

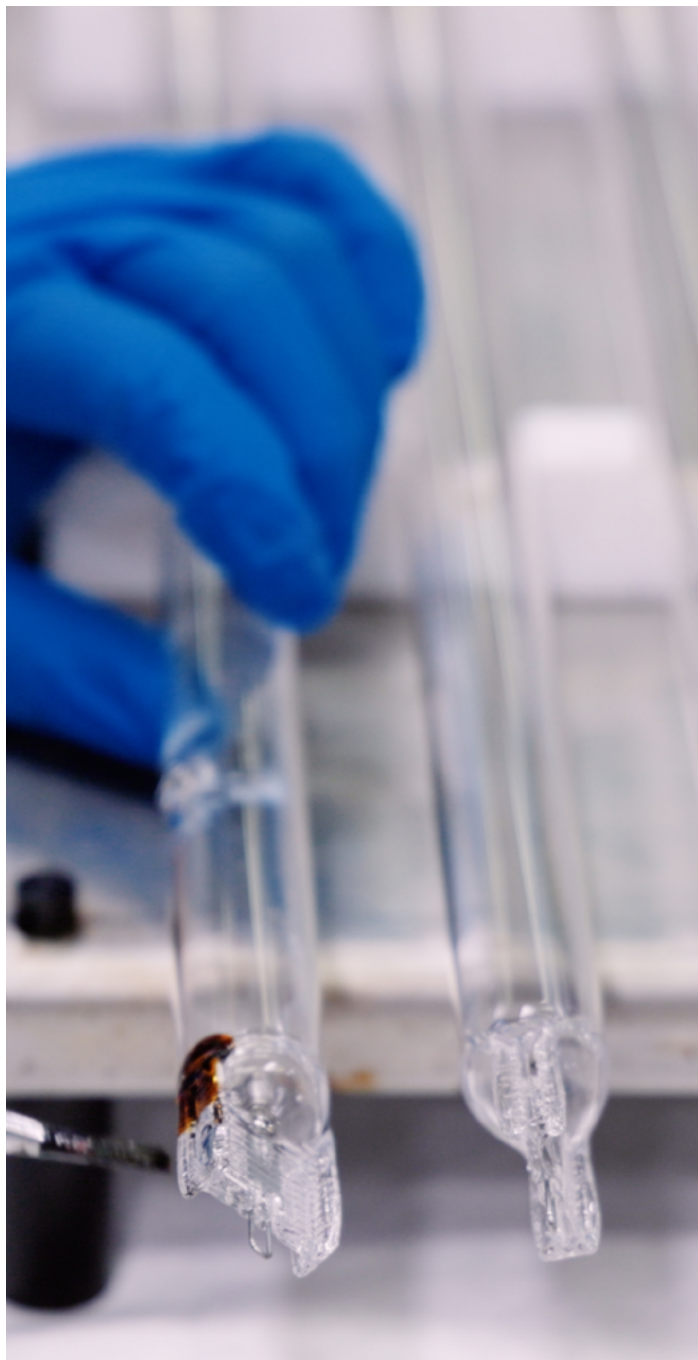


Manufacturer of Custom
Made UV-C Lamps For Disinfection

Ultravio Lamp Catalogue

Ultraviolet Disinfection lamps, custom manufactured
to your UV requirements.

www.ultravio.com



Halma group

Halma is a global group of life-saving technology companies. Named as one of Britain's Most Admired Companies, our group of around 45 companies provide innovative products and services that help solve many of the key problems facing the world today.

