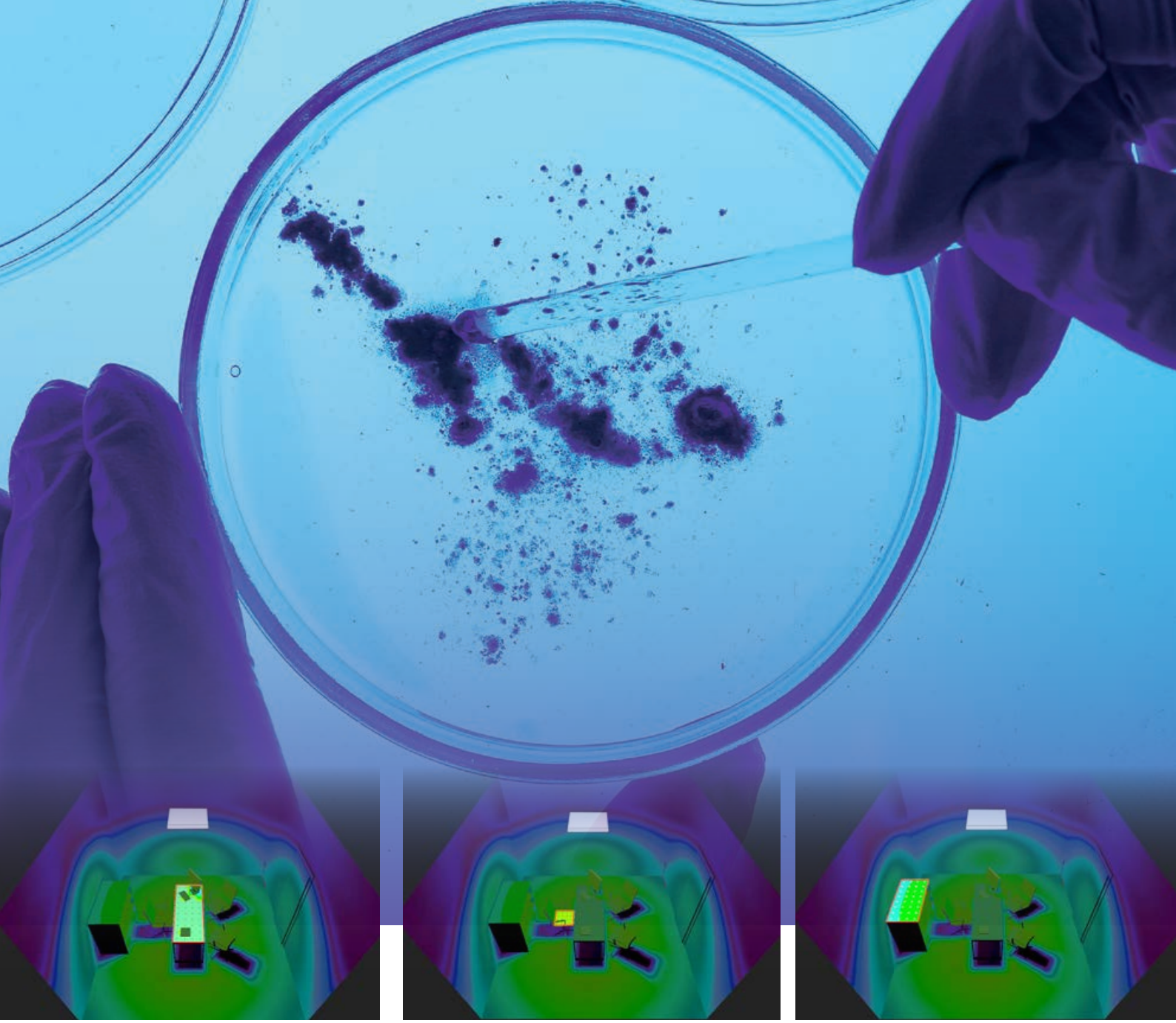


disano illuminazione

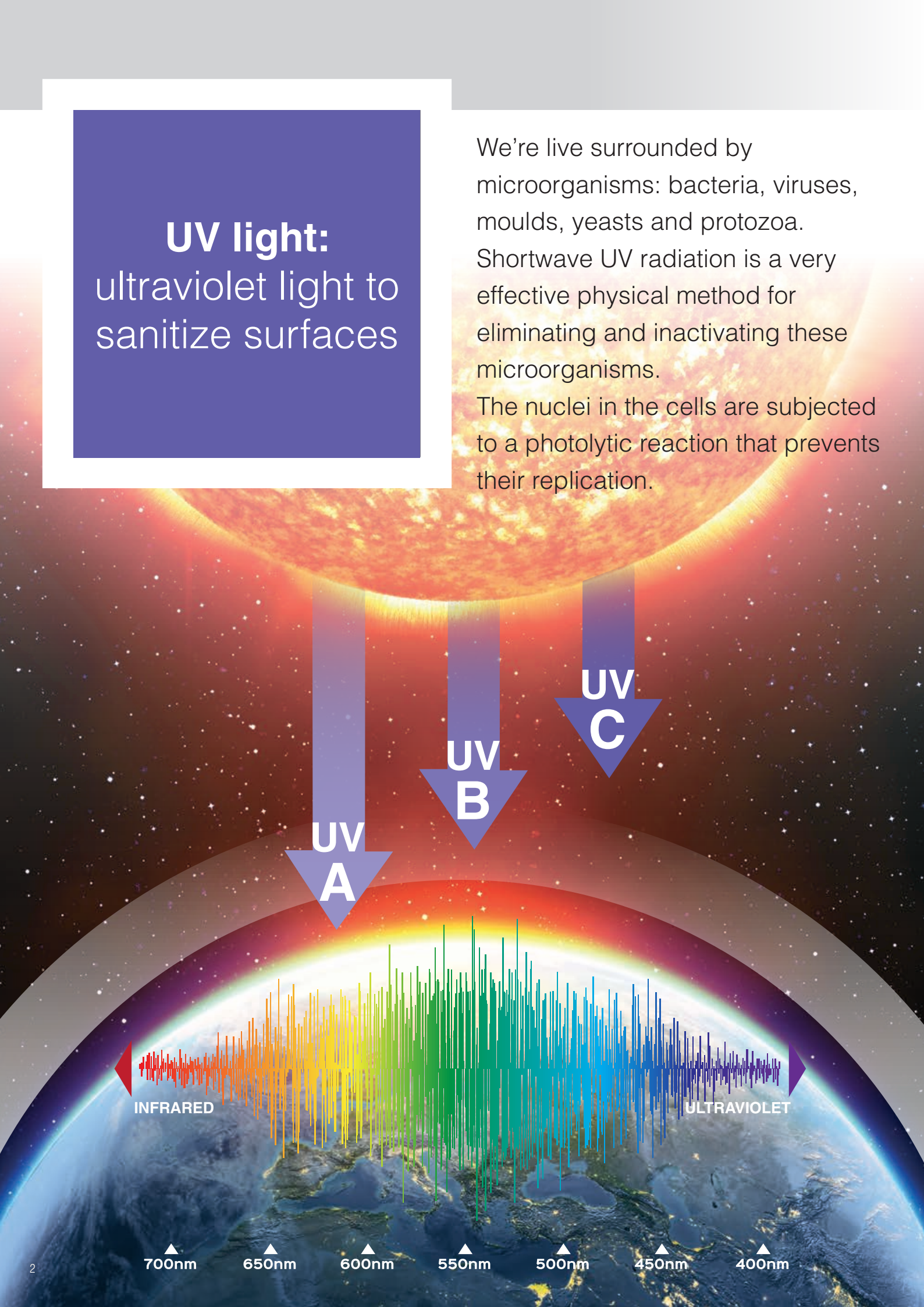
UV lighting for sanitization

Luminaires with
UV light disinfection technology
for the sanitization of surfaces

M A D E I N I T A L Y

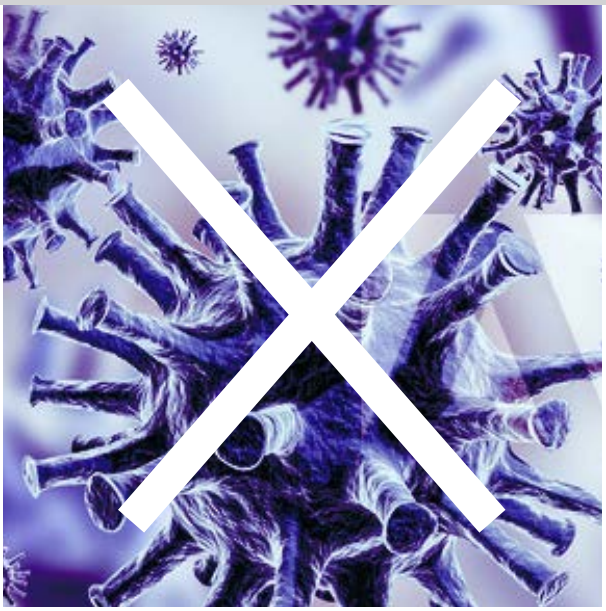
UV light: ultraviolet light to sanitize surfaces

We're live surrounded by microorganisms: bacteria, viruses, moulds, yeasts and protozoa. Shortwave UV radiation is a very effective physical method for eliminating and inactivating these microorganisms.
The nuclei in the cells are subjected to a photolytic reaction that prevents their replication.



The germicidal effect of light is provided in the shortwave UV band below 320 nm.

UV irradiation is the most RELIABLE, ECO-FRIENDLY, EASY-TO-USE and LOW-COST method for sanitizing the surfaces in the spaces where we spend most of our time.



MAIN ADVANTAGES

EFFECTIVE
Kills 99% of microorganisms

FAST
Extremely fast sanitization time

EASY TO USE
Can be installed as re-cessed, ceiling and floor lamp for night-time use and in the absence of people inside the room

LOW COST
Considerable saving of time and disinfectants

ECOLOGICAL
Does not interact with foreign bodies and does not require additives that may not be biodegradable

Note: UV does not replace cleaning

Reliable
Scientific research has shown that ultraviolet rays can affect water and air-borne microorganisms, be they bacteria, viruses, fungi, algae, spores, or other (Note: before installing luminaires fitting UV sources, be sure to contact a qualified technician for the design stage).

Ecological
UV radiation is a physical, not a chemical, disinfection system. UV rays act on the nucleus of the cell that, when properly irradiated, is subjected to a reaction that prevents the reproduction process in a completely natural way (without using chemical disinfectants).

Low-cost
Disinfection with ultraviolet lamps is currently the most economical option offered by technology.

