

# UV-C luminaires and devices

Spaces free  
of viruses  
and  
bacteria

Disinfection of  
microorganisms



V3

**troll**  
LUXIONA



# LUXIONA

## ALWAYS ALERT TO THE DEMANDS OF THE SECTOR

Due to the great problems as a result of the COVID-19 disease, we have been boosted to develop a new range of **UV-C germicidal** disinfection products. This method of disinfection has been recommended by the **WHO (World Health Organization)**.

We are supported by our extensive experience in the production and marketing of lighting systems for Health & Care spaces.



We have an ISO 13485 certified manufacturing plant for the production of medical devices.



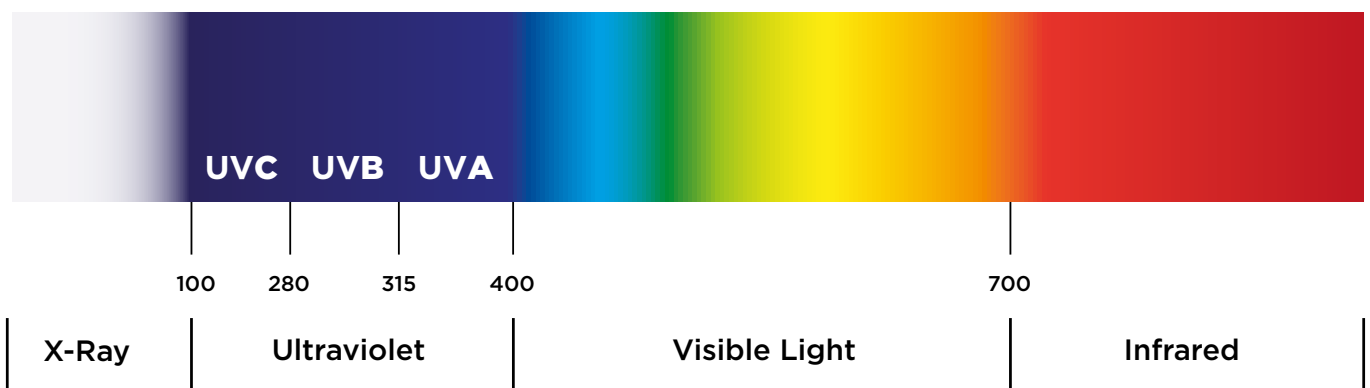
# WHAT IS UV-C TECHNOLOGY?

## TYPES OF UV SPECTRUM AND THEIR PROPERTIES

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### Light spectrum

Wavelength (nm)



UV ultraviolet radiation is part of electromagnetic wave radiation, **as are X-rays**, radio waves, or **visible light**.

From a practical point of view, **the UV spectrum** is divided into three categories:

#### **UV-C - short wave 100v nm - 280 nm**

This has a strong bactericidal and germicidal effect. It has a high photobiological risk since it can cause severe burns to the skin and eyes.

#### **UV-B - medium wave 280 nm - 315 nm**

Its applications are mainly in radiotherapy. It creates provitamin D. It has a low photobiological risk, increases pigmentation and can cause the appearance of small thermal erythemas on the skin.

#### **UV-A - long wave 315 nm - 400 nm**

Corresponds to the natural rays of the sun. It is involved in phytochemical processes, pigmentation, etc. The photobiological risk on the skin is negligible.