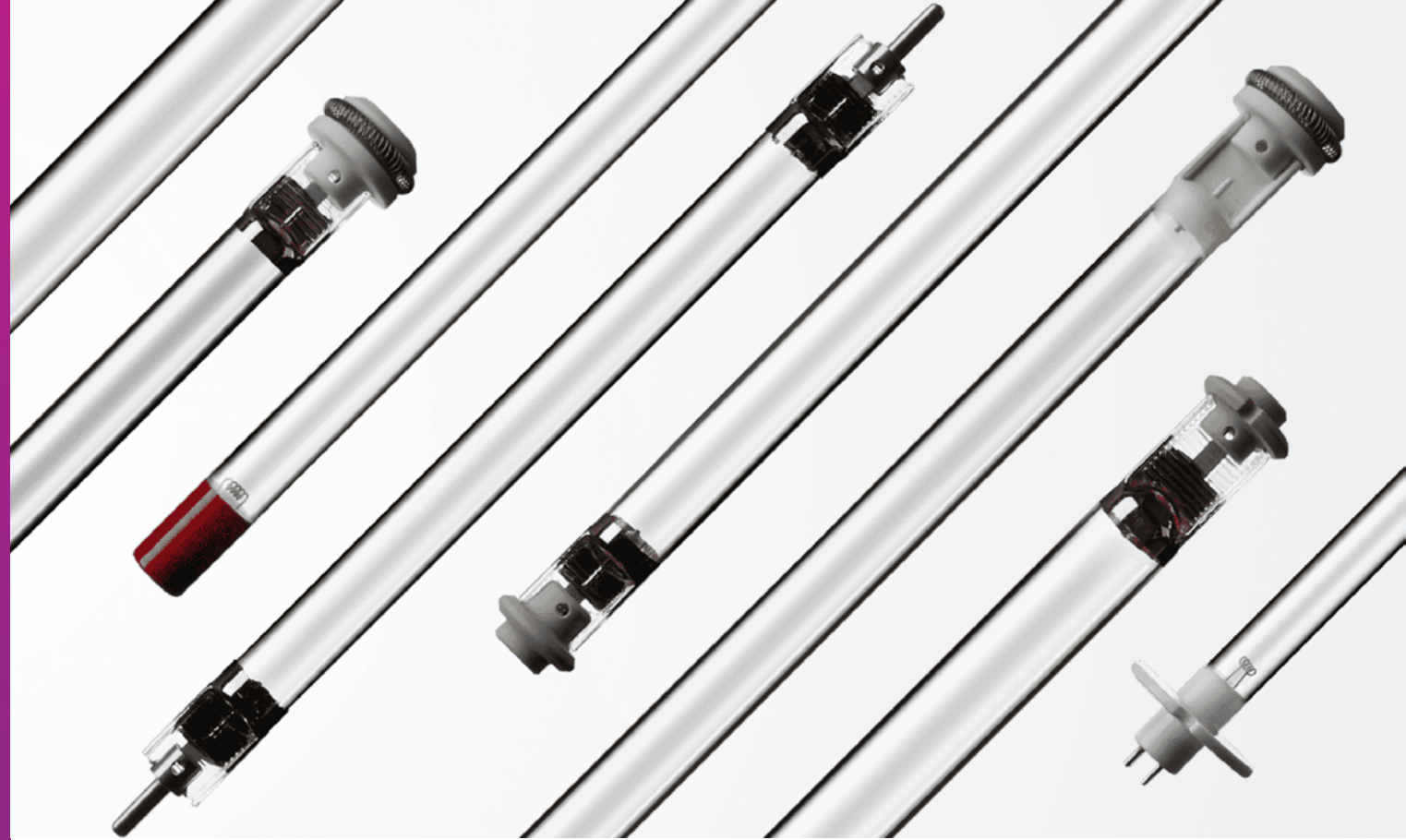
Halma Group's purpose is to grow a safer, cleaner, healthier future for everyone, every day. Halma's DNA runs through our business at all levels. It embodies the core elements of our organisation and culture that are inextricably linked to enable our success.

Sustainability is an intrinsic part of Halma's strategy and it is driven by its purpose. By growing in line with this purpose, Halma companies deliver a positive impact in the markets they serve and beyond. We all aim to amplify this positive impact by working towards achieving our Key Sustainability Objectives, as part of our Sustainability Framework.



