



SAFE AIR DISINFECTION – WITH PROVEN RESULTS

Studies, publications and supporting documents


VIROBUSTER[®]
THE AIR PURIFICATION SPECIALIST

UV-C – THE SAFEST ALTERNATIVE TO TRADITIONAL PROCESSES

VIROBUSTER® systems use effective UV-C technology, and offer the safest and most efficient alternative to traditional processes.

With a short wavelength of 254 nanometres, UV-C light is perfectly suited (when used safely, cleanly and at a suitable dose) to microbiological purification. Treatment with UV-C blocks the genetic material of micro-organisms such as viruses and bacteria, which prevents them from multiplying. This means that after treatment with UV-C, they are no longer infectious.



UV-C is a tried-and-tested solution

UV-C has been known to be effective since 1901. It has been used for water sterilisation without the use of chemical additives, and for air purification in the medical industry. With a combination of smart technology, high safety standards and the right UV-C dose, our devices eliminate 99.99% of SARS-CoV2¹ virus in just one cycle - as proven in multiple scientific studies¹.

UV-C is safe and efficient

Our devices work solely on the basis of UV-C. This means there are no filters or hazardous additions such as plasma (ozone) or ionisation, making it an emission-free solution that is safe for users and the environment².



UV-C developed to perfection - The patented VIROBUSTER® UVPE³ principle is superior to traditional UV-C technologies (UVGI⁴)

How UV-C is used has changed significantly since it was first established.

The “open” UV-C method, which uses direct radiation of the area to be disinfected with UV-C light but is less effective and presents a health hazard due to ozone release, was still used until the SARS1 outbreak in 2003. After this method was officially rejected by the WHO and other health institutions, the now-standard (ozone-free) UV-C technology (UVGI) was developed, whereby the lamps are placed in the closed ventilation channels of air conditioning systems. While this eliminated the safety issue, it drastically reduced efficacy, as the air is not present in the plastic ventilation system long enough to be exposed to sufficient radiation. This is a major issue that VIROBUSTER® identified early on and has now effectively overcome with the UVPE method.

THE VIROBUSTER® UVPE MECHANISM: THE NEXT GENERATION OF AIR DISINFECTION

Safe air disinfection - with proven results

VIROBUSTER® UVPE units are different to open or standard UV-C (UV-C lamps in air conditioning channels) - they bring together modular, highly-effective, high-dose UV-C technology and special reflectors with a targeted displacement current. This results in a powerful combination that clearly outperforms all other UV-C technologies currently on the market¹.

While traditional air purifiers usually only advertise their high filter efficacy, it is also important to compare a number of other factors:

- 1 **Device efficacy:** VIROBUSTER® offers proven efficacy of >99.99% against SARS-CoV2¹
- 2 **Space efficacy:** The combination of slow intake and a high output speed guarantees a reduction in microbial counts for the whole room - in just a few minutes.
- 3 **Device comfort:** The pedestal offers stability, and the fan it contains is extremely quiet given its air flow capacity⁵. It can therefore be used long term, for example in offices, hospital rooms and bedrooms.
- 4 **Safety and Sustainability:** Our devices work solely on the basis of UV-C. This means there are no filters or hazardous additions such as plasma (ozone) or ionisation, making it an emission-free solution that is safe for users and the environment.
- 5 **Cost-effectiveness:** As there are no filters that would require regular changing, maintenance is only required every 2-3 years⁶. Its low maintenance costs make STERIBASE® the perfect choice.

The following pages show that VIROBUSTER® UVPE technology - particularly in its floor devices - outperforms the competition in each of these fields.

1 "Coronavirus surrogate inactivation rates", Elimination Study, Bermpohl 2020, Biotec GmbH, Gütersloh

2 TÜV Air Purification Device Report R60024536

3 Ultraviolet pathogen elimination, a mechanism developed by VIROBUSTER®

4 Ultraviolet germicidal irradiation

5 The carefully designed air flow enables air mixing with almost no bypass, and thus the highest possible net air exchange per hour.

6 When used 10 hours per day, 280 days per year

1 DEVICE EFFICACY

To make sure we can live up to our promises, we are regularly tested by independent labs. The following studies prove that VIROBUSTER® technology is highly effective with 99.99 % treatment rates for coronavirus, for example.

EFFECTIVE ELIMINATION OF CORONA AND INFLUENZA VIRUSES

2020-09, Dr. rer. nat. A. Bermpohl, Biotec GmbH

“Coronavirus surrogate inactivation rates after a single cycle of the VIROBUSTER® STERIBASE® Plus device”

Result: >99.99 % (>LOG 4)

The goal of the study was to analyse how well the STERIBASE® Plus system inactivates coronavirus surrogates.

Two coronavirus surrogates were used: Phi6 and MS2 bacteriophages.