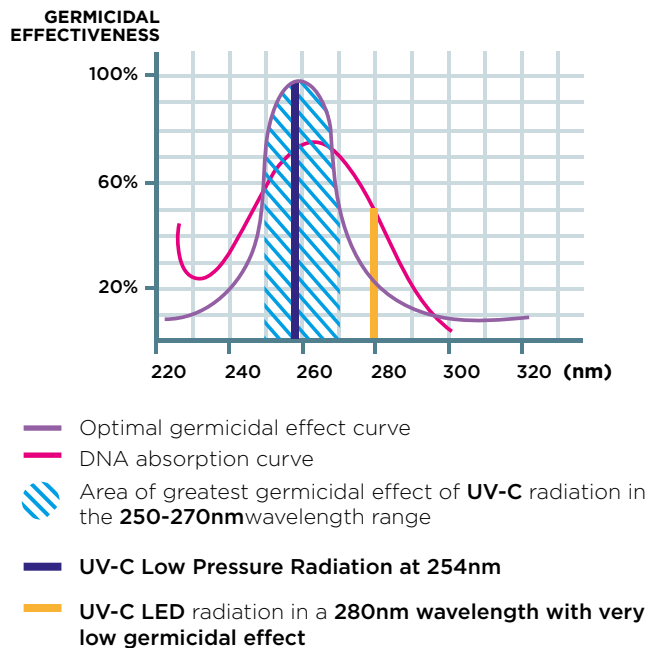
# WHY DOES UV-C DISINFECT?

The **UV-C** radiation of a **low pressure lamp** consists of a single spectral line of radiation at 254 nm, which is located in the area of maximum germicidal effect of the UV-C: between the wavelengths of 250 and 270nm

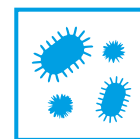
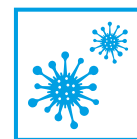
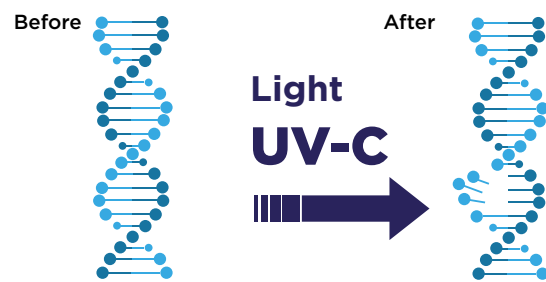
The **UV-C** radiation emitted by **LED** consists of a wave radiation between 275 and 280 nm, with very low germicidal effect.

The bactericidal mechanism results from the absorption of energy from **UV-C radiation** by **ribonucleic acids** and **proteins**, which induces chemical reactions that affect the **molecular structure** of the microorganisms until they are eliminated: **DNA+ RNA breakage**.

## UV-C Spectrum Germicidal effectiveness



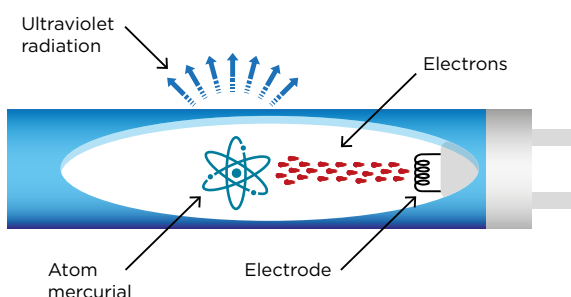
## Molecular structure (DNA+RNA)



99.9% effectiveness against microorganisms

# WHY DID WE CHOOSE LOW-PRESSURE RADIATION AS THE SOURCE?

Sources of **low pressure UV-C radiation** are **more effective** than LEDs in their germicidal effect.



**Low-pressure UV-C radiation** lamps are currently the **only source of light** for applications in **large spaces**.



Large spaces with **UV-C Low Pressure**



Small applications with **UV-C LED**

# WHAT TYPES OF UV-C SOLUTIONS DOES LUXIONA OFFER?

THE PRODUCTS OF THIS NEW UVC RANGE ARE **SPECIALLY MANUFACTURED** TO STAND UP TO ULTRAVIOLET RADIATION.

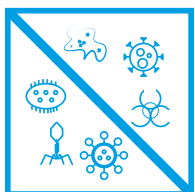
## NOTABLE FEATURES OF OUR PRODUCTOS ACCORDING TO EACH MODEL

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### Bactericidal coating

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LUXIONA sets the standard by offering the option of including a bactericidal coating in accordance with the same technology as our Health&Care class I, II and III luminaires.



### Motion sensor

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To ensure the safety of people and animals, our luminaires include a motion sensor. If the sensor detects a human or animal presence in the room, it automatically disconnects the power source.