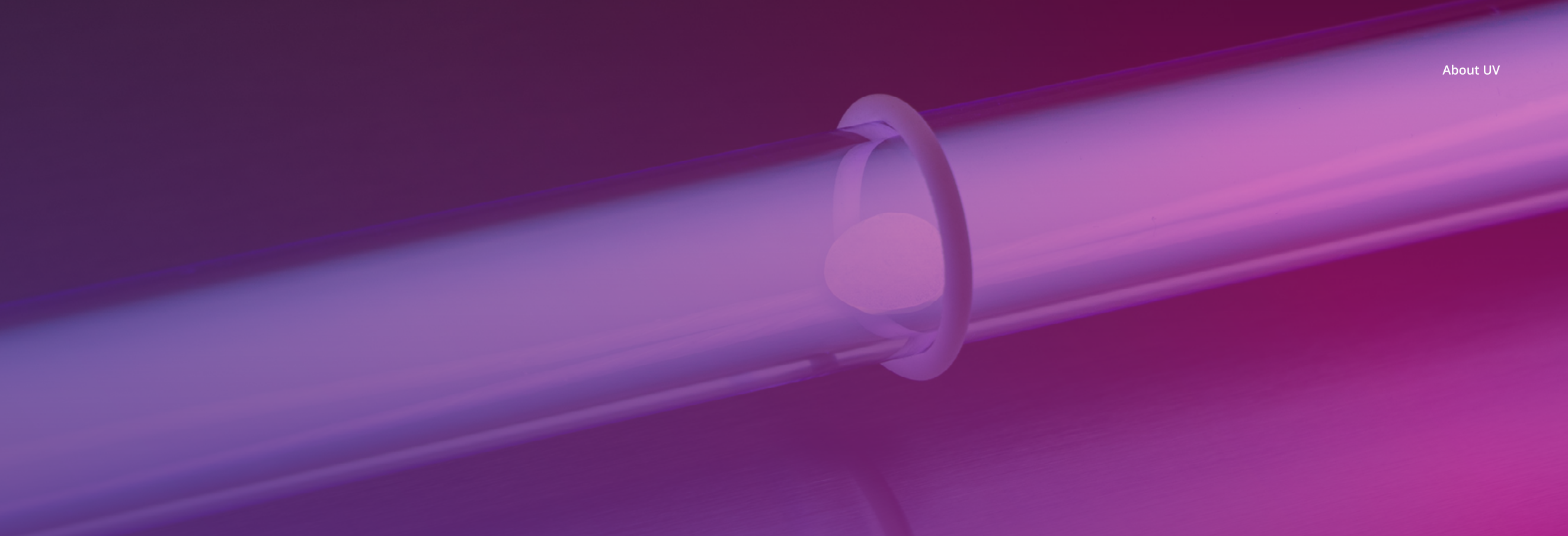
Ultravio - Lamp Production Facility

Ultravio has been manufacturing lamps since 1924, providing a wide range of high-quality lamps for Hanovia - part of Halma Group. Throughout the decades, Ultravio has produced medium-pressure, standard UV lamps and amalgam lamps.



Our production facility is in the UK, recently extended into a **BREEAM “Excellent” certified** building, using **ISO9001:2015** throughout the entire production process. Ultravio has provided UV lamps and is investing continuously in R&D to use innovative technologies in lamp production.

As the UV market is growing at a high speed, we have decided to broaden our business, by providing system manufacturers and OEM’s with high-quality lamps. With decades of experience, innovation and dedication, we are a market leader in UV lamp manufacturing, whilst our global footprint already includes the Americas, EMEA and APAC regions.



Innovation, Research & Development

Ultravio has nearly a century of experience in designing and manufacturing UV lamps. We also have considerable familiarity with a range of UV applications, including many that are subject to validation by regulatory authorities around the world. Therefore, we are the ideal partners for developing lamps to meet your specific needs and helping you achieve your product performance targets.

At our lamp manufacturing facility, we have a full suite of techniques available for thoroughly scanning and characterising UV lamps. As well as accurately measuring the emission spectrum across the ultraviolet range, we can establish how the lamp output varies over time to predict its performance at the “end of lamp life”.

This ensures that the lamp always meets your minimum performance requirements and that replacements can be scheduled at the optimum time intervals.

Another aspect that affects UV lamp performance is the operating

temperature. Ultravio can measure the lamp output as a function of temperature, and then adjust the design to optimise performance under specific operating conditions.

Thanks to our long experience in the industry, we also have an in-depth understanding of the different methods of powering UV lamps and have worked with some of the industry leaders, so we can advise you on the pros and cons of the various options available. Ultravio lamps can be laser-etched with logos or other custom markings to your specifications, promoting your brand and allowing full traceability of individual lamps.

UV Disinfection Basics

Strong sunlight is known to kill bacteria, viruses, moulds and spores. Almost a century ago scientists identified the part of the spectrum responsible for this well-known effect as primarily the UV-C spectrum.

What is Ultra Violet (UV) light?

UV light is a naturally occurring component of solar radiation. It falls in the region between visible light and X-Rays in the electromagnetic spectrum between the wavelengths 100nm – 400nm. UV can be further categorized into UV-A, UV-B and UV-C and Vacuum UV.

How does a UV-C light disinfect?

When UV light meets a microorganism it penetrates its DNA, destroying the adenine and thymine bonds effectively inactivating bacteria, viruses, spores and moulds, by stopping them from multiplying and causing infection.