Design
The Disano group is happy to offer expert advice to designers when planning the space where the lights will be installed.

Legend

The presence of people is allowed

Versions also including general lighting

The presence of people is not allowed

Versions with UV lighting only

UV light: the ideal sanitization of all spaces

Highly frequented places can be sanitized with UV lamps.
UV rays trigger a photochemical reaction within the microorganisms damaging their protein structure to alter their DNA/RNA.
This makes them harmless and unable to replicate, preventing the spread of contagion, disease or damage.

Ultraviolet germicidal irradiation is a safe, proven and effective technology to eliminate microorganisms like bacteria, viruses, fungi, spores, mites and moulds.
It ensures bacteriologically controlled surfaces and can be used in luminaires for the bacteriological sanitization of:

- offices - schools
- waiting rooms - medical studios
- bars and restaurants
- shopping centres - shops
- gyms - locker rooms
- beauty salons and wellness centres
- hotels
- kitchens and public rest rooms
- common work areas

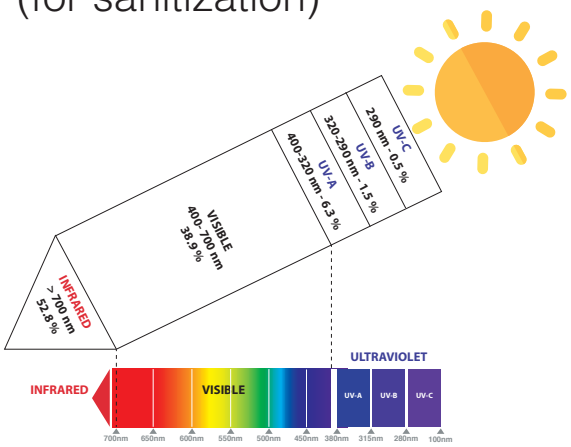
UV-A and **UV-C** LED

The spectral range of ultraviolet radiation is, by definition, between 100 and 400 nm (1 nm = 10^{-9} m) and it is not visible to the naked eye.

Thanks to the filtering action of the Earth's atmosphere, most UV in nature is UV-A, a very small portion is UV-B, and UV-C rays are practically absent.

Artificial UV sources have been available on the market for several decades. Based on their wavelength, they can be used in different sectors and applications.

- UV-A (long wave)
  315 to 400 nm
  (for medical and industrial use)
- UV-B (medium wave)
  280 to 315 nm
  (for curative medical use)
- UV-C (short wave)
  100 to 280 nm
  (for sanitization)



- schools
- gyms
- factories
- offices
- stores
- hotels
- dentists/beauticians
- waiting rooms
- shopping malls
- hospitals and health centres

The **UV-A** light modules are less aggressive than the UV-C modules and require longer sanitization time.
It is therefore necessary to control ON/OFF times based on the absence/presence of people in the room.
For example: sanitization can be carried out at night, on weekends, on holidays, on certain weekdays, when certain areas are closed.

The **UV-C** light modules are more aggressive than UV-A modules and allow shorter sanitization time.
We recommend equipping the system with “absence devices” (sensors or smart technology) so that the UV-C modules will activate only when nobody is in the room.

application tips

UV-A: long sanitization time at night, weekends, holidays **(in the absence of people)**	**UV-C:** very short sanitization time temporary absence in a room **(in the absence of people)**
• classrooms • corridors • gyms • laboratories	• break • when exiting the classroom to move to another classroom
• training areas • common areas	• when moving from one lesson to the next • locker rooms
• production • storage • common areas	• assembly chain break • lunch break
• open space • common areas • restrooms	• lunch break • in rooms between one conference and the next
• sales • warehouses	• fitting rooms (between one customer and the next)
• utility rooms • kitchens • bars and restaurants	• reception • when changing room • when cleaning empty common areas
• all areas	• when moving from a room to the next
• all areas	• during short closures to the public
• all areas	• after cleaning bathrooms and transit areas • (before re-opening to the public)
• all areas except patient/visitor rooms	• when the staff leaves their work station for patient visits or rounds

Before installing UV luminaires, be sure to entrust the lighting design to a professional lighting designer.

UV light: special mounting tips

The human eye cannot see ultraviolet light.
Exposure to UV-B and UV-C radiation without using skin or eye protection may cause erythema (reddening of the skin) or conjunctivitis (inflammation of the eye).

The use of UV sources, especially those in the UV-C wavelength band, require special attention as they can cause inflammation and damage, sometimes even permanently. This is why it is essential that UV sources are used when there are no people and/or animals in the room.

- Use of timers or time switchers (on-off timers)

- Use of “absence” detectors (sensors)

- Use of SMART control devices to control the lighting system

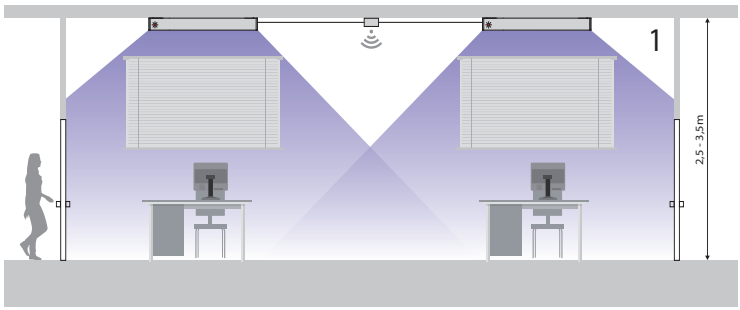
UV luminaires can be installed in a room by simply connecting them to the lighting system.
This type of application requires the supervision of a qualified installer who will assess the safety of the system, based on whether or not people* are inside the room.

