

Care222[®] Technology

Filtered 222 nm Far UV-C Disinfection for Occupied Spaces

Where can you use
Care222[®] technology?

- ◆ Conference rooms
- ◆ Elevators
- ◆ Educational establishments
- ◆ Food and beverage production
- ◆ Hospitals
- ◆ Hotels
- ◆ Industrial kitchens
- ◆ Laboratories & clean rooms
- ◆ Public spaces
- ◆ Public transport
- ◆ Sanitary facilities
- ◆ Surgical practices
- ◆ Other general disinfection applications



Ushio is proud to introduce the Care222[®] series, a new line of krypton chloride (KrCl) excimer lamps designed for highly-effective microbial reduction. Lamp modules fitted with Care222[®] technology deliver filtered ultraviolet germicidal irradiation (UVGI) to kill bacteria and inactivate a vast range of viruses, without damaging human cells and tissues. Respected scientific institutions, such as Japan's Kobe University, have made significant contributions to the development of 222 nm as a disinfection tool, while Columbia University (USA) granted Ushio use of its patented optical band-pass filter with worldwide exclusivity. Enter a new era of precautionary pathogen control, as microbial reduction becomes a reality in occupied spaces, with Ushio's unique Care222[®] far UV-C disinfection technology.



Filtered 222 nm far UV-C lamp modules with Care222® technology are able to achieve microbial reduction in occupied spaces, with minimal health risks to human skin or eyes, when operated within current regulations governing ultraviolet (UV) exposure.

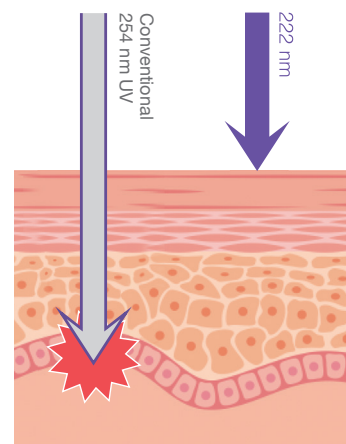
Breaking new ground in occupied space safety

Devices that use Care222® technology emit far UV-C wavelengths in the 200–230 nm band, with a peak at 222 nm. This band is mostly absorbed by proteins in the skin and is not transmitted beyond the top layer (*stratum corneum*), nor that of the cornea; therefore, molecular mutation of the deeper skin formation layer, the *stratum spinosum*, can be avoided. By contrast, the wavelengths emitted from conventional 254 nm UV disinfection lamps penetrate the deeper tissue layers and can cause mutations that lead to serious illnesses, such as skin cancer or cataracts.

Filtered far UV-C excimer lamp modules

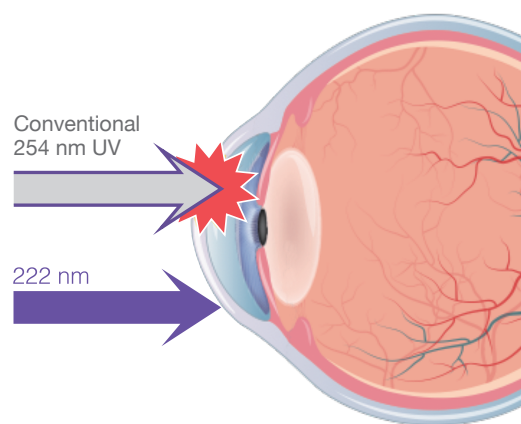
- ◆ Effective germicidal emissions of 200–230 nm
- ◆ Patented optical band-pass filter blocks harmful wavelengths longer than 230 nm, ensuring peak irradiation at 222 nm
- ◆ Output power of 2.5 mW/cm² (50 mm from the window)
- ◆ Effective reduction of viruses, bacteria, and spores, including coronaviruses, MRSA, E. coli, and many more
- ◆ Highly-effective when applied to both air and surfaces
- ◆ Instant on/off at full output power
- ◆ Mercury-free & environmentally friendly
- ◆ No lifetime reduction by frequent on/off cycles
- ◆ Minimal ozone emission

