fixtures within the recommended height range of 8-13ft. Also, more than one fixture may be needed if the square footage of the room is greater than approximately 160ft^2 or if shorter exposure times are desired.

For a room with both high ceilings and a large square footage, where the exposure times would need to be greater than 60 minutes, the AirZing fixture would not be recommended for that space.

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7. How long should I operate the AirZing PRO 5030 UNIV to disinfect a surface in my application space?

UV-C is most effective on surfaces directly exposed to the UV-C light. It's important to note that soiled surfaces, porous materials or recessed areas may not be disinfected. When determining the location for the AirZing fixtures in the room it may be helpful to consider the surfaces in the room that are higher priority for disinfection, like high contact areas, and ensure that the location of the fixtures allows for direct exposure to the UV-C light.

The amount of exposure time needed to disinfect is based on the UV-C dose required for the targeted microorganism (published data available based on scientific studies) and the amount of UV-C irradiance at the surface being disinfected. An example of the calculation is shown below, but OSRAM also offers a calculation tool that can provide guidance for surface disinfection.

UV Dose = Exposure Time x UV Irradiance

Microorganism	99% (J/m^2)
Bacillus anthracis (vegetative)	90.4
S. enteritidis	80
B. megatherium sp. (veg.)	75
B. megatherium sp. (spores)	56
B. paratyphosus	64
B. subtilis (mixed)	142
B. subtilis spores	240
Corynebacterium diptheriae	68
Eberthella typhosa	42.8
Micrococcus candidus	121
Micrococcus piltonensis	162
Micrococcus sphaeroides	200
Neisseria catarrhalis	88
Phytomonas tumefaciens	88
Proteus vulgaris	54
Staphylococcus aureus	99

Source: CIE 155:2003 UV Air Disinfection

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How long do we need to operate our AirZing?

W/m^2

30W
1.2 @ 1m
0.20 @ 2.5m
0.075 @ 4m

For example:

- We use 30W (AirZing PRO 5030 UNIV)
- The installation height is 2.5m
- Our target is to kill 99% of Staphylococcus aureus
- We need to operate:

$495s = 99J/m^2 \div 0.20\ W/m^2$

0.20 W/m^2

99 J/m^2

8.25 mins

8. How can I measure the UV-C output of my AirZing fixture so that I know it is working?

There are both quantitative and qualitative methods available to measure UV-C irradiance.

Quantitative:
A UV-C radiometer is the most accurate way to measure UV-C irradiance. At a distance of 3ft, the output of the AirZing PRO 5030 UNIV fixture should measure between 0.11 and 0.13W/ft^2. If the reading is below 0.11 W/ft^2 the lamp should be replaced with a new OSRAM G30T8/OF (PURITEC HNS 30W) lamp.

UV-C radiometers are readily available for purchase with a range of features and prices:

- Data storing models are optimal, since they can be operated in the room without a person needing to be present to view the results live. Stored results can be reviewed after the chosen exposure time is completed.
- For models that do not store data, the person operating the radiometer must wear full protective clothing and UV-C blocking eyewear to protect eyes and skin from UV-C exposure during testing.

An example of a comprehensive quantitative solution is the X1-1-UV-3726 from Gigahertz-Optik. It offers a detector specific for UV-C 254 nm irradiance measurement and can measure irradiance and dosing. It can also log data when used with the optional software package. This unit has a feature that can assess UV-C hazard limits for a workspace.

Qualitative:
There are also testing cards, strips or dots available at a lower cost that can be used as a qualitative measure of UV-C exposure. These cards can be placed within the space being disinfected for the recommended exposure time. The test strip has a test area that is sensitive to UV and will change color as an indication of UV exposure. You should follow the manufacturers recommendations for use of these test cards.

One qualitative option is the Tri-Card Dosimeter from Intellego Technologies. These cards are easy for anyone to use and offer a less expensive approach compared to a UV-C radiometer. Pricing is available at www.intellego-technologies.com.

9. If I am am using the AirZing PRO for disinfection can I be certain that I've eliminated all viruses and bacteria?

No. Like other disinfection processes, including the use of chemical products, complete elimination of viruses and bacteria with UV-C light cannot be guaranteed. However, experts agree that the use of UV-C light, when used properly, can be a valuable tool to include to reduce the overall risk of exposure to harmful viruses and bacteria.

10. Should I be concerned about objects and materials in the rooms where I want to use the AirZing PRO for disinfection?

We are most familiar with how the UV-A component of sunlight can affect (i.e. age) certain outdoor products over time. We are also aware of the degrading effects of harsh chemicals on some materials. UV-C light, like that emitted by the AirZing PRO 5030 UNIV, can also age materials over time, in particular

non-metallic materials such as plastics, rubber, paint, etc. These types of products can be shielded during operation to prevent potential aging effects from happening over time. UV-C can also damage living plants, so it is recommended that these be removed during UV-C operation.

11. Can I use the AirZing PRO 5030 UNIV in my home?

No. The AirZing PRO 5030 UNIV is an "open" UV-C fixture, meaning that it provides direct UV-C radiation for optimal air and surface disinfection. Exposure to direct UV-C light, however, is also harmful to eyes and skin for both people and animals. Even though the AirZing PRO is equipped with an IR motion sensor as a safety shut-off feature, it is still important that the fixture be used in a professional setting, operated by trained personnel in a controlled environment to ensure the safe and effective operation of the fixtures.

