oxytec air & water purification systems

Clean Air

UV-C disinfection for ventilation and air-conditioning technology




Germ-free supply and circulating air
with using UV-C disinfection

Channelframe 600 – 1500

The Channelframe is used to disinfect airflows for the disinfection of the air flow in large to very large centralized air-conditioning and ventilation systems. It can be integrated both in ventilation units as well as in ventilation ducts. The emitters can be changed during operation.

→ Easy to install at the plant

Areas of application

- Humidifier
- Heat exchangers in air-conditioning/ ventilation systems
- Ventilation ducts
- Ventilation casing

Immersion lamps TSM/TST 300 – 1500

The UV-C immersion lamp air disinfection module is designed for effective disinfection at low temperatures. Due to the high-quality UV-C lamps with a protective tube from the cold, the air is exposed to a high UV-C dose, so that undesirable microorganisms are effectively killed.

Areas of application

- Food industry
- Ventilation systems
- Public ventilation systems
- Pharmaceutical industry
- Hospitals

UV-Box Air Disinfection Module

The UV-Box was specially designed as a plug-in module to disinfect airflows using UV-C in centralized air-conditioning and ventilation systems.

→ Easy to flange onto trunking/units
→ Housing material stainless steel or optionally galvanized steel

Areas of application

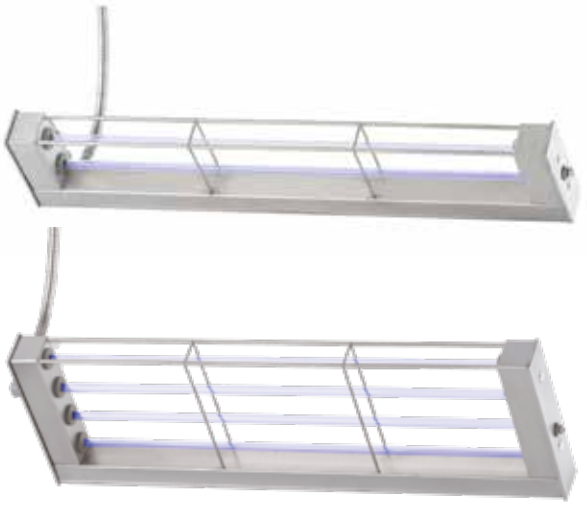
- Food industry
- Ventilation systems
- Public ventilation systems
- Pharmaceutical industry
- Residential ventilation systems
- Hospitals

In ventilation systems of hospitals, offices, sports halls and restaurants

UV IB 200 – 600
Installation frame for air handling units and heat exchanger/evaporator disinfection

Can also be used for permanent disinfection of heat exchanger fins/coils, which prevents the building of a biofilm on the fins. The UV IB 200 – 600 frame is used to disinfect airflows in air conditioning and ventilation systems.

→ Easy to retrofit in any system



Areas of application

- Humidifier
- Heat exchangers in the air-conditioning/ ventilation systems
- Ventilation ducts
- Ventilation casing

Mounting system for UV IB frames

Up to 6 modules on top of each other can be mounted on the rails. The rails have a predefined grid for hooking in the UV modules. Manual adjustment during assembly can be almost completely avoided, resulting in considerably reduced assembly times.

100 % germ-free. oxytec develops and produces UV-C systems for the effective disinfection of air, surfaces and water. Harmful micro-organisms have no chance – bacteria, fungi, yeasts and viruses are inactivated up to 99.999 %. In this way, we offer planners, constructors and operators of air conditioning systems disinfection solutions in accordance with the VDI 6022 guideline to support hygiene quality.

Continuous disinfection – low operating costs

UV-C radiation inactivates germs naturally

Feel-good climate?