### Timer

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In the case of portable luminaires, they also incorporate a timer, thus delaying their operation until the person has left the room and reconnecting again before the person enters.

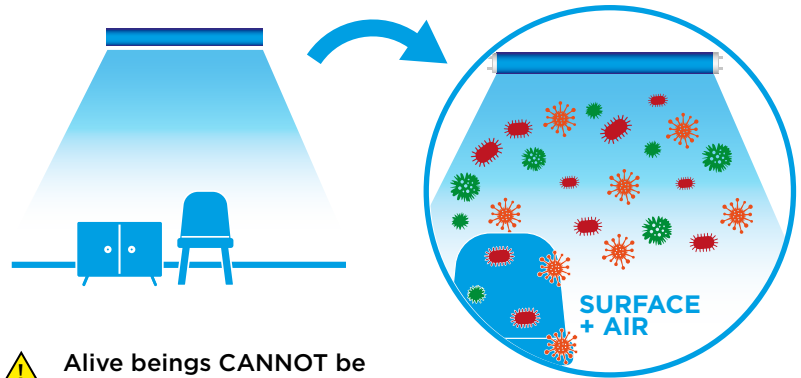


# DISINFECTION BY DIRECT RADIATION

Air and surface **disinfection** by **direct UV-C radiation**. The germicidal action is produced by direct exposure to UV-C radiation.

## Characteristics

- Short disinfection time.
- Bad odour elimination.
- Multiple devices connected to a single control..
- Hidden areas from direct emission will not be disinfected.
- Immediate use of the space once the radiation is over (no need to ventilate as in the case of the ozone disinfection system)
- May affect materials not resistant to UV-C radiation (e.g. some types of polymers).
- Photobiological hazard class RG3.



**Alive beings CANNOT be present during radiation.**

**Professional use only. Please read the operating and installation instructions carefully.**

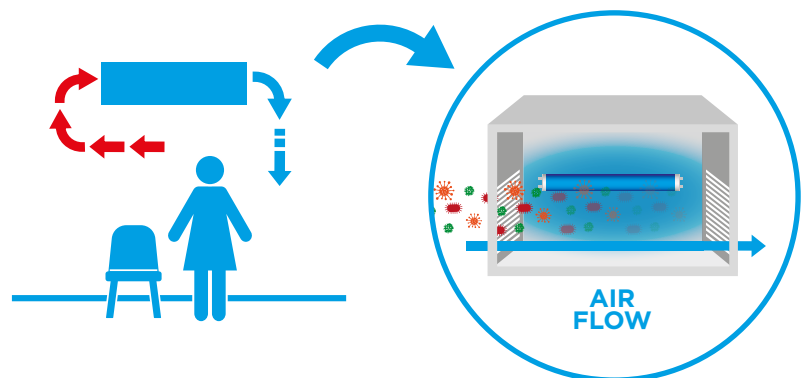
# UVC-FLOW AIR DISINFECTION

Disinfection of the **air** through UV-C radiation

The germicidal action is carried out by forced air circulation inside the disinfection chamber.

## Characteristics

- Longer disinfection time than direct radiation.
- Bad obours elimination.
- Especially indicated solution for closed spaces.
- Easy filter maintenance. Open device not needed.
- Electrical components are protected against dust and UV-C radiation.
- Low noise emission fan.



**Living beings CAN be present during its operation.**

# DIRECT RADIATION



## AGALINE UV-C



**Source of light:** T8  
**Lamp wattage:** 1x15 / 1x30/ 1x36 W  
                           2x15 / 2x30 / 2x36 W  
**Duration:** 9000 hours  
**Installation:** Surface, wall, mobile base  
**Construction:** Steel