Phi 6: Cystoviridae, lipid-enveloped virus, dsRNA, MW RNA approx. 13.5 kb, diameter 60-100 nm

MS2: Leviviridae, no envelope, ssRNA, MW RNA approx. 4 kb, diameter 26 nm

You can find the complete study at:

http://caro-cm.com/Biotec_SARS-Cov2_Virobuster_Efficiency.pdf

2006-04, Dr. rer. nat. A. Bermpohl, Biotec GmbH

“Influenza (H1N1) surrogate inactivation rates after a single cycle of the VIROBUSTER® STERITUBE® device”

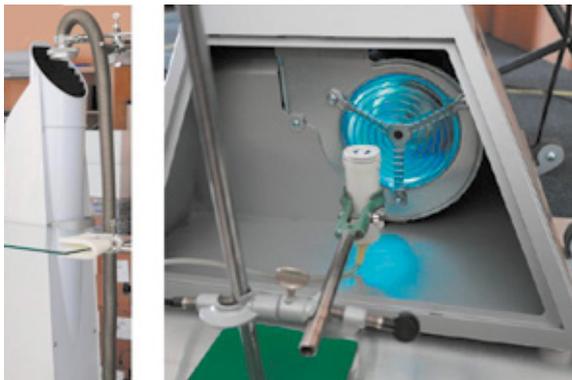
Result: >99.9999 % (>LOG 6)

The goal of the study was to analyse how well the STERITUBE® inactivates influenza surrogates.

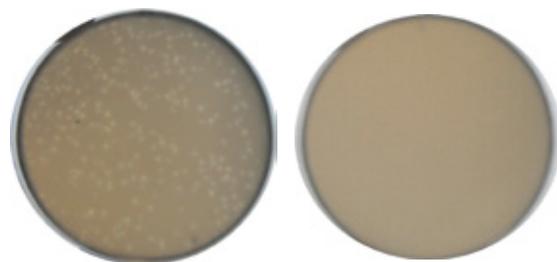
This used: Bacteriophage MS2 (strain DSM13767), host bacteria: E. coli TOP10F' – Infection via F family pili: Leviviridae
Structure/size: naked; diameter 250A (icosahedral shape); diameter 25--27 nm
Genome: 1s-RNA; 4 genes on a 3569 nucleotide genome
Proteins: 180 envelope protein and 1 adsorption protein copies

You can find the complete study at:

http://caro-cm.com/LAB_STERITUBE_MS2_DE.pdf



Coronavirus surrogate (Phi6) aerosolisation



Before and after UV-C treatment: Influenza virus surrogate (MS2)

EFFECTIVE ELIMINATION OF CORONA AND INFLUENZA VIRUSES

2009, Univ.-Prof. Dr. med. K. Kleesiek and Dr. rer. nat. Jens Dreier (Heart and Diabetes Centre North Rhine-Westphalia) – Ruhr-University Bochum

“Analysis of the transmission of airborne viruses via air handling systems and development of disinfection measures”

Result: This study proved UVPE to be more effective than traditional UV-C systems by >3 LOG.

The goal of the experiment was to show that traditional filters do not work against viruses and that viruses survive in air handling systems. According to studies, UV-C systems are an effective alternative.

You can find the complete study at:
http://caro-cm.com/WIS_FF_VIRUS.pdf

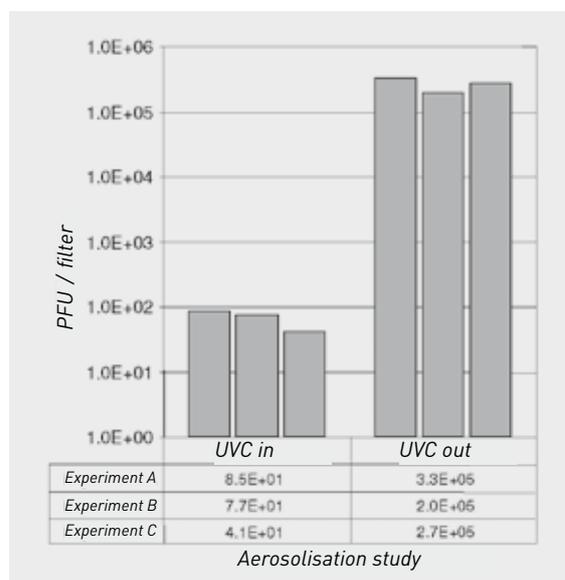
2009, Dreier, Bempohl, Jeschin, Becker, Kleesiek

“Transmission of viruses by air handling systems and inactivation by UV-C radiation”

Result: 3.6 log (99.98 %) reduction by VIROBUSTER® versus traditional air handling systems

Viruses (coronavirus surrogate: bacteriophage MS2), which are introduced into an air handling system in aerosolisation studies, are still present in an infectious form in the supply airflow up to four hours later. The F5/F7 filter elements used in air handling systems are not able to retain viruses sufficiently. The integration of UV-C modules in the airflow can in part reduce viruses to below the diagnostic threshold.

You can find the complete study at:
http://caro-cm.com/WIS_DREIER-BERMP-OHL.pdf



Result: Air treated with UVPE was purified by 3.6 LOG.