Depth of UV-C penetration into the epidermis

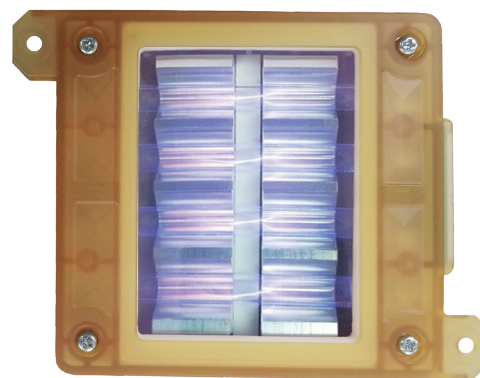


222 nm far UV-C is absorbed by proteins in the top layer of dead skin cells, known as the *stratum corneum*.

Depth of UV-C penetration into the eye

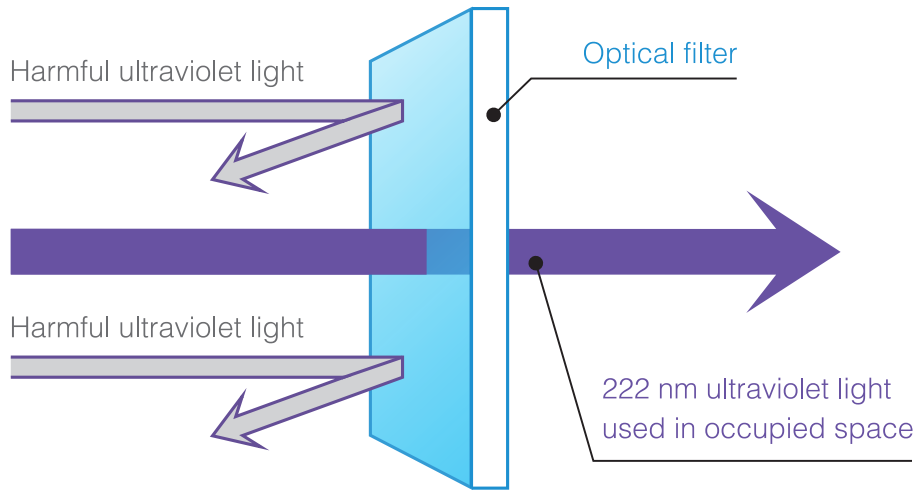


222 nm far UV-C is absorbed by the outer surface of the *cornea*, thereby reducing the risk of cataracts.



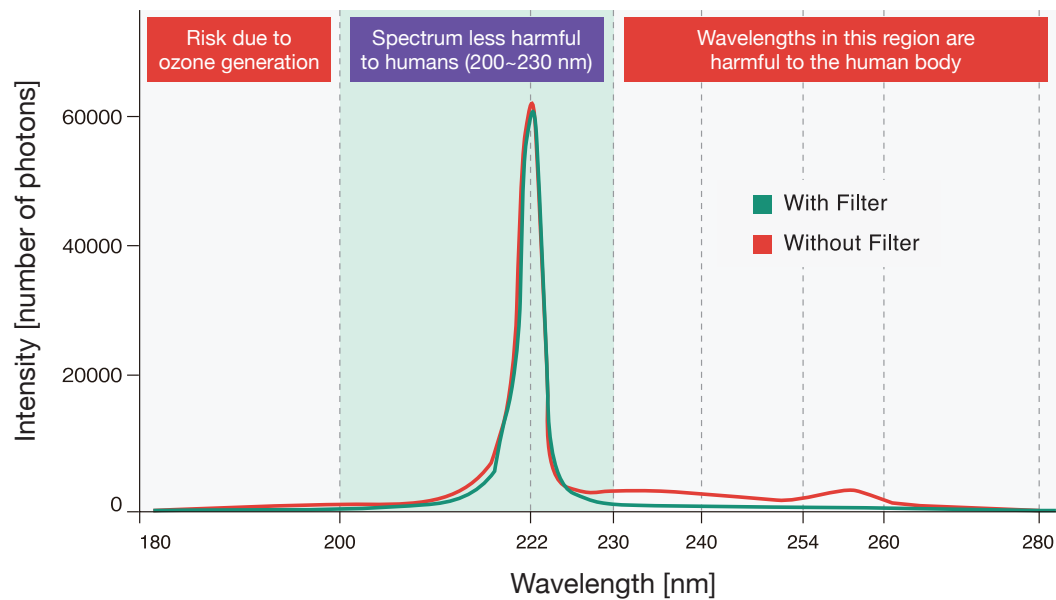
The Care222® lamp and filter combination has been designed especially for integration into OEM-produced devices and luminaires.