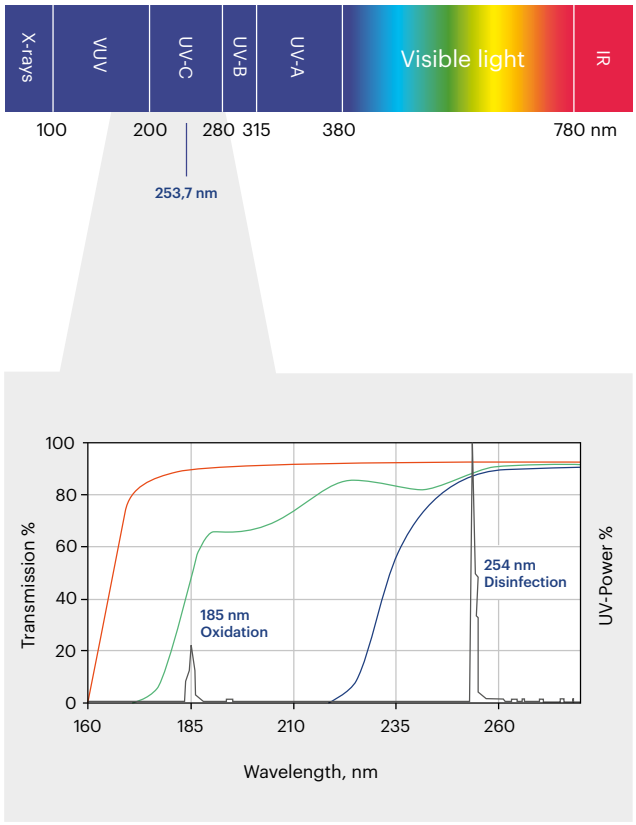
Air-conditioning and ventilation systems are now indispensable and a world without them is unimaginable. They are firmly installed in working areas, in the medical sector technology and the food industry. We often speak about a "feel-good" climate and, by that, we also mean factors like temperature and humidity. But what about pathogenic germs? What effect do they have on difficult to clean surfaces or in narrow ducts? Germs, viruses and mould often find an ideal breeding ground for their growth.

The consequences can be fatal: Significantly reduced shelf life of food, the sick building syndrome in offices. Infections cost a lot of money and reduce the business efficiency. oxytec has been developing and installing systems using the UV disinfection technology. We support the hygiene requirements for ventilation and air-conditioning systems in accordance with the VDI 6022 guideline. Numerous references have proven a positive impact.

UV-C rays are a part of the natural sunlight and prevent the growth of microorganisms.

oxytec has expertise in the area of UV disinfection. The company calculates and optimizes the UV-C disinfection components or the entire UV-C modules specifically for your application. Computer-simulations – already used during the planning of HVAC systems – guarantee a high degree of efficiency in the future. Existing systems can also be retrofitted with our UV disinfection systems.

UV-C rays are a part of natural sunlight



1. Exposing microorganisms to UV-C radiation of the sunlight prevents their reproduction and has a "killing" effect.

The innovative UV disinfection technology results in direct benefits for the user: no chemicals or toxic compounds are used and micro-organisms have no potential to develop resistance. Undesirable microorganisms are inactivated in a matter of seconds, while the product properties remain. In addition, UV-C disinfection meets the high requirements of consumer protection, the VDI 6022 and the HACCP concepts. But most importantly, UV-C disinfection has a positive effect on the IFS certification.

2. The beginning

For a long time now, it is known that sunlight helps prevent the spread of infections. In 1878, English scientists Downes and Blunt discovered that the growth of microorganisms was greatly reduced when exposed to sunlight. The process could not yet be clarified at the time. Later, scientists showed that this effect comes from the invisible component of sunlight with wavelengths below 320 nm. Since this discovery, developing an artificial source of radiation to kill bacteria became possible. The type of radiation that causes the inactivation of bacteria is now known as ultraviolet radiation.

3. Ultraviolet radiation

Ultraviolet radiation cannot be perceived by the human eye. By definition, it covers the spectral range from 100 to 380 nm. It is thus directly adjacent to the blue, visible part of the light spectrum. The ultraviolet spectrum is divided as follows:

- **UV-C: 280 – 200 nm Germicidal effect**
- **UV-C-VUV: 200 – 100 nm Ozone formation**

Effective for all germs and with no development of resistance

Technical prevention using UV-C with no development of resistance

- This radiation has the strongest effect on germs or on their genetic material in the cell nucleus.
- Viral pathogens such as the influenza virus can thus be killed with a relatively low-intensity radiation of 6.8 Ws/cm².
- Because of the important advantage of the physical UV disinfection, the development of resistance is unlikely.
- UV-C disinfection also works when germs have already developed a resistance against common disinfectants such as alcohol, antibiotics, etc.
- UV-C disinfection removes all microorganisms. Microorganisms can be frequently occurring E. coli bacteria, SARS, Legionella or mould.