**According to each model:**  
 • Timer  
 • Motion sensor

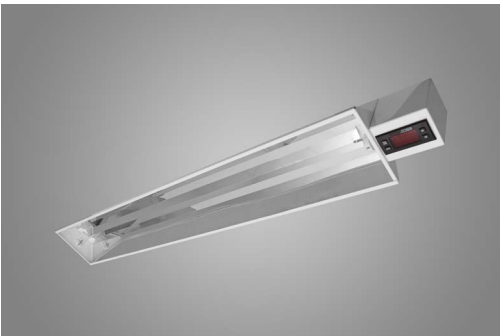
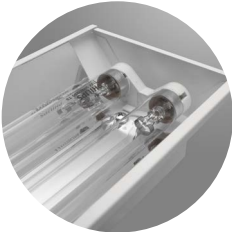
**On demand:**  
 • Operating hours counter  
 • Bactericidal paint



			Irradiance times (m) 99% Removal				
			VIRUS		BACTERIA		FUNGUS
Lamp	Coverage area	Irradiance W/m²	Coronavirus	Influenza A	Stafilococcus Aureus	Mycoplasma Spp	Aspergillus Flavus
Agaline 1x30w	up to 10m²	0.2	5,6	5,4	10,0	12,5	56,7
Agaline 1x36w	up to 12m²	0.14	8,1	8,8	13,8	17,3	80,5
Agaline 2x30w	up to 18m²	0.13	8,8	9,8	14,8	18,5	86,6
Agaline 2x36w	up to 25m²	0.12	9,6	10,9	15,9	19,9	93,7

- Values obtained according to the most unfavorable irradiancies calculated in a theoretical study at 2.8m distance with the useful plan surface at 0.85m.
- Recommendations based on the data provided by the manufacturer of the lamps.
- Conclusions obtained under ambient conditions of 25° C and 60% relative humidity.
- These data must be considered as a theoretical approximation, it is necessary to check the real irradiance on the surfaces to be treated once the installation has been carried out with a radiometer.

### SURFACE / WALL



• Model with timer

### ROLLER BASE (Wheel accessory)





# DIRECT RADIATION



## OKTAN UV-C

**Source of light:** TCL  
**Lamp wattage:** 2x36 / 2x55 W  
**Duration:** 9000 hours  
**Installation:** Surface, wall, mobile base  
**Construction:** Steel

**According to each model:**

- Timer
- Motion sensor



**On demand:**

- Operating hours counter
- Bactericidal paint

Lamp	Coverage area	Irradiance W/m <sup>2</sup>	Irradiance times (m) 99% Removal				
			VIRUS		BACTERIA		FUNGUS
			Coronavirus	Influenza A	Stafilococcus Aureus	Mycoplasma Spp	Aspergillus Flavus
Oktan 2x36w	up to 25m <sup>2</sup>	0.1	11,5	14,1	18,7	23,6	112,2
Oktan 2x55w	up to 30m <sup>2</sup>	0.1	11,5	14,1	18,7	23,6	112,2

- Values obtained according to the most unfavorable irradiances calculated in a theoretical study at 2.8m distance with the useful plan surface at 0.85m.
- Recommendations based on the data provided by the manufacturer of the lamps.
- Conclusions obtained under ambient conditions of 25° C and 60% relative humidity.
- These data must be considered as a theoretical approximation, it is necessary to check the real irradiance on the surfaces to be treated once the installation has been carried out with a radiometer.

### SURFACE / WALL



### ROLLER BASE (Wheel accessory)



# DIRECT RADIATION



## UV-C UNIVERSAL



**Source of light:** TCL  
**Lamp wattage:** 36 / 55 W  
**Duration:** 9000 hours  
**Installation:** SURFACE / MODULAR  
**Construction:** Steel

**According to each model:**  
 • Motion sensor

**On demand:**  
 • Operating hours counter  
 • Bactericidal paint



Lamp	Coverage area	Irradiance W/m²	Irradiance times (m) 99% Removal				
			VIRUS		BACTERIA		FUNGUS
			Coronavirus	Influenza A	Stafilococcus Aureus	Mycoplasma Spp	Aspergillus Flavus
Universal 1x36w	up to 12m²	0.12	9,6	10,9	15,9	19,9	93,7
Universal 1x55w	up to 15m²	0.17	6,7	6,8	11,6	14,5	66,5
Universal 2x36w	up to 25m²	0.12	9,6	10,9	15,9	19,9	93,7
Universal 2x55w	up to 30m²	0.15	7,6	8,0	13,0	16,2	75,3

- Values obtained according to the most unfavorable irradiances calculated in a theoretical study at 2.8m distance with the useful plan surface at 0.85m.
- Recommendations based on the data provided by the manufacturer of the lamps.
- Conclusions obtained under ambient conditions of 25° C and 60% relative humidity.
- These data must be considered as a theoretical approximation, it is necessary to check the real irradiance on the surfaces to be treated once the installation has been carried out with a radiometer.