What is UV-C light?

UVC between the wavelengths of 220nm and 290nm is recognised as having significant 'germicidal' properties. UV-C light is almost entirely filtered out by the Earth's atmosphere, so to utilize the germicidal properties we have to artificially generate it here on earth using commercially produced UV lamps.

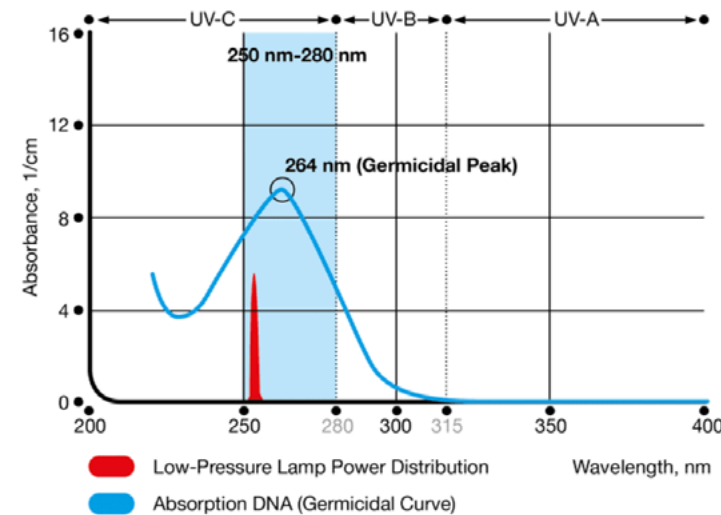


There are two mainstream UVC lamp technologies used in Industrial and Municipal applications:

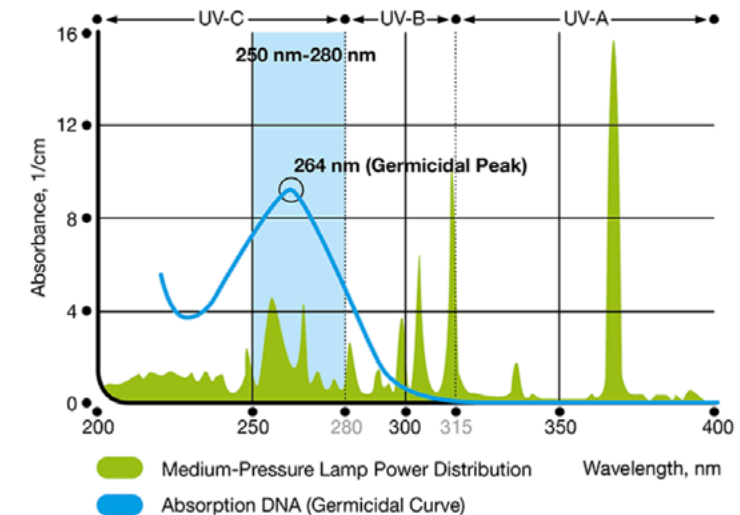
1. Amalgam lamps offer a monochromatic (Single wavelength) output at 254nm with 30%+ conversion of electricity to UVC. These lamps are efficient but their energy density is low which means they are relatively low power (100 to 800 W) and long. They are used when efficiency is key, but larger multi-lamp systems can be bulky and difficult to maintain.

2. Medium Pressure lamps offer a polychromatic output across a wide spectrum. This can be useful to match the sensitivity of a target organism, but they have a lower energy efficiency (~15%). Conversely, they are high-powered (1kw to 24KW) and short which means you need fewer lamps in a smaller reactor.