A sufficient UV-C dose, many years of application know-how and the necessary technology are the prerequisites for the desired success. The number of scientific proofs has become ever greater, especially in recent years.

Germ reduction up to 99.999 %	Highly effective UV lamps against bacteria, yeasts, viruses and mould
Chemical-free UV disinfection	No residues, no NOx
High quality assurance	Undesirable microorganisms are reliably inactivated
No development of resistance	Also effective against germs that have resistance to common disinfectants
Dry process	No moisture
Temperature-neutral	No heating of the media and surfaces due to the UV light
Cost certainty	Clearly calculable acquisition costs; Low maintenance costs

The effectiveness of the UV-C technology is scientifically proven

Scientifically proven

Scientific tests have shown that the maximum bactericidal effect and the absorption spectrum of DNA(deoxyribonucleic acid) are achieved by UV-C irradiation at 260 nm. In this respect, it is justifiably assumed that the UV radiation has an effect on the cell nucleus and that a radiation in the spectral range of around 260 nm is generally capable of killing microorganisms. This effect on microorganisms is used for disinfection and sterilisation measures and thus within hygiene to prevent infections.

Accordingly, we use radiation sources, whose effect is exclusively based on the emission of the spectral line at 254 nm.

The inactivation of microorganisms occurs immediately. The extent of inactivation depends on the UV-C radiation dose. Resistance to UV-C radiation cannot develop. In order to kill microorganisms, a radiation dose of 20 W s/m² to 100 W s/m² is required, whereby the sensitivity of each organism to the effect of radiation is very different, ranging from 7 W s/m² (Escherichia coli in air) to up to 1000 W s/m² (fungi).

The radiation dose is defined as radiation energy per unit area and is the product of:

Radiation dose (Ws/m²) = Radiation intensity (W/m²) x exposure time (s).

It is therefore the product of irradiance and the irradiation time.

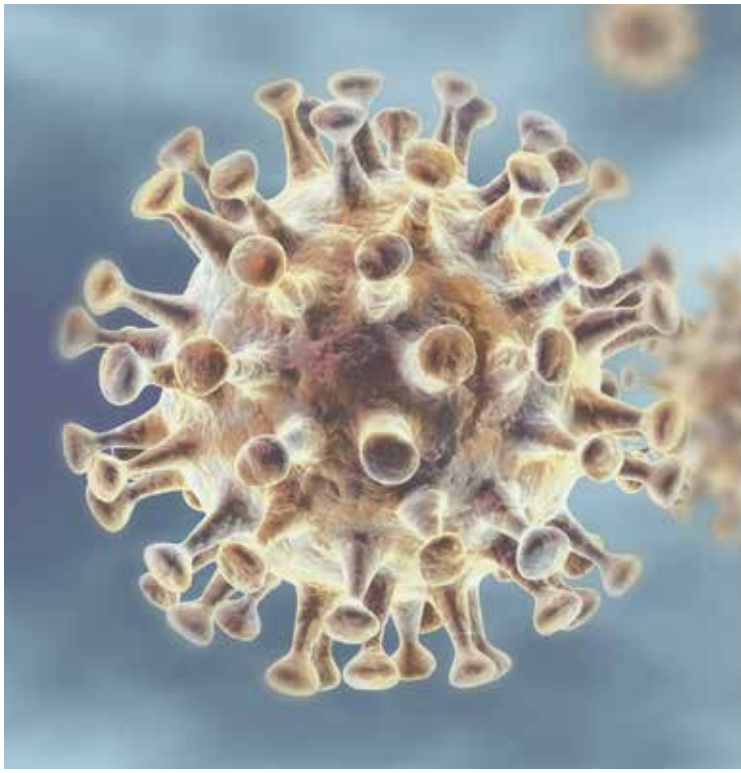
The table shows the dose values for the most important germs found in hospitals (the so-called hospital germs).