VIROBUSTER® STERITUBES® module, fitted in an air channel as a 2x4 cluster (LOG 3.6 – 99.98% reduction)



BÄRO UV-C lamps positioned in air channel (LOG 0.8 – 89.8% reduction)

2 SPACE EFFICACY

High efficacy per cycle alone is no guarantee of safety for a whole room. While a sufficiently effective device will blow out pathogen-free air, there must also be a suitable quantity of air in the room in order to achieve the required level of dilution in the room air. This is where the VIROBUSTER® STERIBASE® 300 comes in: The combination of a targeted slow, almost horizontal air intact (at a 270° angle) near to the floor and a high output speed means that there is barely any bypass of inflow and outflow. This maximised output guarantees an attenuation of the pathogens in the whole space - in just a few minutes.

**2010, Dr. rer. nat. A. Berrnphol,
Biotec GmbH**

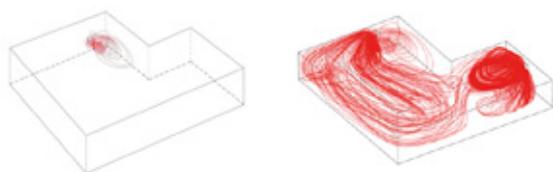
“Comparison of UV disinfection devices”

Result: STERIBASE® is the only powerful solution in terms of space efficacy.

The series of tests is used to verify the efficacy of individual devices in terms of a reduction in microbial count. The criteria measured were “air recirculation” (measurements in a hermetically sealed room with several cycles) and “single cycle”. Furthermore, as part of the series of tests, the aspiration capacity and air circulation of the test devices was also measured.

You can find the complete study at:

http://caro-cm.com/LAB_BIOTEC_ASPER_KRONT_STERIBASE.pdf



CFD modelling for various devices

**2011, Aurbach U., Wisplinghoff H.,
Cologne Centre for Mycology (ZfMK)**

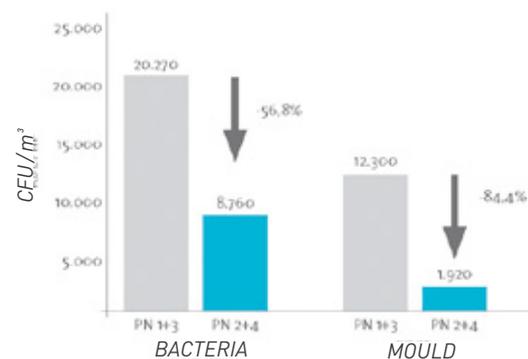
“Establishing the micro-organism elimination rate in room air using UV-C radiation”

Result: Across the area as a whole, pathogens were reduced by 67 % and mould spores by 84 %.