Low pressure



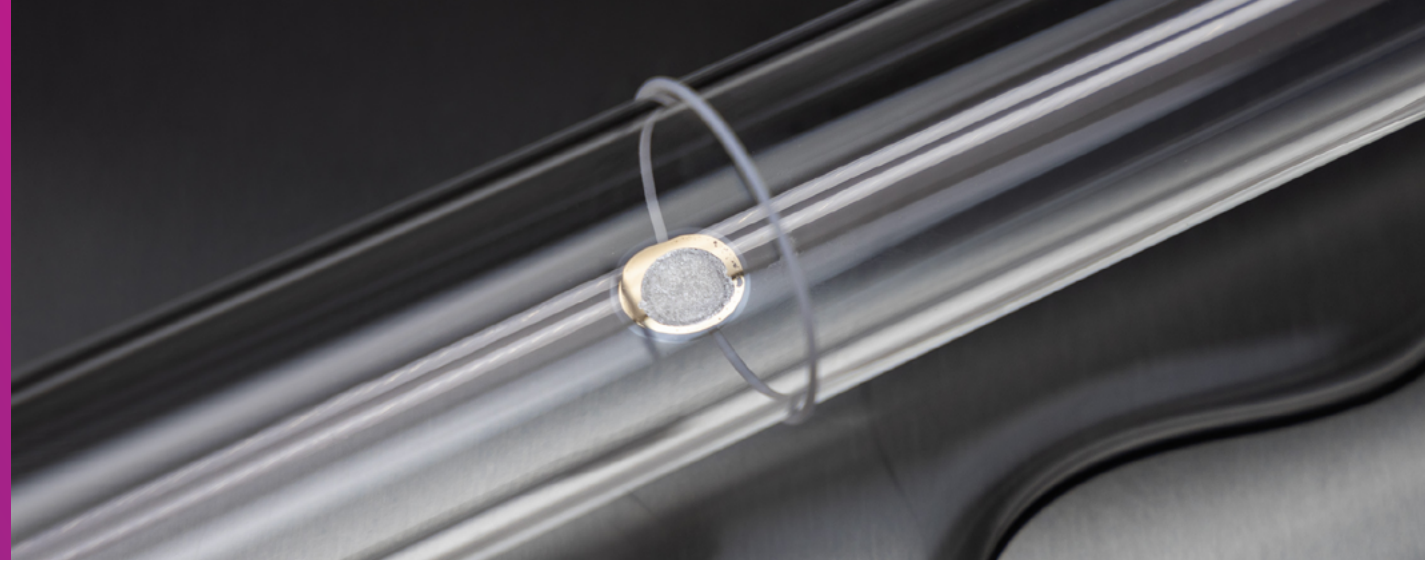
Medium pressure



These two lamp technologies offer a choice of reactor design which allows us to weigh the pros and cons of size and efficiency for a given application. As we manufacture both types of lamps we are uniquely placed to assess these competing characteristics to arrive at our "Application Optimised UV" solutions.

How do we generate UVC Light?

Benefits of using Low Pressure or Medium Pressure lamps:



	Low pressure	Medium pressure	Supporting Comments
Low power use	✓		Low pressure lamps are more efficient, but are lower powered
Efficient at higher flow rates		✓	Medium pressure lamps run at a much higher power density to low pressure lamps so one medium pressure lamp can treat a much higher flow than a single low pressure lamp
Spare restrictions		✓	Medium pressure lamps for the same UV output are around a third of the length of a low pressure lamp and so systems are much smaller
Lamp life	✓		Low pressure lamps typically last 16000 hours while the latest generation of medium pressure lamps last about 8000 hours
Disinfection efficiency		✓	Medium pressure has a higher UV light energy output and not only breaks a microbe's DNA bond but also ruptures the cell wall. Some microorganisms are much more sensitive to these multiple wavelengths produced by medium pressure lamps.
Low running temperature	✓		Low pressure lamps run at about 120°C, whereas medium pressure runs at 600°C to 800°C
High water temperature		✓	Medium pressure UV systems are hardly affected by the water temperature, whereas low pressure can only operate between 5-40°C
Status "ON" after no water flow	✓		In many cases low pressure systems can operate for longer without any water flow than medium pressure systems

Applications of the lamps

Water treatment is one of the major applications of UV-C disinfection. The process is used extensively for destroying the infection capability of pathogens in industrial wastewater, domestic wastewater, ballast water and sources of drinking water. Disinfection with UV-C light is highly effective; when pathogens such as bacteria, viruses or molds are exposed to the germicidal wavelengths of UV light, their DNA is damaged rendering them incapable of reproducing or infecting.