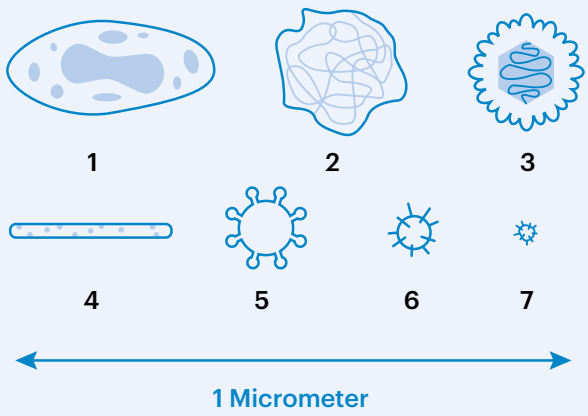
	90% sterilization	99,9% sterilization
Escherichia coli (air)	7 W s/m²	21 W s/m²
Legionella pneumophila	9 W s/m²	27 W s/m²
Staphilococcus aureus	22 W s/m²	66 W s/m²
Proteus vulgaris	27 W s/m²	81 W s/m²
Salmonella enteritidis	40 W s/m²	120 W s/m²
Pseudomonas aeroginosa	55 W s/m²	165 W s/m²
Bacterium subtilis	60 W s/m²	180 W s/m²

Viruses are not completely captured by mechanical filters

The spread of the coronavirus SARS-CoV-2

Leading virologists agree that the main route of transmission of SARS-CoV-2 is through droplet infection during coughing, sneezing and speaking. The spray of droplets can be transmitted, but not completely prevented by mouth masks. Since the air in a room always contains a large number of particles, dusts and pollen, which cause great problems for allergy sufferers in particular, the spray mist attaches itself to these particles and humidifies them. This creates an aerosol, which remains in suspension for several hours. The smallest particles of an aerosol has a size of only a few nanometres. Therefore, a permanent cleaning of the ambient air from corona viruses, germs and bacteria can effectively reduce the risk of infection.





Relative shapes and sizes of different types of viruses

1 Smallpox virus
2 Mumps virus
3 Herpes virus
4 Tobacco mosaic virus
5 Inluenza virus
6 Adenovirus
7 Poliovirus

Disinfection with UV-C rays in the air stream

An extremely reliable, ecologically and economically alternative to conventional methods of air disinfection in air handling units is the disinfection with UV-C rays in the air flow. Ultraviolet radiation is often used in air-conditioning systems for water disinfection in air washers. With our UV modules we treat the supply air volume flow directly with UV-C radiation. Coupled with the mechanical filtration, this leads to a significant reduction of germs in the supply air and effectively combats the growth of germs in air handling units. We use this technology successfully in the pharmaceutical industry and in all areas of the food industry.

oxytec has been an expert in producing and developing efficient systems for disinfection and sterilization for almost 20 years.

UV-C radiation inactivates all germs, even the “smallest”

UV-C inactivation is a complementary measure, especially in those room classes in which, according to DIN 1946-4 does not require a third filter stage. But also in systems that work with recirculated air components. Since there is no pressure drop of this "physical filter", the economic efficiency is given.

The combination with mechanical filtration results in a high reliability of the disinfection measure. The smaller the diameter of the germs, the poorer the separating effect of the mechanical filtration.

The disinfecting effect of UV irradiation is inversely proportional to the diameter of the germs. As the diameter of the germs decreases, the disinfection effect increases.

Result with sustainability

- Disinfection rate: 90 to 99 %.
- Absolutely no ozone formation
- No formation of nitrogen oxides
- No formation of fine dust
- The system is operated with renewable energy, it is sustainable
- The disposal of the emitters is regulated by law and free of charge
- No chemical air change in supply air (outside air)

Germs in the supply air

→ The different reasons why germs are found in the supply air are:
- Contaminated fresh air or recirculated air components
- Contamination of the components (humidifier, filter, etc.) or contaminated surfaces in the air handling unit.