* NOTE:

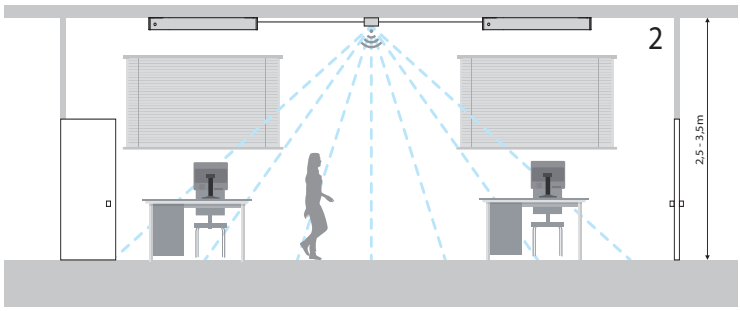
- UV light may cause serious damage to the skin or the eyes, therefore avoid direct exposure on humans, animals and plants.
- Lighting fixtures equipped with UV-C LED sources must be **used only in the absence of people.**

Luminaires must be installed by qualified staff to ensure compliance with safety and radiation protection requirements.

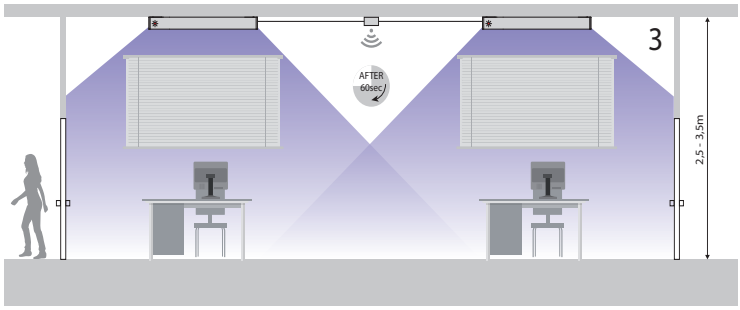
Example of installation with “absence” sensors



1) When the power supply is switched on and the sensor doesn’t detect any presence in the room for 60 seconds, the UV lamp will turn on and a red LED light will be visible.



2) As soon as the sensor detects movement, the UV lamp will automatically go off (together with the red LED light).



3) If 60 seconds go by and no movement is detected, the lamp will turn on again (in the UV mode) and the red LED light will be visible again.

Mounting recommendations

Before installing UV luminaires, **be sure to entrust the lighting design to a professional lighting designer.**

The main factors to consider for a proper use of UV sources are:

- radiated power
- exposure time
- distance

For a UV lamp to be effective on spores, germs, bacteria and viruses, the lighting system must be designed so that the above parameters are correctly combined in order to achieve the desired results according to scientific/academic studies and literature.

N.B.: UV dose varies based on the type of microorganism to be eliminated for the deactivation to be effective (see table). Microorganisms on surfaces that are not directly exposed to UV radiation (hidden or in shadow) will not be eliminated.

Define the dose and time necessary to eliminate pathogens:

UV dose is based on intensity and time

Irradiation $\frac{W}{m^2}$ **X** **Time** sec. **=** **UV dose** $\frac{J}{m^2}$

Microorganism	(Ho) Radiant Exposure J · m-2	(K) Decay Rate Constant m² · J-1
Bacillus anthracis(vegetative)	45,2	0,05
Bacillus anthracis (spores)		0,0031
S. enteritidis	40,0	0,058
B. megatherium sp. (veg.)	37,5	0,061
B. megatherium sp. (spores)	28,0	0,082
B. paratyphosus	32,0	0,072
B. subtilis (mixed)	71,0	0,032
	60,0	0,038
B. subtilis spores	120,0	0,019
Corynebacterium diptheriae	34,0	0,068
Eberthella typhosa	21,4	0,108
Micrococcus candidus	60,5	0,038
Micrococcus piltonensis	81,0	0,028
Micrococcus sphaeroides	100,0	0,023
Neisseria catarrhalis	44,0	0,052
Phytomonas tumefaciens	44,0	0,052
Proteus vulgaris	27,0	0,085
Pseudomonas aeruginosa		0,238
		0,572
	55,0	0,042
Pseudomonas florescens	35,0	0,066
S. typhimurium	80,0	0,029
Sarcina lutea	197,0	0,012
Serratia marcesens	24,2	0,095
	22,0	0,105
	8,3	0,277
		0,221
		0,214
		0,445
Dysentery bacilli	22,0	0,105
Shigella paradysenteriae	16,8	0,137
Spirillum rubrum	44,0	0,052
Staphylococcus aureus	21,8	0,106
	49,5	0,047
		0,089
		0,348
		0,042
		0,960
Streptococcus haemolyticus	26,0	0,089
	21,6	0,107