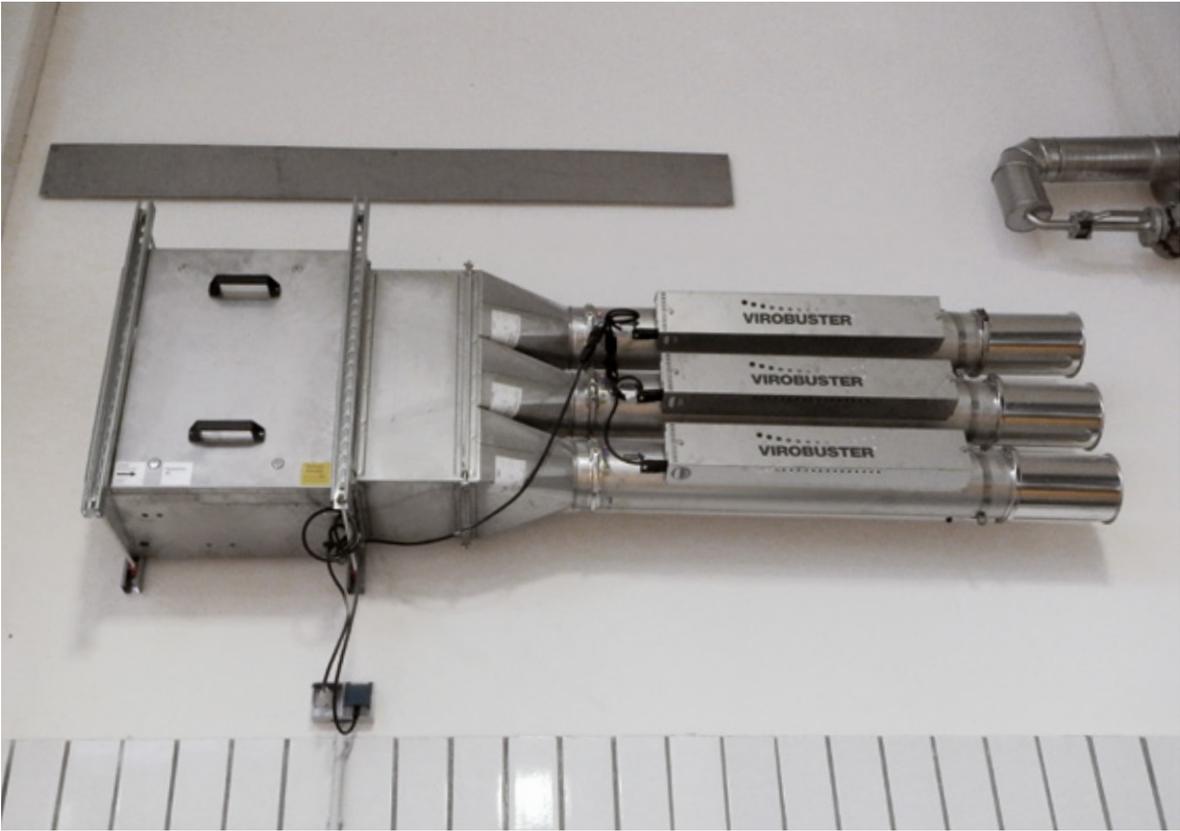
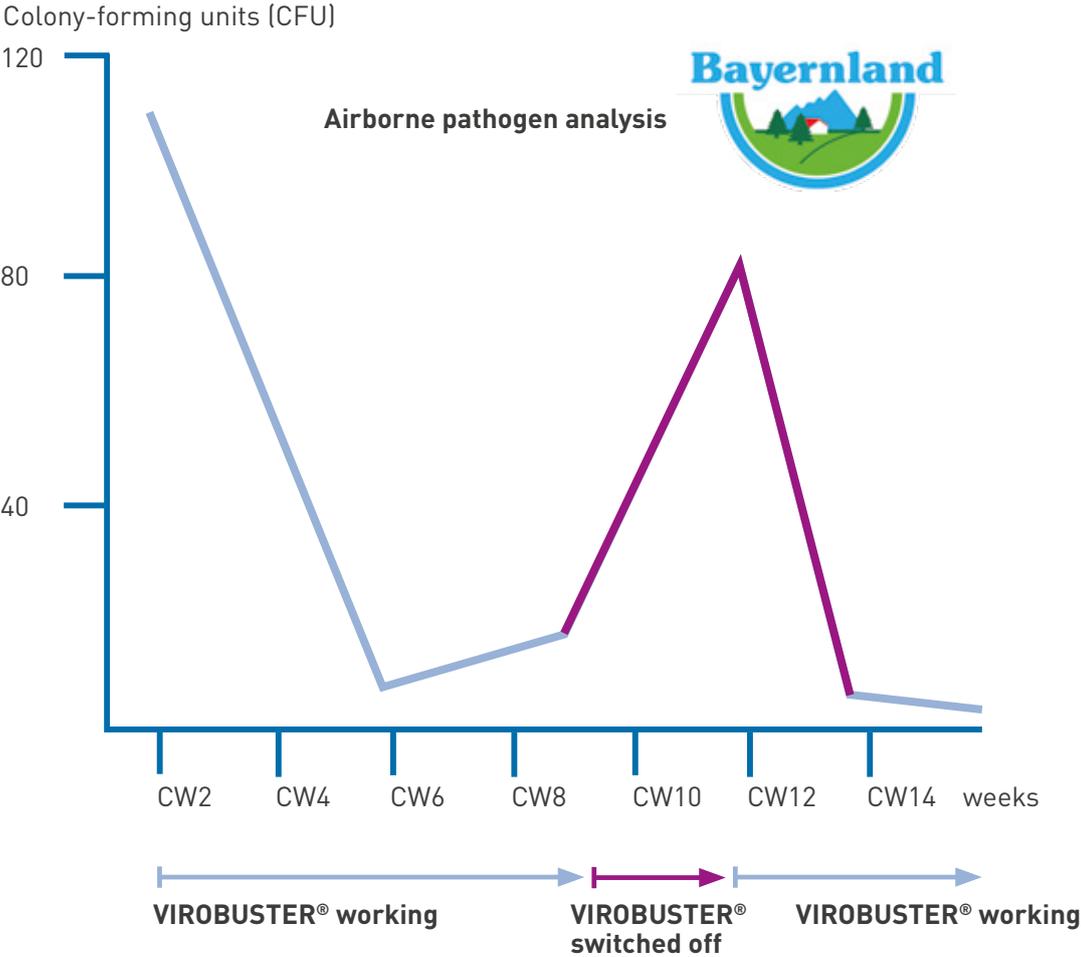
The objective of this prospective, multi-centre user observation was to establish the mechanism of action of STERIBASE® with regard to the elimination of active bacteria and mould in room air under practical conditions. VIROBUSTER®'s UVPE technology contributes to increased air purity, even for UV-stable pathogens. This user observation thus supports the importance of UV-C technology as a valuable tool for reducing microbial counts in room air.

Full study:

http://caro-cm.com/WIS_WISPLINGHOFF.pdf



Effect of VIROBUSTER® on bacteria and mould



Industrial recirculation unit

3 DEVICE COMFORT

In addition to characteristics like device and space efficacy, user criteria like noise level, practicality, ease of use and aesthetics also play a major role.

