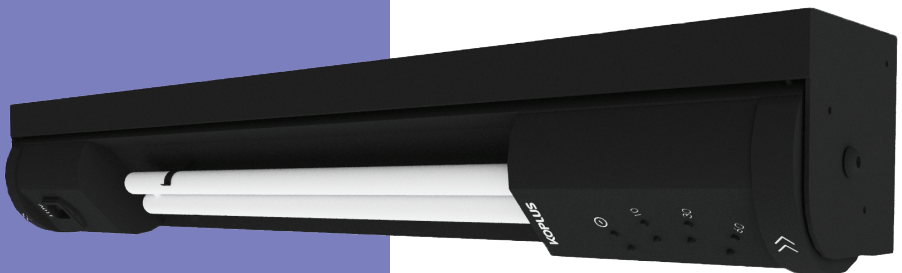


KOPLUS®

# UVC LIGHT



## Product Brochure

Productbrochure  
Produktbroschüre  
Brochure produit

EU Edition  
[www.koplus.eu](http://www.koplus.eu)

# What is UV Radiation?

A Radiation, Invisible To The Human Eye, Measured On The Eletromagnetic Spectrum

## Types & Benefits

### UVA

Ultraviolet A ray has the longest wavelength, with the lowest energy level. It can penetrate skin cells as deep as the dermis, but with controlled exposure to UVA, it can help with the production of vitamin D.

### UVB

Ultraviolet B ray has a wavelength between UVA and UVC. UVB can reach the epidermis layer of the skin. Similarly, exposure to UVB can increase the production of vitamin D.

### UVC

Ultraviolet C ray has the shortest wavelength, with the highest energy level. Due to its wavelength, it doesn't easily penetrate through the skin. UVC is a common germicidal tool.

## UVC as Germicidal Tool

UVC is a disinfectant for nonporous surfaces, including air, surfaces, and liquids. It has the ability to inactivate or even kill off microorganisms / bacterias.

# Can It Help Covid-19 ?

## SARS-CoV-2 Introduction

### Type & Structure

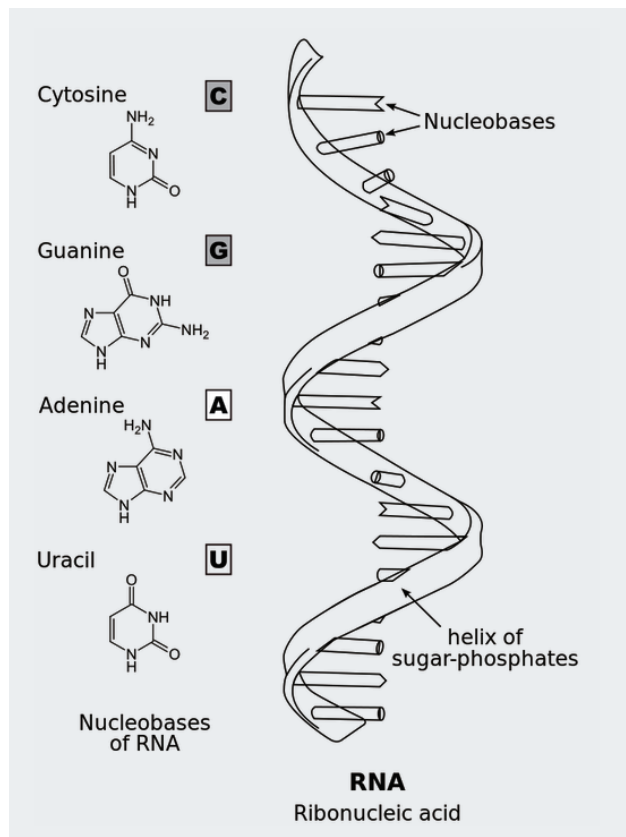
SARS-CoV-2 is a single-stranded RNA virus that reproduces by attaching itself to a host. The RNA structure consists of nucleic base pairs, where Cytosine (C) correlates with Guanine (G), and Adenine (A) correlates with Uracil (U).

### Current Situation

Scientists continues to find solutions to completely eliminate SARS-CoV-2 from further reproducing. One proposed idea is to inactivate SARS-CoV-2 through the use of UVC radiation.

### History

SARS-CoV-2 is the 7th type of coronavirus that has affected human. This virus is what causes the disease COVID-19. Vaccines against this virus are made but more research are being done to prepare for mutations and more.