Filtering 254 nm and other harmful UV wavelengths



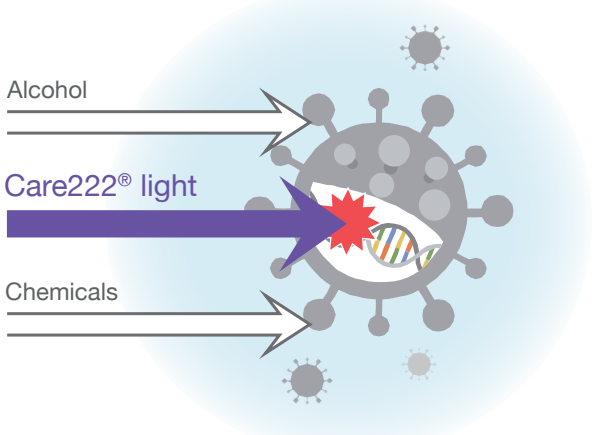
Columbia University granted Ushio worldwide exclusive use of its patented optical band-pass filter.

Excimer lamp spectrum distribution



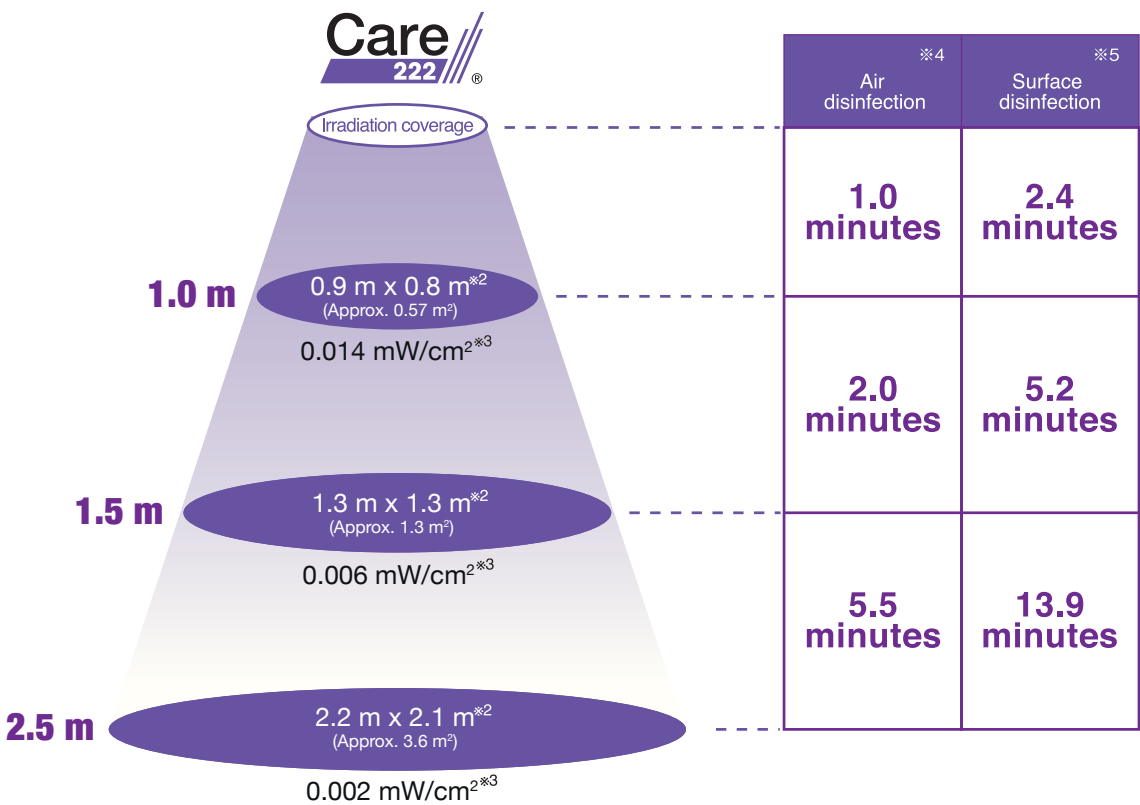
The patented Care222® optical band-pass filter prevents exposure to harmful wavelengths or toxic levels of ozone.