“It works” isn’t good enough for us - our devices also have to be pleasant on the eyes and ears.



Low noise levels

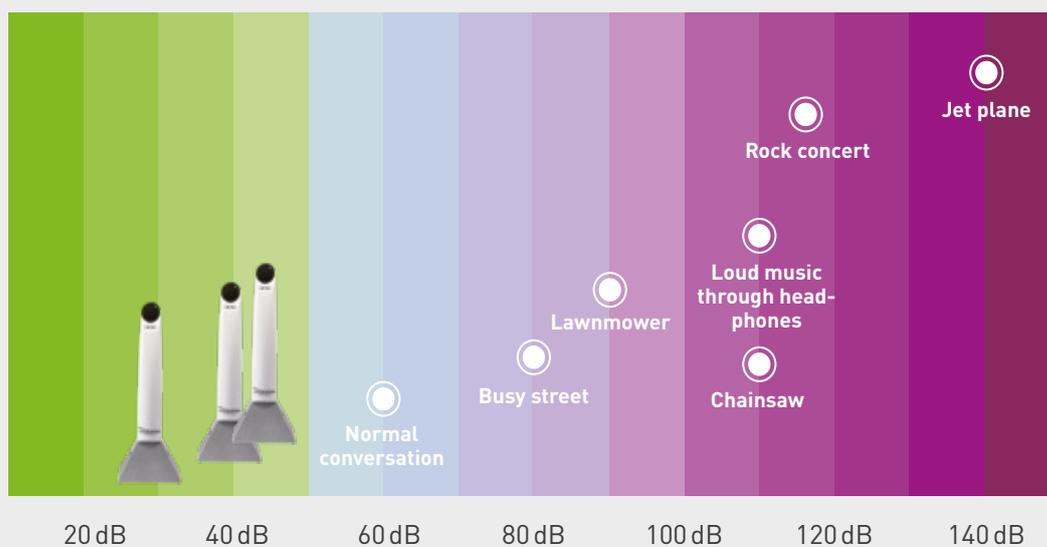


**A < 30 dB(A)
sleep mode**



**An attractive design
(Design Award
Winner)**

EVERYDAY NOISE LEVELS IN DECIBELS (dB)



STERIBASE® airflow / noise levels:

Level 1: 150 m³/h / 29.4 dB(A)

Level 2: 230 m³/h / 40.5 dB(A)

Level 3: >300 m³/h / 47.2 dB(A)

4 SAFETY AND SUSTAINABILITY

Other effective technologies, like plasma (ozone generation) and ionisation are available. However, these solutions are not completely harmless due to their (chemical) mechanism of action. This is why, with user and environmental safety in mind, we developed the even more effective, fully risk-free UVPE principle from UV-C. UVPE is safe for users, free from emissions and can even be used without (HEPA) filters for pathogen reduction.

2010, Asper and Kront, Olfatec Forschung, Entwicklung und Dienste GmbH

“Emission Values Test Report”

Result: Zero emissions

In this study, 12 testers assessed the odour emissions/room air quality of the VIROBUSTER® STERIBASE® 300 Plus. All testers were trained and met the DIN EN 13725 selection criteria with regard to the reference substance n-Butanol.

Samples were taken from the outlet of the VIROBUSTER® device and tested for three parameters: odour concentration (as per DIN EN 13725), intensity and hedonics (rated as per VDI 3882).

You can find the complete study at:

http://caro-cm.com/LAB_BIOTEC ASPER KRONT STERIBASE.pdf

2011, Dr. rer. nat. A. Bermpohl, Biotec GmbH

“Impact of VIROBUSTER® air handling system on room air quality”

Result: No presence of VOCs

This study tested whether using the VIROBUSTER® system results in a change in the volatile organic compounds (VOCs) in room air, and whether additional VOCs are found as a result of the system.

VOC is an umbrella term for carbon-containing (organic) substances that evaporate easily (volatile) or are already gaseous at low temperatures (e.g. room temperature).

You can find the complete study at:

http://caro-cm.com/TE_VOC_BIOTEC.pdf



Taking of odour samples



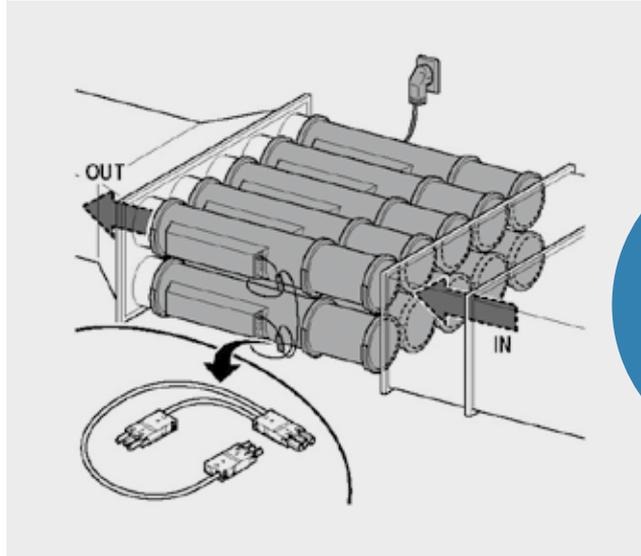
Ozone measurement samples



No change in colour

FREE FROM OZONE, NOX AND OTHER HAZARDOUS SUBSTANCES, TÜV TESTED

The STERIBASE® was developed for the medical industry and therefore had to meet certain safety requirements such as electrical and EMC safety to avoid potential interference with other medical devices.