# Inactivation Process

## 1. UVC Dose

It is tested that the wavelength at 262 nm serves to be the most effective dose for germicidal processes.

## 2. Placement

The closer the light is to its contacting surface, air, or liquid, the less time it will take to disinfect. 15-watt UVC Lamp can cover approximately 100 square feet (The ratio of 15:100 remains the same as watts increase).

## 3. Nucleic Acid Damage

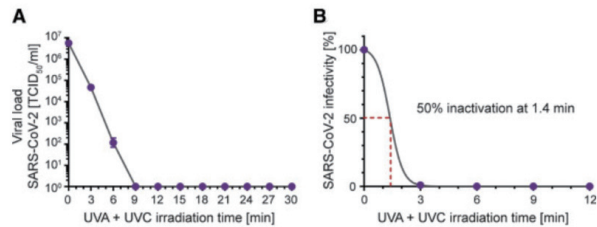
Bacteria and viruses (SARS-CoV-2) consists of DNA or RNA with nucleic acid pairs. UVC radiation damages these nucleic acids.

## 4. Inactivation

With a crucial component missing (the nucleic acid), the DNA / RNA will be inhibited from replicating, leading to the inactivation of the bacteria or virus.

# SARS-CoV-2 Test

## American Journal of Infection Control



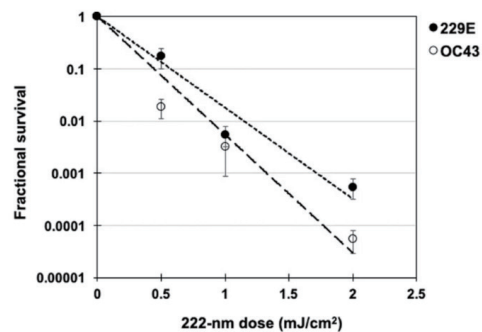
## Liquid

Proves that under 1,048 mJ/cm<sup>2</sup> dose of UVC radiation (+additional UVA exposure), it took...  
- 9 minutes to completely inactivate SARSCoV-2

	UVC irradiation time				
	Control	10 seconds	30 seconds	60 seconds	300 seconds
Mean viable SARS-CoV-2 (TICD <sub>50</sub> /mL) (SD)	2.05 ± 1.21 × 10 <sup>4</sup>	2.34 ± 0.86 × 10 <sup>3</sup>	6.32 ± 0.0 × 10 <sup>1</sup>	6.32 ± 0.0 × 10 <sup>1</sup>	6.32 ± 0.0 × 10 <sup>1</sup>
Log reduction		0.94	2.51	2.51	2.51
Mean SARS-CoV-2 RNA* (copies/test) (SD)	2.12 ± 0.27 × 10 <sup>7</sup>	5.75 ± 0.82 × 10 <sup>7</sup>	3.41 ± 1.08 × 10 <sup>7</sup>	2.95 ± 0.41 × 10 <sup>7</sup>	3.03 ± 1.73 × 10 <sup>7</sup>

## Surface

Proves that under far-UVC (207~110 nm)  
- 30 seconds to reduce live coronavirus by 99.7%



## Air

Proves that under 222 nm dose of UVC radiation  
- 99.9% of airborne coronaviruses (228E and OC43) are killed in 25 minutes

# Tests On Other Bacterias

## Product used on test

### Specifications

Power cord : 1.4m

Amp : 5 amp

Voltage : 110V or 250V

UVC Light : Philips TUV PL-L 36W 4P UV-C

Time Setting : 5 min/ 30 min/ 60 min

## Under our UVC lamp...

- Escherichia Coli
- Staphylococcus aureus
- Candida Albicans
- Methicillin-resistant
- Staphylococcus aureus
- Salmonella Enteritidis
- Influenza virus H1N1
- MDCK Cells

... these bacterias have a 99.9% sterilisation / inactivation ratio and rate (1.5m).