Substance-free virus inactivation



The Care222® light excites the molecules within the DNA and RNA of micro-organisms and pathogens, such as bacteria, viruses, and protozoa. The resulting destruction of their genetic structure renders the organisms unable to reproduce or infect and, in some cases, kills them.

Inactivation time with Care222® light



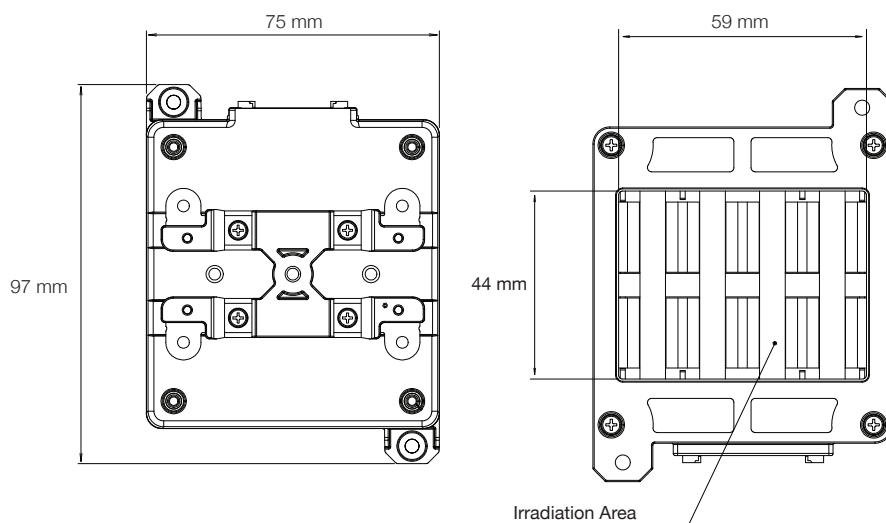
*1 The inactivation time is calculated based on the intensity at the centre of the exposure area at each irradiation distance. This time is only for inactivation of adherent and floating viruses irradiated by UV light in a sealed space. Effectiveness may vary by local environment and irradiation conditions. These results were carried out in a controlled laboratory environment.

*2 The area covered by 60% of the central intensity.

*3 Central intensity

*4 Reference: Buonanno, et al., Sci. Rep. 10, 10285 (2020)

*5 Reference: Kitagawa, et al. (2020) DOI: <https://doi.org/10.1016/j.ajic.2020.08.022>