Prüfzeichen Test Mark



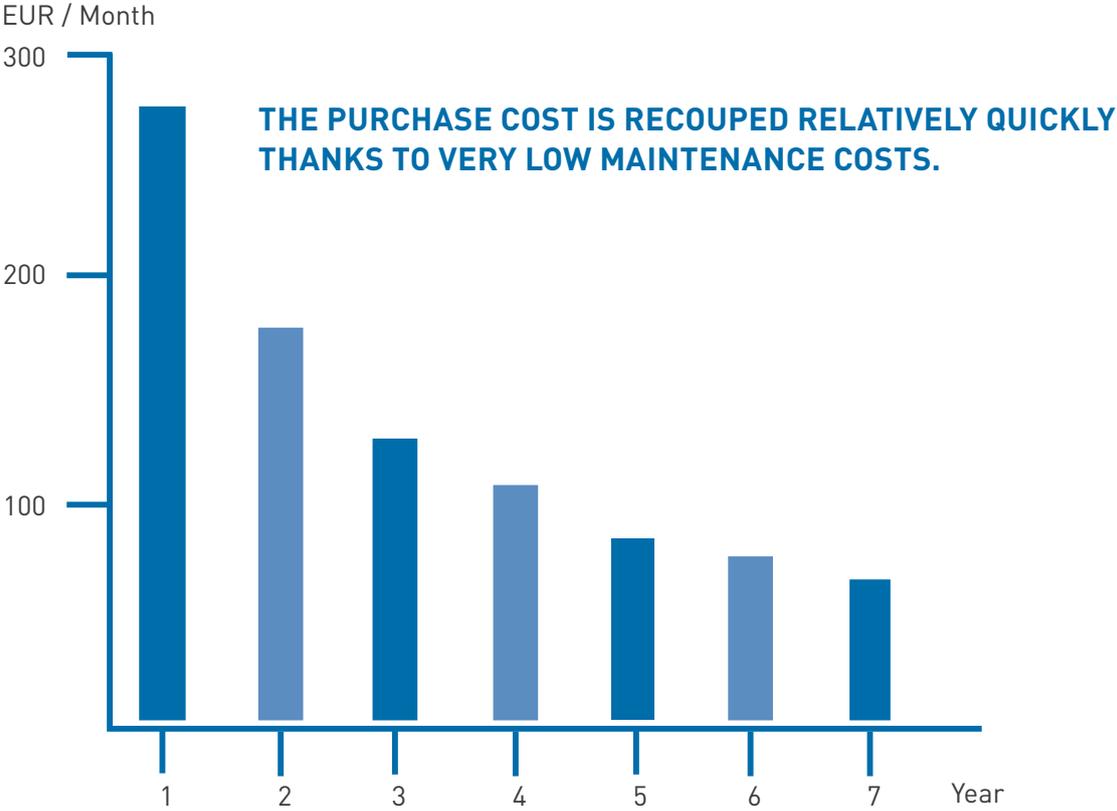
Geprüft nach Tested acc. to
EN 60335-1:2002+A1+A11+A12+A2+A13
EN 60335-2-65:2003+A1

Der Anhang 1 der Richtlinie 2006/95/EG ist eingehalten. Das Zertifikat kann im Rahmen der Konformitätserklärung nach Annex 1 of the directive 2006/95/EC be complied with. The certificate can be used in connection with the EC declaration



5 COST-EFFECTIVENESS

As there are no filters that would require regular changing, maintenance is only required every 2-3 years⁷. Its low maintenance costs make STERIBASE® the perfect choice.



⁷ Investment: List price
Maintenance: 10 hours per day, 280 days per year
0.15 EUR/kWh