The requirements for the construction (design) of the components for UV disinfection depend on the required degree of disinfection. Depending on the germ spectrum, an inactivation of 90 % to 99.9 % should be targeted.

The irradiation chamber in the air handling unit is dimensioned in such a way that an irradiation dose (approx. 20 to 100 W s/m²) related to pathogenic germs at least results in an inactivation rate of about 90 %. Especially vegetative pathogens can be significantly reduced by UV-C irradiation.

UV-C modules easily retrofittable

UV-C modules can be retrofitted to any system

- UV-C disinfection systems can be used as filters (F5/F7) required by the state of the art (VDI 6022) to significantly and sustainably reduce the number of viruses and other microorganisms in air conditioning systems.
- As a rule, UV-C disinfection modules can be easily integrated into existing and planned new air-conditioning systems or units. Installed exactly in the air-conditioning shaft or the air-conditioning unit, the systems work as follows: The room air is sucked in via the on-site fan, pre-filtered and fed into a unit module. This unit module contains special UV-C low-pressure lamps, which emit radiation with a wavelength of 253.7 nm and inactivate the existing germs.
- The nearly germ-free air is then released back into the environment (room).
- As part of the project planning, the relevant process data is recorded in advance, in order to dimension the systems according to requirements. Relevant planning parameters are the air temperature, the relative humidity and the air velocity in the on-site ventilation unit. Attention must be paid to the durability of the on-site components.

Monitoring

In order to be able to guarantee a sufficient radiation dose the continuous monitoring of the radiation intensity of the UV-C radiation is absolutely necessary. For monitoring the lamps we recommend hour meters and current meters.

Positioning after the second stage filter has the advantage that the UV lamps are optimally protected against dirt particles. In addition microorganisms that have formed a cluster are retained by the stage filter. This avoids the shadow effect.

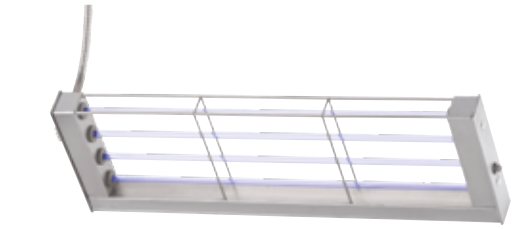
UV-C irradiation chamber with stage filter

Safety

Since direct UV-C exposure to human skin or eyes can cause solar erythema (sunburn) and conjunctivitis (inflammation of the conjunctiva), it should be avoided at all costs.

The indirect irradiation of the supply air flow in the air handling unit is not dangerous, since no direct radiation can enter the room to be air-conditioned. The maintenance staff is protected by door contact switches from unintentional radiation exposure.