## SURFACE / MODULAR



- Model with motion sensor

# DISINFECTION BY UVC-FLOW AIR



## AIRSTREAM UV-C



<b>Source of light:</b>	T8
<b>Lamp wattage:</b>	1x30 / 1x36 W 2x30 / 2x36 W
<b>Duration:</b>	9000 hours
<b>Installation:</b>	Surface, wall, portable devices for the floor, base or mobile
<b>Construction:</b>	Steel with anti-bacterial paint, can be built it in stainless steel
<b>Air intake filters</b>	Included

**According to each model:**  
• 1 or 2 filters

**On demand:**  
• Operating hours counter

### Estimated time for a complete renovation of the room air

Surface	Volume for h= 2,8 m	Time (hours)	Number of devices
25m <sup>2</sup>	70m <sup>3</sup>	2h 18 min	1
30m <sup>2</sup>	84m <sup>3</sup>	2h 45 min	1
50m <sup>2</sup>	140m <sup>3</sup>	2h 18 min	2
60m <sup>2</sup>	168m <sup>3</sup>	2h 45 min	2

It is recommended to use at least the following devices according to the volume of the room:

Volume	Number of devices
up to 99 m <sup>3</sup>	1
up to 179 m <sup>3</sup>	2
up to 279 m <sup>3</sup>	3
up to 400m <sup>3</sup>	4

- Recommendations based on the data provided by the manufacturer of the lamps.
- Conclusions obtained under ambient conditions of 25° C and 60% relative humidity.
- The dose received inside the cavity is approximately 48 W.s / m<sup>2</sup> for 2x30W and 60 W.s / m<sup>2</sup> for 2x36W at the point furthest from the internal chamber.

### CEILING OR BASE-WALL



### BASE



### ROLLER BASE (Accessory wheels)



- Model with operating hours counter

# WHERE CAN WE USE OUR LUMINAIRES?



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## HEALTH & CARE

- Operating rooms
- Treatment rooms
- A&E
- Consultancy rooms
- Outpatient clinics
- Dentists
- Hospital corridors
- Laboratories
- Physiotherapy
- Ophthalmology
- Psychiatry
- Beauty salons
- Spa
- Veterinarians
- Geriatrics
- Day centres for the elderly

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## INDUSTRY

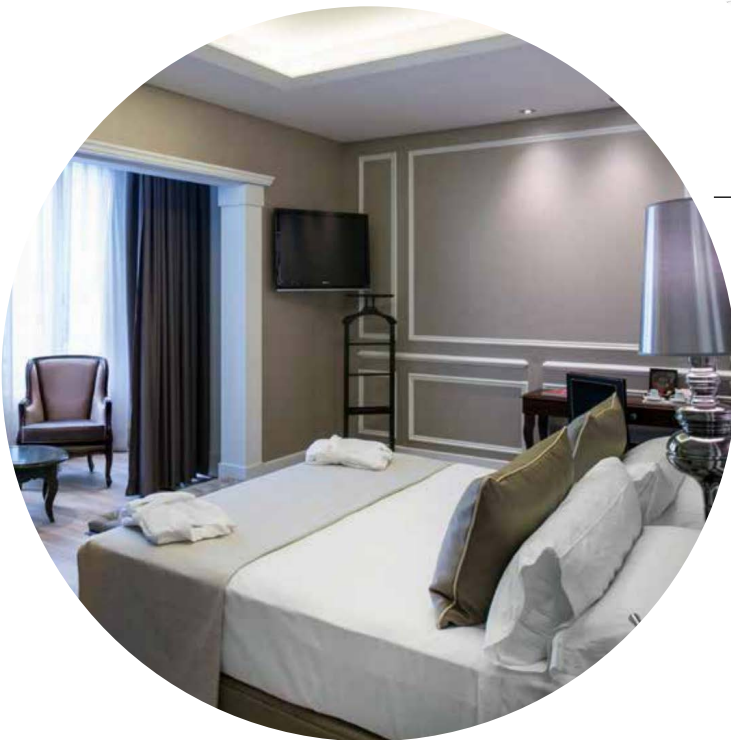
- Food industry
- Pharmaceutical industry
- Cosmetics industry
- Electronics industry
- Silos, drying rooms and ripening rooms
- Packaging areas
- Warehouses
- Dressing rooms
- Eating areas