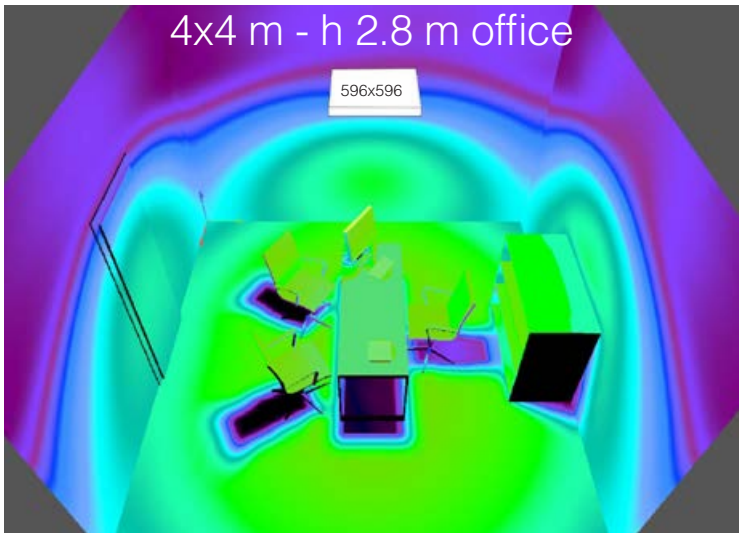
Microorganism	(Ho) Radiant Exposure J · m-2	(K) Decay Rate Constant m² · J-1
Streptococcus lactis	61,5	0,037
Streptococcus viridians	20,0	0,115
Clostridium tetani	49,0	0,047
Streptococcus pyogenes	21,6	0,107
		0,616
		0,107
Streptococcus salivarius	20,0	0,115
Streptococcus albus	18,4	0,125
B. prodigiosus	8,3	0,329
B. pyocyaneus	55,0	0,052
Mycobacterium tuberculosis		0,099
		0,472
		0,213
	100,0	0,023
Mycobacterium kansasii		0,036
Mycobacterium avium-intra.		0,041
Escheria coli		0,093
		0,376
Haemophilus influenzae		0,060
Adenovirus		0,055
		0,0047
Vaccinia		0,153
Vaccina		0,155
Coxsackievirus		0,111
Influenza A		0,119
Cryptococcus neoformans		0,010
Fusarium oxysporum		0,011
Fusarium solani		0,0071
Penicillium italicum		0,013
Penicillium digitatum		0,0072
Rhizopus nigricans spores		0,0086
Cladosporium herbarum		0,0037
Scopulariopsis brevicaulis		0,0034
Mucor mucedo		0,0040
Penicillium chrysogenum		0,0043
Aspergillus amstelodami		0,0034
Fusarium oxysporum		0,011
Fusarium solani		0,0071
Penicillium italicum		0,013
Penicillium digitatum		0,0072

CIE 155:2003

Before installing UV luminaires, be sure to entrust the lighting design to a professional lighting designer.

Practical example of surface sanitization

Log Reduction Scale		
The number in the log reduction value refers to the number of nines shown in the percentage, which indicates the percentage of microorganisms that are eliminated by a given disinfection procedure.		
1-Log Reduction	= 90% inactivation	Classification
2-Log Reduction	= 99.9% inactivation	Detergent
3-Log Reduction	= 99.99% inactivation	Detergent/Sanitizing
4-Log Reduction	**= 99.999% inactivation**	**Sanitizing**
5-Log Reduction	= 99.9999% inactivation	Disinfectant
6-Log Reduction	= 99.99999% inactivation	Disinfectant
7-Log Reduction	= 99.999999% inactivation	Disinfectant
8-Log Reduction	= 99.9999999% inactivation	Disinfectant
9-Log Reduction	= 99.99999999% inactivation	Sterilant
10-Log Reduction	= 99.999999999% inactivation	



Irradiance and Fluence Scale 4x4 m office

E_e	0,00002	0,00003	0,00005	0,00007	0,0001	0,0002	0,0003	0,0005	0,00075	mW/cm²
30 min	0,036	0,054	0,09	0,126	0,18	0,36	0,54	0,9	1,35	mJ/cm²

E_e	0,001	0,002	0,003	0,005	0,0075	0,01	0,02	0,03	0,05	mW/cm²
30 min	1,8	3,6	5,4	9	13,5	18	36	54	90	mJ/cm²

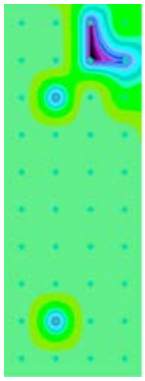
E_e	0,075	0,1	0,2	0,3	0,5	0,75	1	1,5	mW/cm²
30 min	135	180	360	540	900	1350	1800	2700	mJ/cm²

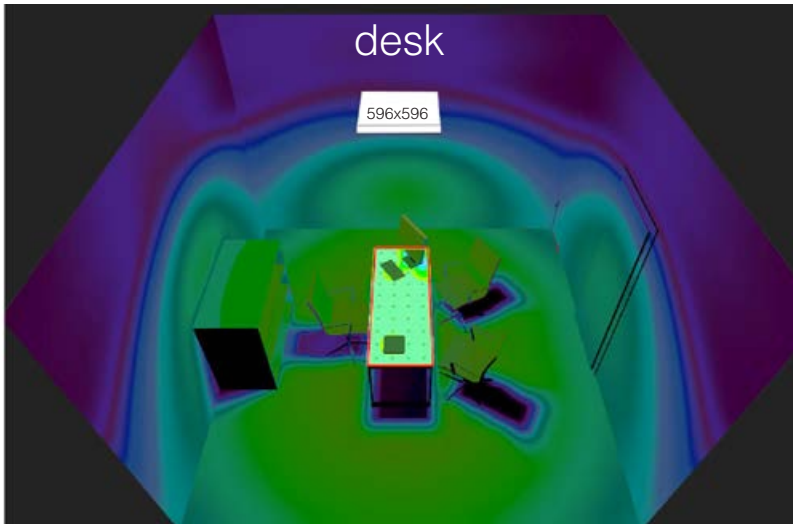
Calculation area= 60x160cm
h from ground= 75cm