i VIROBUSTER® UVPE VERSUS OTHER TECHNOLOGIES

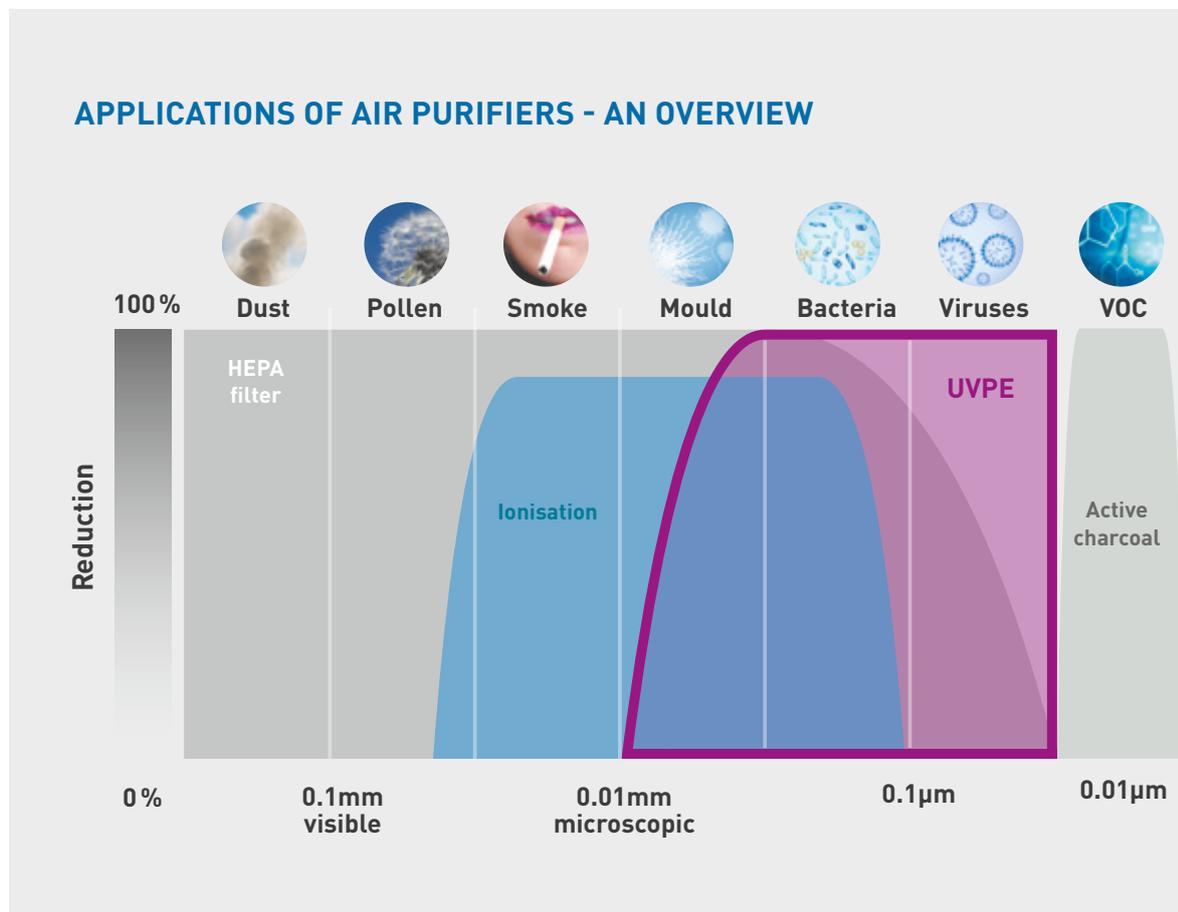
Pathogen reduction - a piece of cake with UVPE:

An air purifier can be a useful alternative if ventilation using windows or a building ventilation system are not possible. But which technology, which provider and which model are best suited to your specific needs and conditions?

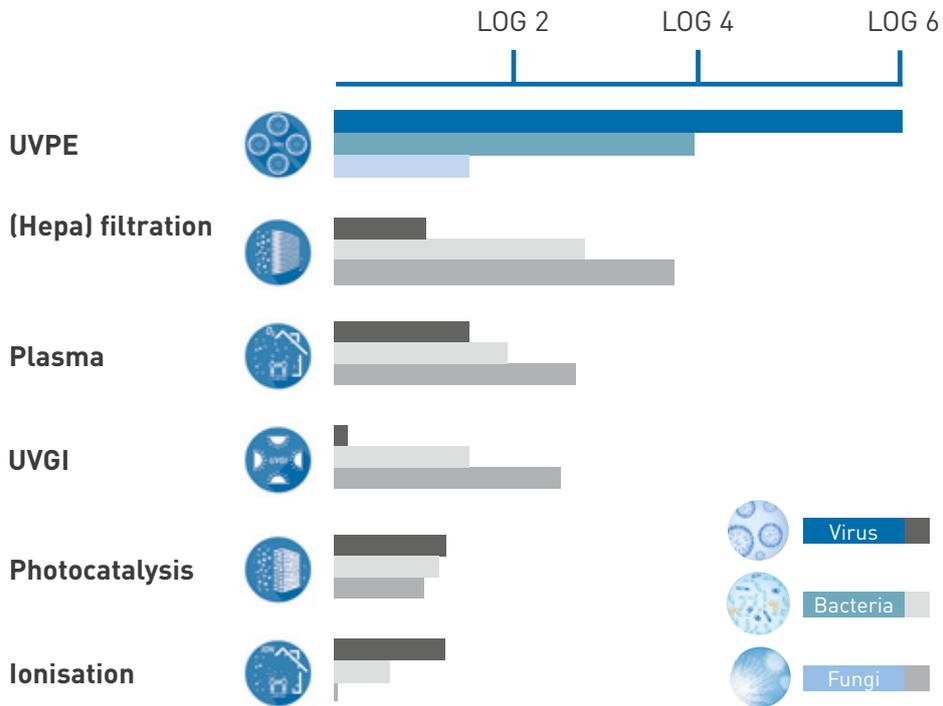
When comparing air purifiers, it is important to take into account:

- Intended purpose
- Device/ventilation capacity
- Purification efficiency
- Room volumes and
- How polluted the ambient air is.