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## PUBLIC BUILDINGS

- Train and bus stations
- Cinemas
- Schools
- Offices
- Trains and buses
- Airports
- Sports facilities
- Gymnasias
- Post Office
- Churches and worship centres



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## HOSPITALITY

- Common hotel spaces
- Hotel reception
- Hotel rooms
- Restaurants
- Kitchens
- Bars
- Dance halls

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## RETAIL

- Fashion stores
- Food stores
- Retail stores
- Shopping arcade
- Hypermarkets





# FAQS ON UV-C GERMICIDAL DEVICES

## ● DOES ULTRAVIOLET RADIATION AFFECT ALIVE BEINGS? HOW CAN THESE DEVICES BE USED SAFELY?

Ultraviolet radiation is naturally emitted by the sun. Our atmosphere absorbs the most dangerous radiation, such as some UV-B and all UV-C radiation. The latter, between 100 and 280 nm wavelengths, are extremely harmful to alive beings.

Our air purification devices keep the source of radiation completely isolated from the outside, so they can be used in areas where living beings are present.

Our direct emission products must be used by qualified professional personnel. To minimize risks, our devices have on and off timing systems, so that no human being is required to use them.

## ● DOES ULTRAVIOLET RADIATION AFFECT FOOD?

The interaction of ultraviolet radiation with food is minimal and it is an ideal disinfection, since it does not use any type of chemical agent, so it eliminates microorganisms in complete safety, with the food being suitable for consumption immediately after treatment.

## ● UV-C DISINFECTION DEVICES. ARE THEY SUITABLE FOR DISINFECTING SURFACES?

Our direct radiation devices are suitable for disinfecting surfaces directly exposed to radiation, being more effective depending on how much radiation reaching these surfaces. This radiation is inversely proportional to the square of the distance, so it varies exponentially as we move away from the source of radiation.

Our air disinfection devices collect the air from the room and subject it to intense radiation at close range, thus returning decontaminated air to the room. Therefore, they reduce the risk of surface contamination by airborne germs, but do not disinfect already-contaminated areas.

## ● CAN OBJECTS IN THE ROOM TO BE DISINFECTED BE DAMAGED BY THE USE OF THESE DEVICES?

Our air purification devices have no direct emission of ultraviolet light, so they do not act a threat to the environment, living beings or objects.

In the case of direct radiation devices, they can interact with certain materials, just as with continuous exposure to the sun's rays. UV type C rays can alter some materials. This is another reason why they should be used by competent personnel to minimize these risks.

## ● WHAT IS THE ADVANTAGE OF UV-C DISINFECTION SYSTEMS OVER OTHER SYSTEMS?

The main advantage is that the disinfected areas can be used immediately after disinfection, provided that the direct radiation has stopped.

Moreover, in the case of our air purification products, they can be used in the presence of living beings in the area to be purified, since no direct radiation is produced and no chemicals are emitted that interact with them.

## ● HOW LONG DO YOU HAVE TO WAIT BEFORE ENTERING A ROOM THAT HAS BEEN DISINFECTED BY UV-C?

In the case of the AIRSTREAM UV-C, since it is a device that decontaminates the air without direct radiation, it is immediate, even being compatible with the presence of living beings.