Luminaire data:
- Luminaire= 596x596mm
- Quantity= 1
- P(UV-C)= 3.95W
- P(Wtot)= 21 W

Results:
- Average irradiance: E_e= 0,03 mW/cm²
- Minimum irradiance: E_{min}= 0,01 mW/cm²
- Uniformity: U_0 = 70%
- UV dose for Covid-19*= 22 mJ/cm²

Log4 (estimated)= 30 min



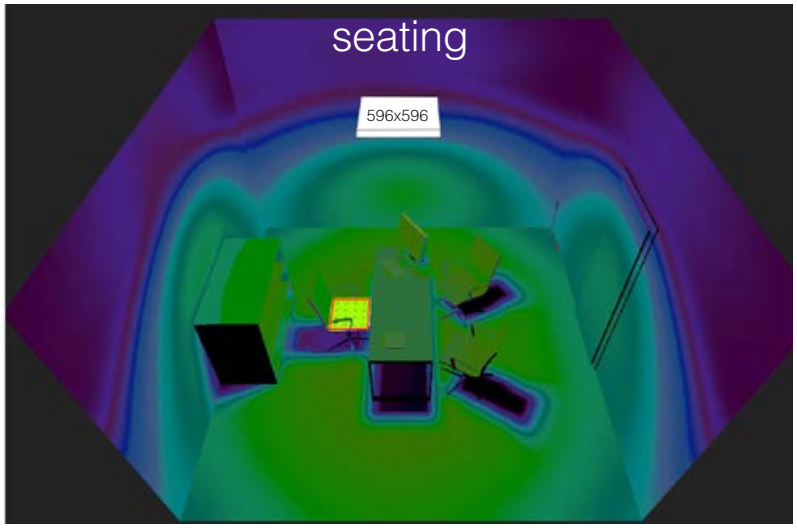


Calculation area= 40x40cm
h from ground= 45cm

Luminaire data:
- Luminaire= 596x596mm
- Quantity= 1
- P(UV-C)= 3.95W
- P(Wtot)= 21 W

Results:
- Average irradiance: E_e= 0,024 mW/cm²
- Minimum irradiance: E_{min}= 0,023 mW/cm²
- Uniformity: U_0 = 90%
- UV dose for Covid-19*= 22 mJ/cm²

Log4 (estimated)= 16 min

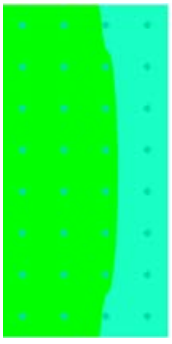


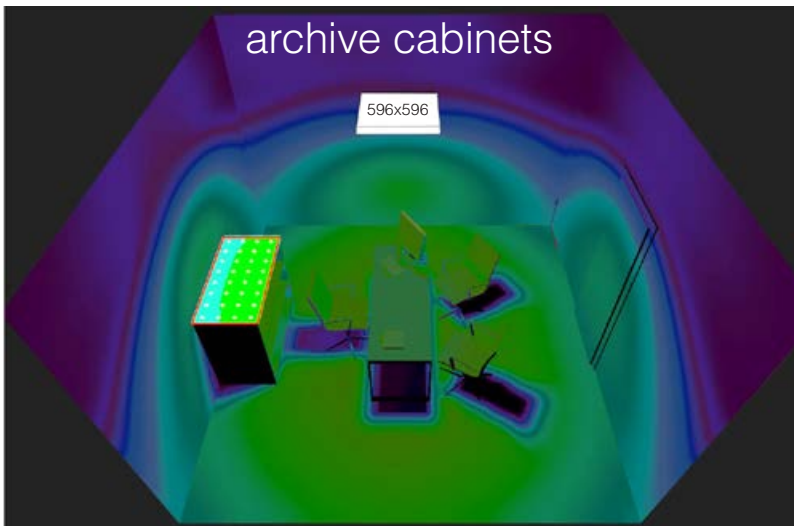
Calculation area= 60x160cm
h from ground= 75cm

Luminaire data:
- Luminaire= 596x596mm
- Quantity= 1
- P(UV-C)= 3.95W
- P(Wtot)= 21 W

Results:
- Average irradiance: E_e= 0,012 mW/cm²
- Minimum irradiance: E_{min}= 0,008 mW/cm²
- Uniformity : U_0 = 65%
- UV dose for Covid-19*= 22 mJ/cm²

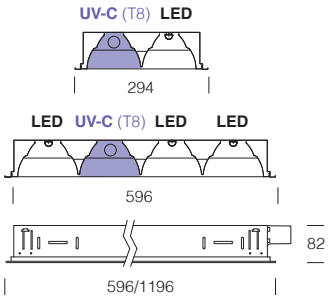
Log4 (estimated)= 48 min





* UV dose for Covid-19: according to currently available scientific publications

IP20IK07



4000K

50.000h L80B20

LED

9.000h UV-C

UV

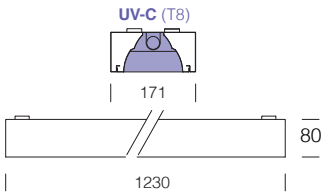
Housing: galvanized steel sheet.