Installed position and conditions for housing shall be considered

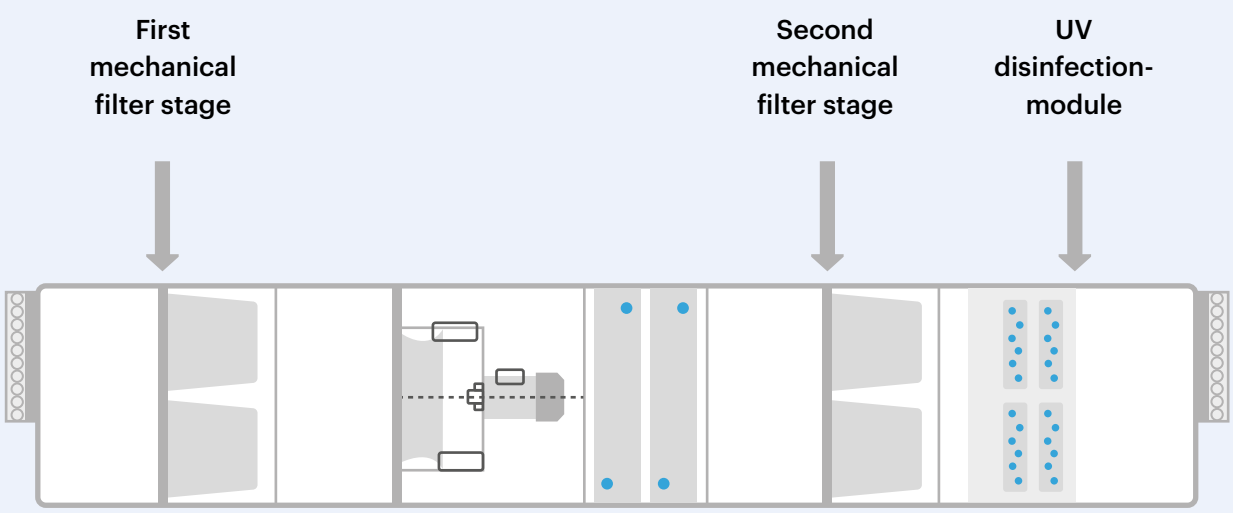


Installation position boundary conditions

- The UV-C modules should be installed as end to end as possible
- Between the filter (usually F7) and the UV-C there should always be a light trap
- The pressure loss of the light trap is 10 Pa.
- When using a light trap, it is important to UV-C emitters can be reached
- Observe the influence of temperature
- System monitoring is possible

Enclosure specifications

- A galvanised inner wall is sufficient (not powder coated)
- Both materials – galvanised and stainless steel – both have a reflection of approx. 30 %.
- Zinc paint reflects only 6 %
- The enclosure seals (seams) must be protected
- The sight glass should be UV-C resistant.
- A door limit switch should always be planned for the UV-C chamber



Positioning of the UV-C irradiation chamber in the air handling unit

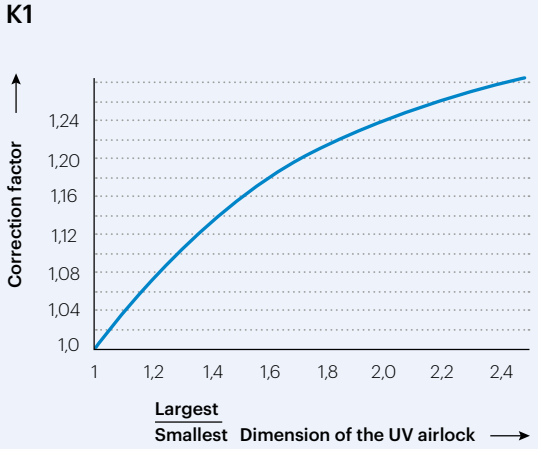
Disinfection modules are dimensioned accordingly

oxytec is a specialist for UV disinfection and calculates and optimises UV-C disinfection components or the entire UV-C modules specifically for your application.

The disinfection effect does not only depend on the degree of air pollution (shadow effect) and the degree of reflection of the enclosure, but also on the level of humidity, temperature and geometry. At a relative humidity of more than 80 %, the air nuclei are surrounded by a water skin, which can reduce the sensitivity of germs to UV radiation by a factor of 5 compared to dry air. An air filtration is therefore necessary to reduce dust exposure and thus to reduce the formation of shadows.

Furthermore, the radiation dose is calculated as a function of the air velocity, the air temperature and/or the air humidity of the disinfection effect.

The optimal radiation dose must correspond to the requirement of the disinfection profile.



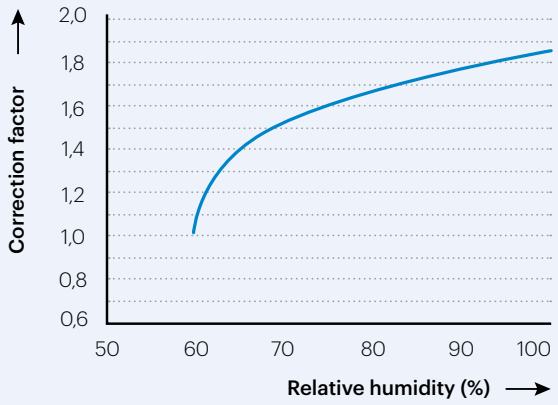
Correction factor K1: for rectangular cross-sections

Radiant power

The service life of the spotlights used is approx. 10,000 to 12,000 h. After 10,000 h the average radiation loss is about 20 %. The ideal ambient temperature of the radiators is 20 °C. The radiation chamber should not only be the end of the AHU not only for reasons of disinfection but also because of the existing ambient parameters, if they are around 20°C and 60 % rel. humidity. The reflectance of metal sheets is approx. 25 to 30 %.