With regard to the direct radiation models, AGALINE, OKTAN and UNIVERSAL, the room can be used immediately after the disinfection process, provided that the radiation from the lamps has stopped.

#### Sources of documentation used:

- IES <https://www.ies.org/standards/committee-reports/>
- CLEVELAND UNIVERSITY <https://elautoclave.files.wordpress.com/2020/03/cleveland-2020.pdf>
- UNIVERSITY OF SANTIAGO DE COMPOSTELA <https://www.medrxiv.org/content/10.1101/2020.04.07.20057224v2.full.pdf>

#### ● ARE THERE MANY APPLICATIONS ON THE MARKET THAT USE LEDS IN THEIR DEVICES. ARE THEY ALSO SUITABLE?

There are LEDS that emit at UV-C wavelength, but they do so at a wavelength of 275-280 nm, greater than that emitted by our devices, 254 nm. Radiation with this wavelength is the most effective in eliminating viruses, bacteria, fungi and microorganisms in general. In addition, this length is the best absorbed by ribonucleic acids in particular, being much more effective in RNA-type viruses, such as COVID-19.

On the other hand, the optical efficiency of the lamps used in LUXIONA devices is approximately 30 times higher than that of LEDS.

#### ● IF UV-C RADIATION IS HARMFUL TO LIVING BEINGS, HOW DO I CONNECT THE DEVICE WITHOUT BEING AFFECTED?

Our portable devices are equipped with a timer for switching on and off, so that we have enough time to switch on and off before it starts, and after the radiation time is complete it will switch off automatically.

The fixed device must be fitted with appropriate safety measures, which may include presence detectors, safety key switches, open door detectors, etc.

#### ● WHAT IS THE RANGE OF ACTION OF THE DEVICES? HOW MANY DO I NEED TO DISINFECT A ROOM?

It depends if we are talking about air purification or direct emission devices. If we are talking about air purification, it is between 23-50 m<sup>3</sup>/h, taking into account that its use is compatible with the presence of living beings in the area, so that its use can be uninterrupted.

For direct radiation devices, as a general rule, we can give an initial approximation according to the following table:

Lamp	Coverage area up to	Irradiance W/m <sup>2</sup>	Irradiance times (m) Eliminación 99%				
			Coronavirus	Influenza A	Staphylococcus Aureus	Mycoplasma Spp	Aspergillus Flavus
Agaline 1x30w	10m <sup>2</sup>	0.2	5,6	5,4	10,0	12,5	56,7
Agaline 1x36w	12m <sup>2</sup>	0.14	8,1	8,8	13,8	17,3	80,5
Universal 1x36w	12m <sup>2</sup>	0.12	9,6	10,9	15,9	19,9	93,7
Universal 1x55w	15m <sup>2</sup>	0.17	6,7	6,8	11,6	14,5	66,5
Agaline 2x30w	18m <sup>2</sup>	0.13	8,8	9,8	14,8	18,5	86,6
Agaline 2x36w	25m <sup>2</sup>	0.12	9,6	10,9	15,9	19,9	93,7
Universal 2x36w	25m <sup>2</sup>	0.12	9,6	10,9	15,9	19,9	93,7
Oktan 2x36w	25m <sup>2</sup>	0.1	11,5	14,1	18,7	23,6	112,2
Universal 2x55w	30m <sup>2</sup>	0.15	7,6	8,0	13,0	16,2	75,3
Oktan 2x55w	30m <sup>2</sup>	0.1	11,5	14,1	18,7	23,6	112,2

To determine the number of devices and their effectiveness more precisely, you can request a more detailed study from our staff.

- Values obtained according to the most unfavorable irradiances calculated in a theoretical study at 2.8m distance with the useful plan surface at 0.85m.
- Recommendations based on the data provided by the manufacturer of the lamps.
- Conclusions obtained under ambient conditions of 25° C and 60% relative humidity.
- These data must be considered as a theoretical approximation, it is necessary to check the real irradiance on the surfaces to be treated once the installation has been carried out with a radiometer.