Optics: in scored matt aluminium with wide light distribution.

- separate switches: one for the general lights, the other for UV sanitization.
- complete with built-in UV module operating indicator to ensure the safety of people.

877 Comfort - matt scored optical

				CLD			CELL (T8)		
mm	colour	weight	code	LED	W tot	LUMEN OUTPUT (tq= 25 °C)	UV-C	W tot	UV-C (W) RADIATION
294x596	white	2.20	151203-69	**1x**	**10**	4000K - 985lm - CRI 80	**1x**	**21**	3,95
294x1196	white	4.10	151204-69	**1x**	**19**	4000K - 1970lm - CRI 80	**1x**	**38**	13
596x596	white	3.50	151208-69	**3x**	**28**	4000K - 2985lm - CRI 80	**1x**	**21**	3,18



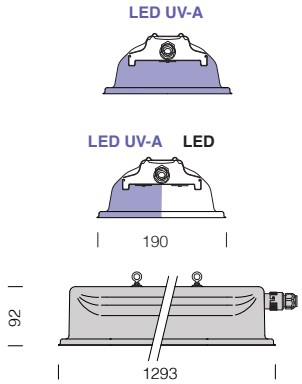
9.000h UV-C

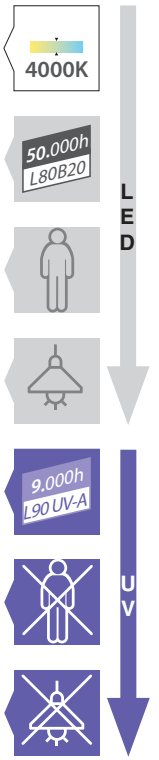
UV

777 Comfort - matt scored optical

				CLD			CELL (T8)		
mm	colour	weight	code	LED	W tot	LUMEN OUTPUT (tq= 25 °C)	UV-C	W tot	UV-C (W) RADIATION
171x1230	white	3.50	141201-69	-	-	-	**1x**	**38**	

IP65IK08





983 Forma

				CLD			CELL (T8)		
mm	colour	weight	code	LED	W tot	LUMEN OUTPUT (tq= 25 °C)	UV-A	W tot	UV-A (W) RADIATION
190x1293 mono.	s. silver	7.20	162465-65	-	-	-	**1x**	**66**	21
190x1293 bil.	s. silver	7.20	162466-65	**1x**	**43**	4000K - 5820 lm - CRI 80	**1x**	**66**	21

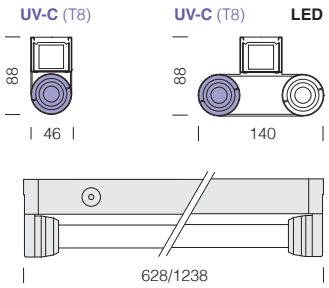
Housing: pressed steel, in a single piece of high mechanical resistance.

Diffuser: in technopolymer plastic specially designed for UV radiation lamps.

- separate switches: one for the general lights, the other for UV sanitization.
- complete with built-in UV module operating indicator to ensure the safety of people.

Before installing UV luminaires, be sure to entrust the lighting design to a professional lighting designer.

IP40IK07



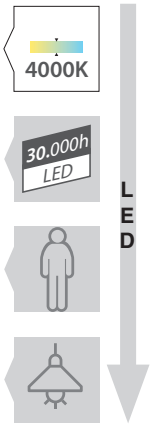
Fixture housing: galvanized steel previously stove-enamelled with UV-stabilised white polyester resin; rounded edges to prevent cutting; polycarbonate end caps.

Standard supply: nylon fastening pawl supplied with power terminal block.

- separate switches: one for the general lights, the other for UV sanitization.
- complete with built-in UV module operating indicator to ensure the safety of people.

6401 Rapid System T8 - with knife swtch

				CLD			CELL (T8)		
mm	colour	weight	code	LED	W tot	LUMEN OUTPUT (tq=25°)	UV-C	W tot	UV-C (W) RADIATION
46x628	white	0.90	238040-69	-	-	-	**1x**	**21**	4,5
46x1238	white	1.40	237531-69	-	-	-	**1x**	**38**	15



6501 Rapid System T8 - with knife swtch

				CLD			CELL (T8)		
mm	colour	weight	code	LED	W tot	LUMEN OUTPUT (tq=25°)	UV-C	W tot	UV-C (W) RADIATION
140x628	white	0.95	238045-69	**1x**	**8**	4000K - 800lm - CRI 80	**1x**	**21**	3.95
140x1238	white	1.90	237536-69	**1x**	**15**	4000K - 1600lm - CRI 80	**1x**	**38**	13

IP40IK08

acc. 6416 one/two-lamp diffuser

628 mm	237741-00
1238 mm	237742-00

Made of steel, pre-painted white with polyester resin.