# Test Data

Test organisms	Action time	Test group	Average cfu of testing groups (cfu/piece)	Average cfu of positive controls (cfu/piece)	Sterilisation logarithm (KL)	Sterilisation rate (%)
Escherichia coli 8099	5 min	1	< 5	$8.0 \times 10^5$	> 5.20	> 99.99
		2	< 5	$8.5 \times 10^5$	> 5.23	> 99.99
		3	< 5	$7.0 \times 10^5$	> 5.15	> 99.99
	15 min	1	< 5	$8.0 \times 10^5$	> 5.20	> 99.99
		2	< 5	$8.5 \times 10^5$	> 5.23	> 99.99
		3	< 5	$7.0 \times 10^5$	> 5.15	> 99.99
Staphylococcus aureus ATCC 6538	5 min	1	< 5	$2.4 \times 10^6$	> 5.68	> 99.99
		2	< 5	$2.1 \times 10^6$	> 5.62	> 99.99
		3	< 5	$2.6 \times 10^6$	> 5.71	> 99.99
	15 min	1	< 5	$2.4 \times 10^6$	> 5.68	> 99.99
		2	< 5	$2.1 \times 10^6$	> 5.62	> 99.99
		3	< 5	$2.6 \times 10^6$	> 5.71	> 99.99
Candida albicans ATCC 10231	5 min	1	$5.5 \times 10^2$	$9.5 \times 10^5$	3.24	99.94
		2	$8.0 \times 10^2$	$1.1 \times 10^6$	3.14	99.93
		3	$4.6 \times 10^2$	$9.0 \times 10^5$	3.29	99.95
	15 min	1	< 5	$9.5 \times 10^5$	> 5.28	> 99.99
		2	< 5	$1.1 \times 10^6$	> 5.34	> 99.99
		3	< 5	$9.0 \times 10^5$	> 5.25	> 99.99
Methicillin-resistant Staphylococcus aureus ATCC 43300	5 min	1	65	$1.9 \times 10^6$	4.47	99.99
		2	35	$1.7 \times 10^6$	4.69	99.99
		3	55	$2.0 \times 10^6$	4.56	99.99
	15 min	1	< 5	$1.9 \times 10^6$	> 5.28	> 99.99
		2	< 5	$1.7 \times 10^6$	> 5.53	> 99.99
		3	< 5	$2.0 \times 10^6$	> 5.60	> 99.99
Salmonella enteritidis CMCC(B) 50335	5 min	1	< 5	$1.8 \times 10^6$	> 5.56	> 99.99
		2	< 5	$2.1 \times 10^6$	> 5.62	> 99.99
		3	< 5	$2.1 \times 10^6$	> 5.62	> 99.99
	15 min	1	< 5	$1.8 \times 10^6$	> 5.56	> 99.99
		2	< 5	$2.1 \times 10^6$	> 5.62	> 99.99
		3	< 5	$2.1 \times 10^6$	> 5.62	> 99.99

# Test Data

Test Virus & Host cell	Action time	Group	Logarithm of infectivity titre of virus (lgTCID <sub>50</sub> /mL)		Average of infectivity titre of virus (TCID <sub>50</sub> /mL)	Average inactivation log value	Inactivation ratio (%)
			Results	Average value			
Influenza virus H1N1 MDCK cells	5 min	Control group 1	5.50	5.39	2.5 X 10 <sup>5</sup>	> 4.89	> 99.99
		Control group 2	5.33				
		Control group 3	5.33				
	Test group 1	< 0.50	< 0.50	< 3.16			
	Test group 2	< 0.50					
	Test group 3	< 0.50					
15 min	Control group 1	5.50	5.39	2.5 X 10 <sup>5</sup>	> 4.89	> 99.99	
		Control group 2					5.33
		Control group 3					5.33
	Test group 1	< 0.50	< 0.50	< 3.16			
	Test group 2	< 0.50					
	Test group 3	< 0.50					



# Benefits Over Risks

What are the risks? Is it worth it?

## Risks

Without careful usage of UVC light, the radiation can be harmful upon direct contact to human skin. Several side effects could include: sunburn, eye damage, respiratory problems due to generated ozone, and in more severe cases, skin cancer.

## Benefits

Tests and researches above confirms the effectiveness of UVC light on inactivating / killing bacterias and viruses (including SARS-CoV-2). It can also kill up to 99.9% of molds, prolonging the life of surrounding products.

## Solution

Keeping risks in mind, our booths will not use UVC lamps as the primary light source, but rather a disinfecting tool when the booth is not in use.

# User Guide

1. Ensure that the booth is vacant.
2. Select and press the preferred time setting button.
3. The indicator light will begin to blink.
4. Leave the booth and close the door.
5. The UVC light will turn on after 60 seconds.
6. Once the UVC light has completed the selected disinfecting cycle, it will automatically turn off.  
When completed, the indicator light will be off.
7. Enjoy a clean booth.



**KOPLUS**<sup>®</sup>