12. How does the sensor work?

The AirZing PRO 5030 UNIV is equipped with a responsive IR motion sensor. When the fixture is turned on, the sensor provides a 30-second delay before energizing the lamp to allow the person operating the fixture to exit the room.

If the sensor detects motion, it immediately turns off the fixture. The fixture will not power back on unless the fixture is shut off for at least 5 seconds and then turned back on.

Please note that although the sensor is an added safety feature, any UV-C fixture should always be operated by a person who is trained and understands the precautions necessary to avoid UV-C exposure to their skin and eyes. OSRAM also recommends that a sign be placed on the door outside the room to alert others to avoid entering the space. A sign is available for download on our webpage www.osram.us/airzing.

13. I noticed DIP switches under the cover of the sensor, can I adjust the sensitivity?

No. Although the sensor has sensitivity dipswitch settings under the sensor cover, they are not active. The sensor is "hard wired" for maximum sensitivity by the factory.

14. Does the AirZing produce ozone?

The AirZing does not generate ozone (O_3), which is known to be harmful for human lung and respiratory function. Ozone is created when UV radiation at a peak of 185nm is emitted from an ultraviolet light source. The PURITEC HNS lamps used to power the AirZing are produced using a special glass that blocks the portion of the ultraviolet spectrum that results in the production of ozone and are therefore considered "ozone-free". Photobiological testing was completed as part of the regulatory approvals that confirms this. Although some products use ozone for disinfection, the UV-C output of the AirZing PRO 5030 UNIV at 253.7nm is already very effective in deactivating bacteria and viruses, and so the production of ozone is not necessary and only adds additional risk of exposure to harmful ozone gas.

15. Why is there sometimes an unusual odor when operating my AirZing PRO fixture?

The UV-C radiation created by the AirZing breaks up the airborne & surface-born dust particles in the workspace, which releases thiol molecules into the air. These molecules have a very low smell threshold, which means they are easily detectable by the human nose. The identification of the odor can vary by person but is often described as a smell like burnt rubber. There are no dangers posed by this odor.

Maintaining a routine dust cleaning schedule in the workspace is recommended to mitigate these types of odors during AirZing operation.

16. What electrical set-up options are available and what do you recommend (i.e. on/off switch, timers, digital controllers, etc.)?

The AirZing fixtures should always be installed by a licensed electrician. It is also important to note that UV-C fixtures should always be operated on their own circuit with an identifiable switch separate from the standard light switch. Safety measures, such as interlocking devices, lockouts, or safety switches are also highly recommended.

Other options to allow additional electronic control of the exposure time could be helpful in some applications. Mechanical or digital timers can be used as well as more sophisticated control options. Safety measures, like lockouts are still recommended for these options. Consult with your electrician for the best option that meets your application and cost requirements.

17. What should I do if the lamp breaks?

Like standard linear fluorescent lamps and compact fluorescent lamps (CFL's), the UV-C germicidal lamps contain very low levels of mercury. If the lamp breaks the same procedures apply and can be found online. It is recommended that the air in the room be circulated and that fragments be picked up using firm cardboard or a dustpan, and sticky tape for small fragments. A vacuum should not be used for initial clean-up to avoid spreading of any mercury in the room. Local disposal requirements (like those for your standard fluorescent bulbs) should be followed

18. Is there a way to protect the lamp from accidental breakage?

When inserting the lamp into the fixture note that it twists 90° and secures into place so that it won't accidently fall out of the fixture.

It's not recommended for fixtures to be mounted where there are activities taking place that could result in the fixture being hit by an object (i.e. ball playing, etc.).

A metal wire mesh guard could be used to protect the fixture. The mesh would need to be open enough to allow the UV-C light to reach the required surfaces as specified, while still protecting the lamp from breakage. OSRAM does not yet offer this type of accessory but could help with questions regarding this approach if it is of interest.

19. What about the use of other UV wavelengths, like UV-A at 405nm or UV-C at 222nm?

There are “UV” fixtures on the market that allow for direct human exposure to the light source. These are typically UV-A fixtures emitting radiation at approximately 405nm. Although they are in a lower risk category for human exposure, there is also evidence that, although they are effective against bacteria, they are not as effective against viruses. More information on this can be found in the information provided by the IES.

There is also an emerging interest in 222nm UV-C radiation. It is believed that this wavelength does not pose risks to human skin and eyes and has been under evaluation at the University of Columbia. This technology is interesting and broadens the application areas for UV-C light disinfection, but there are still limitations for the near-term use of this technology, including the lack of FDA approval so far, as well as the low efficacy and high cost of the excimer light source available.

LED sources for UV-C germicidal applications is also an emerging technology. The use of LEDs will allow for a more fine-tuning of the UV-C output to target specific bacteria and viruses and could provide more design flexibility for UV-C disinfection systems. Efficacy and costs are still barriers to the commercialization of LEDs for most germicidal applications, but OSRAM has been working hard to expedite the improvements in UV-C LED technology and production.

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