6000 Rapid system - track

		S	
length	colour	weight	code
3260	white	3.25	132900-00
4700	white	4.70	132923-00

Designed to be quickly attached to the Rapid System series luminaires.

acc. 6405 upper cover

628 mm	237603-46
1238 mm	237604-46

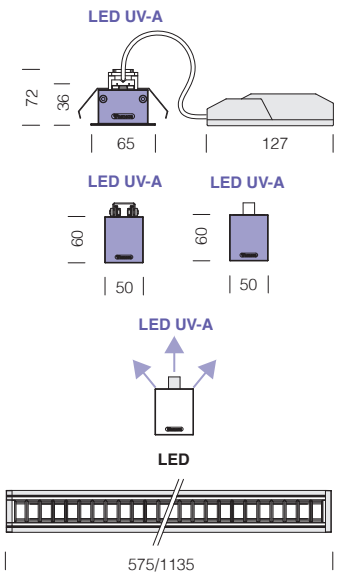
White steel. For ceiling mounting.

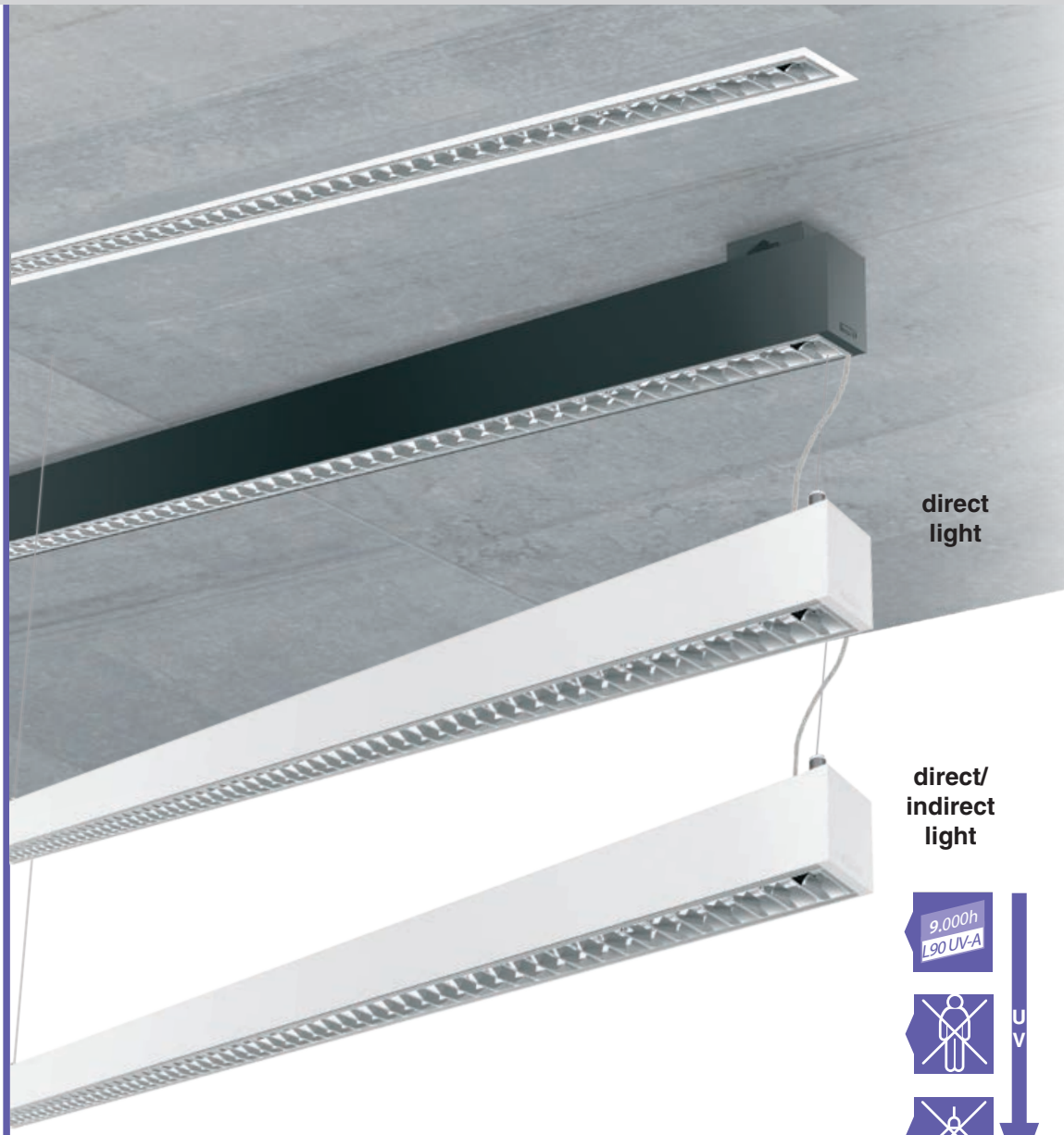
Before installing UV luminaires, be sure to entrust the lighting design to a professional lighting designer.

UGR<19

Fosnova

IP40 IK07





Housing: extruded aluminium.

Terminal ends: die-cast aluminium.

- one switch for UV sanitization.
- complete with built-in UV module operating indicator to ensure the safety of people.

Suspension version:
only direct light
direct/indirect light: ideal near air conditioning systems for the sanitization of the air exhausted from the conditioning system

Subcode to order:
LED **UV-A** = -65

Before installing UV luminaires, be sure to entrust the lighting design to a professional lighting designer.

244-3

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Numbers in some images are written in European format where decimals are separated by commas rather than dots (i.e. 50,000 will display as 50.000).