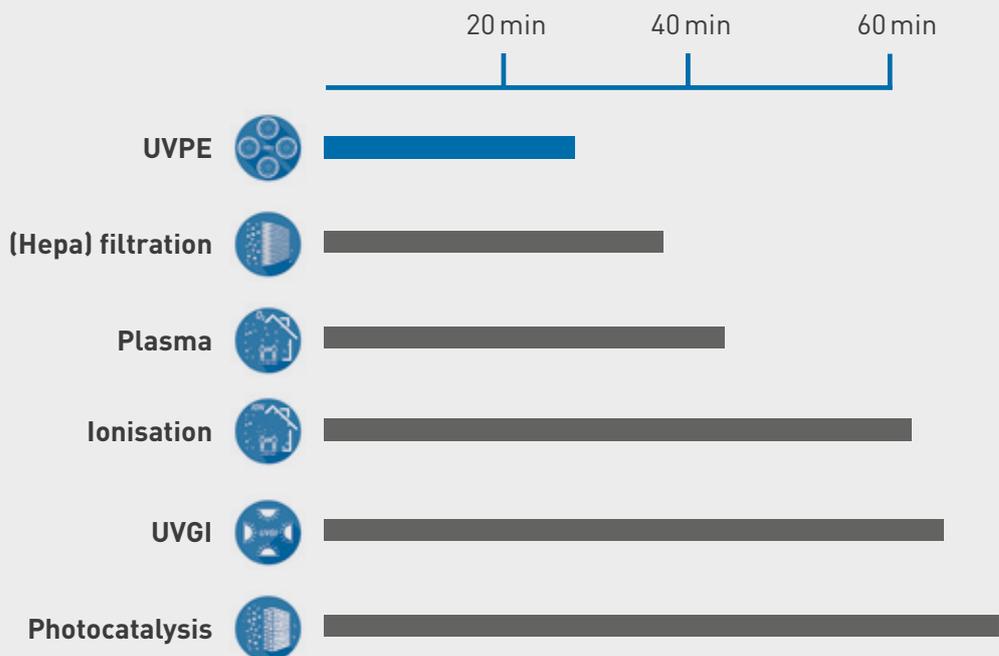
The right choice will differ depending on these aspects. If pollen or odours must be removed from the air, a different air purifier or combination of technologies may be required than for the elimination of mould, bacteria and (corona)viruses. And this is precisely where the UVPE principle comes in.



DEVICE EFFICIENCY IN ONE CYCLE



SPACE EFFICACY, 50 m³ ROOM SIZE AND 300 m³/h VENTILATION CAPACITY



CERTIFIED, PROVEN AND TRIED-AND-TESTED

Some of our satisfied customers:



"99.99% for the coronavirus (surrogate Phi6) in one cycle. The system can be classified as 'very good'."

Dr Andreas BERPPOHL, Biotec GmbH 2020



VIROBUSTER® – THE AIR DISINFECTION SPECIALIST

Our mission statement:

“Scientifically proven innovations for high quality products, effective air hygiene and safety.”

For over 15 years, VIROBUSTER® International GmbH, based in Windhagen, Germany, has specialised in UV-C air disinfection. In 2003, we established the first patent in the world for technology based on UVPE (originally developed for medical use), which continues to be our USP to this day.

From medicine to industry

The first SARS-coronavirus/H5N1 avian influenza threats, and the later H1N1 influenza pandemic, have shown the whole world that airborne diseases can have a significant social and economic impact. Most recently, with the COVID-19 pandemic, this has affected every single household. The importance of cleaner air - more precisely, the risk of infection from pathogens in the air - cannot be overstated. And this risk is what we have transformed into an opportunity.

Today, VIROBUSTER® has developed partnerships across a wide range of industries in over 25 countries, and increasing demand from many other industries shows that VIROBUSTER® disinfection technology is effective and practical beyond medical applications. In particular, industries such as food production (industrial bakeries, delicatessens, fruit and vegetables, etc.), veterinary services, schools, government offices and transport and logistics are already successfully using our UVPE technology.





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Virobuster International GmbH
Köhlershöhner Str. 60
D-53578 Windhagen
Tel.: +49 2224 818 780
Email: info@virobuster.com
www.virobuster.com


Made in
Germany

CE 



• BAUART
GEPRÜFT
• TYPE
APPROVED