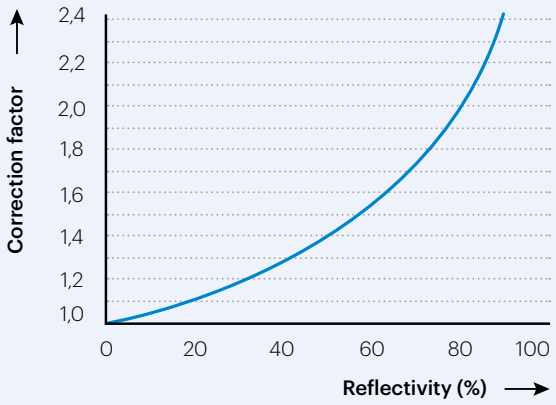
Correction factors flow into the calculation

K2



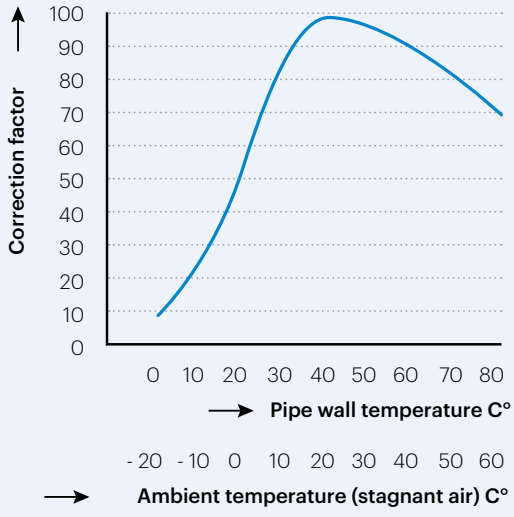
Correction factor K2: required number of lamps at humidity > 60 %

K3



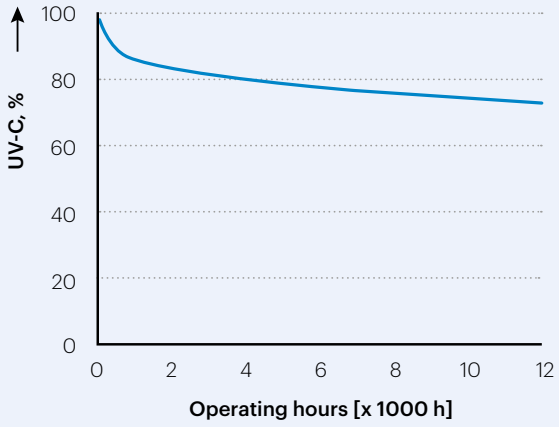
Correction factor K3: required number of lamps for degree of reflection > 20 %

K4



Correction factor K4: Temperature influence

K5



Correction factor K5: Ageing of the UV-C lamps

Optimum radiation dose depending on the requirement profile of the desired disinfection

Your notes

Your notes

We will be happy to advise you personally!

oxytec ag is one of the market leaders in the field of air purification, disinfection and water treatment based on UV-C/ozone, non-thermal plasma (NT plasma) and combination processes with scrubbers.

Since 2004, oxytec has been offering solutions for disinfecting air and surfaces with the highly effective UV-C/ozone and plasma technology. Since then, oxytec ag has equipped hundreds of commercial kitchens, cruise ships and industrial companies. The customers also come from the food, chemical, textile, supply and disposal industry.

Today, the use of environmentally compatible and scientifically certified solutions is also used in residential construction for the conception of waste rooms and for the inactivation of viruses, pollen, bacteria and mould in room air purification.

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