#### ● HOW LONG SHOULD THE DEVICES BE USED FOR SAFE DISINFECTION?

The exposure time of the radiation for the correct elimination of microorganisms, depends on the type of device.

For our air purifier model, AIRSTREAM, the time depends on the volume of the room, so we can calculate it according to its disinfection power, 23-50 m<sup>3</sup>/h.

In direct radiation devices, it depends on the type of microorganism to be eliminated and the radiation that reaches the surface to be disinfected. In most cases, 15 minutes at a distance of approximately 1 m may be sufficient, but you can consult with LUXIONA to properly size the installation. Our air disinfection devices collect the air from the room and subject it to intense radiation at close range, thus returning decontaminated air to the room. Therefore, they reduce the risk of surface contamination by airborne germs, but do not disinfect already-contaminated areas.

#### ● ARE UV-C DEVICES EFFICIENT FOR THE INACTIVATION OF THE VIRUS RESPONSIBLE FOR COVID-19?

Yes, when the virus is directly irradiated by UV-C rays with sufficient energy. The energy reaching the surface will depend on the distance to the emission lamp and the irradiation time.

#### ● HOW CAN WE ENSURE THAT SUFFICIENT RADIATION REACHES THE SURFACES TO BE DISINFECTED? ?

Our specialists can carry out an analysis of the area to be disinfected to calculate the irradiance levels that will reach the surfaces. For this, our luminaires have been tested in a specialized laboratory and accredited by ENAC, **Asselum**. This laboratory has the necessary equipment to obtain the radiation curves of our devices.



# PROTECTED SPACES

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In LUXIONA we are aware of the logical concern of society to share spaces as protected as possible against viruses, bacteria and other microorganisms.

In response to the trust placed by our customers in our devices, LUXIONA has created the „Safe Space” seal.

## Safe Space

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This seal aims to recognize and publicize the commitment of the people responsible for these spaces, to offer their users maximum security.

To do so, they trust LUXIONA and its germicidal devices.



# LUXIONA

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## **LUXIONA**

### **Headquarters**

Passeig de la Ribera, 115  
08420 Canovelles, Barcelona  
SPAIN  
tel. +34 938 466 909  
info@luxiona.com

### **LUXIONA SPAIN**

Passeig de la Ribera, 115  
08420 Canovelles, Barcelona  
SPAIN  
tel. +34 938 466 909  
fax.+34 938 465 709  
info.spain@luxiona.com

### **LUXIONA EXPORT**

Departamento de Exportación.  
Export Department:  
tel. +34 938 616 893  
fax.+34 938 465 709  
info.export@luxiona.com

### **LUXIONA FRANCE**

7 Rue du Colonel Chambonnet  
69500 Bron  
FRANCE  
tel. +33 472 146 666  
fax. +33 472 146 667  
info.france@luxiona.com

### **LUXIONA ITALY**

Via Luigi Cadamosto 4,  
26900 Lodi (LO)  
ITALY  
tel. +39 0 298 274 010  
fax.+39 0 298 274 026  
info.italy@luxiona.com

### **LUXIONA GmbH**

Westhafenstraße 1  
13353 Berlin  
GERMANY  
tel. +49 3040 535 600  
fax. +49 3040 535 609  
info@luxiona.de

### **LUXIONA POLAND**

Ul. Sochaczewska 110,  
Macierzysz  
05-850 Ożarów Mazowiecki  
POLAND  
tel. +48 022 721 72 72  
fax.+48 022 721 72 73  
info.poland@luxiona.com

### **LUXIONA PERU**

Josfel  
Jr. Paita 220 Zona Industrial  
San Juan de Miraflores (Lima)  
PERÚ  
tel. (511) 276 88 22  
fax. (511) 281 48 93  
info.peru@luxiona.com

### **LUXIONA CHILE**

Santa Adela 0618 Recoleta  
8440744 Santiago  
CHILE  
tel. +56 229 695 60  
fax. +56 973 772 329  
info.chile@luxiona.com



EXPERIENCED IN **LIGHTING**

**LUXIONA**  
**troll metalarte** Sagelux