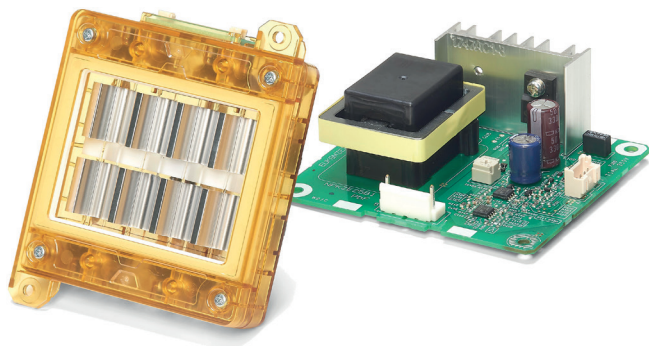


12 W 222 nm Care222® lamp module (with filter)

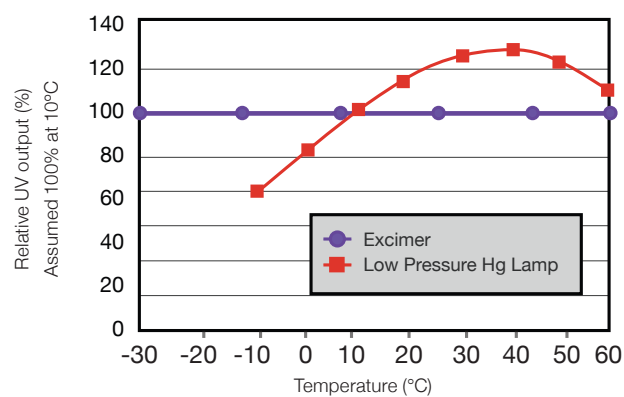


12 W 222 nm Care222® inverter

	Part Number	Type	Size (mm)
Module	114645	UXFL70-222B4-UIA	97 x 75
Inverter	114646	PXZ120I2-A	89 x 82



Excimer lamps are unaffected by ambient temperature fluctuations



Instant on/off at full output power

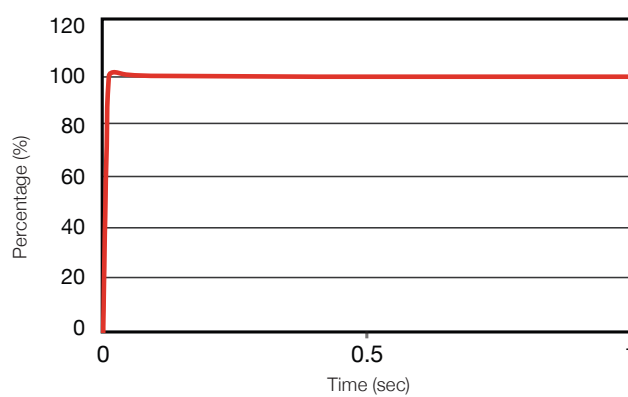




Table 1, Inactivation effect of 222 nm, 254 nm UV-C irradiation, and 70% ethanol on the various species. Dose of UV-C radiation to achieve 3-log reduction of the species is grouped as follows. <50 mJ/cm²: ◆◆◆, ~100 mJ/cm²: ◆◆, ~1000 mJ/cm²: ◆, >1000 mJ/cm²: —. Treatment time with 70% ethanol to achieve 3-log reduction of the species is grouped as follows. <10 sec: ◆◆◆, ~20 sec: ◆◆, ~30 sec: ◆, >30 sec: —. N.D. means no data.

Domain/Species		Methods			
		222 nm	254 nm	70% ethanol	405 nm
Bacteria					
MRSA (Methicillin-Resistant Staphylococcus aureus)		◆◆◆	◆◆◆	◆◆◆	◆
<i>Pseudomonas aeruginosa</i>		◆◆◆	◆◆◆	◆◆◆	◆
<i>Escherichia coli</i> O157		◆◆◆	◆◆◆	◆◆◆	◆
<i>Salmonella</i> Typhimurium		◆◆◆	◆◆◆	◆◆◆	◆
<i>Campylobacter jejuni</i>		◆◆◆	◆◆◆	N.D.	◆
<i>Bacillus cereus</i>	Vegetative cell	◆◆◆	◆◆◆	◆◆◆	◆
	Spore	◆◆◆	◆◆	—	—
<i>Bacillus subtilis</i>	Vegetative cell	◆◆◆	◆◆◆	N.D.	◆
	Spore	◆◆◆	◆◆◆	N.D.	—
<i>Clostridium difficile</i>	Spore	◆◆◆	◆◆	—	—
Molds and Yeasts					
<i>Candida albicans</i>		◆◆◆	◆◆◆	◆◆◆	◆
<i>Penicillium expansum</i>		◆◆◆	◆◆◆	N.D.	◆
<i>Aspergillus niger</i>	Vegetative cell	◆	◆	◆◆◆	◆
	Spore	◆	◆	N.D.	—
Virus					
MS2		◆◆◆	◆◆◆	N.D.	—
Feline calicivirus		◆◆◆	◆◆◆	—	—
Influenza A		◆◆◆	◆◆◆	N.D.	—
SARS-CoV-2		◆◆◆	◆◆◆	N.D.	—



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