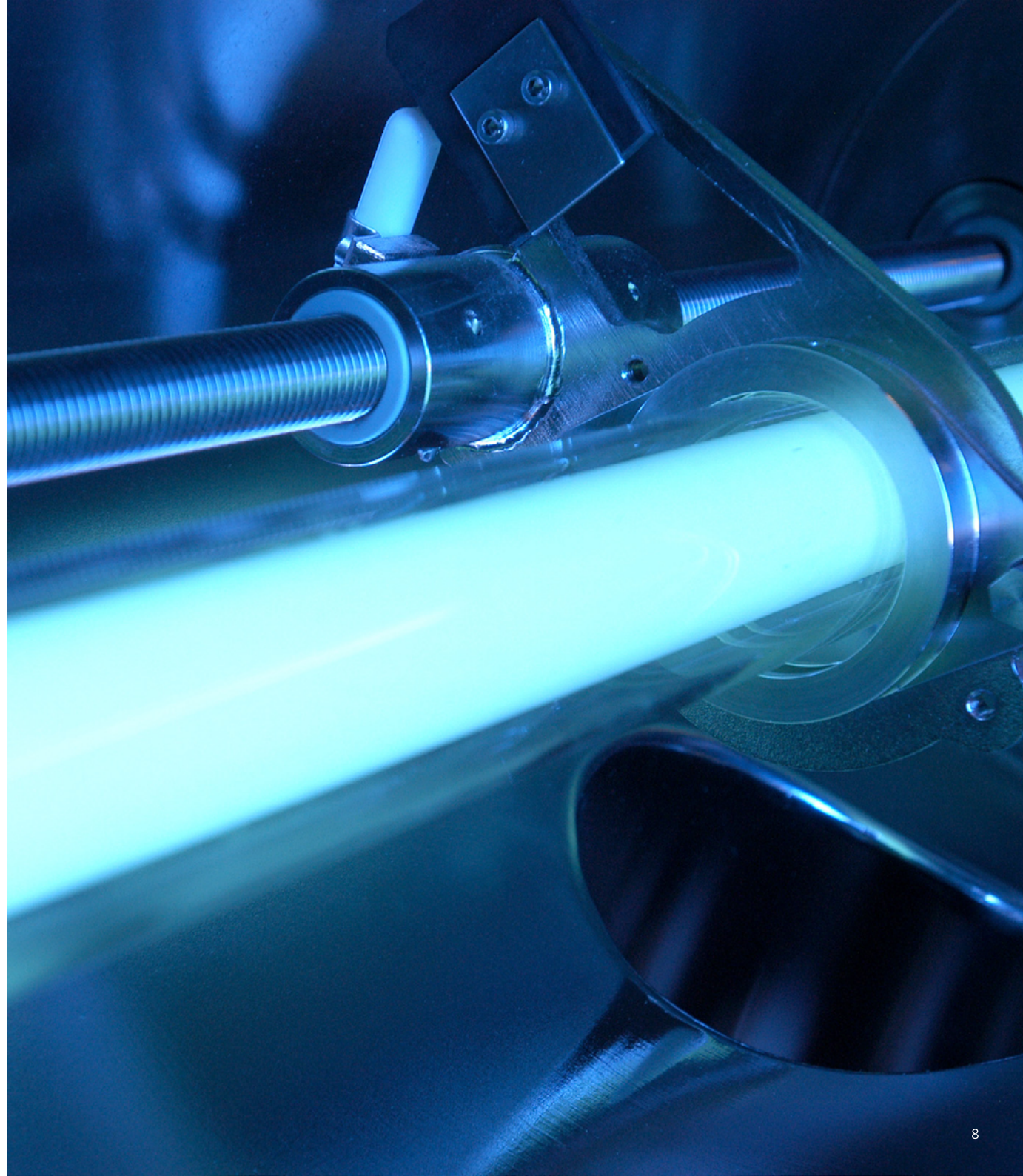
Within the water industry, UV-C disinfection is seen as a reliable and clean alternative to chemical disinfectants as it leaves no residue and can inactivate microorganisms such as protozoa that are resistant to chemical agents like chlorine.

Wastewater treatment

UV disinfection has become a widely-used technology for treating both industrial and domestic wastewater. UV light technology is straightforward to install and maintain, cost-effective and has long-term safety benefits for employees and communities close to water treatment plants. In addition, existing facilities currently using chemicals can be reverse-engineered to use UV light technology as their primary form of disinfection.

Drinking water

For many years, civil engineers have sought an alternative to using chlorine, ozone or membrane technology as primary disinfection agents for municipal drinking water. UV-C light is a proven and safe alternative for primary disinfection with the added benefit of leaving no trace to affect the taste, colour or odour of the water.



UV Surface Disinfection

For many industries, the ability to sterilise surfaces without the use of chemicals is critical. Germicidal UV-C light, therefore, plays an important role in these applications.

The use of UV light disinfection is becoming key for sterilising surfaces in operating rooms, ICUs, burn centres, patient rooms and doctor's offices – in fact, anywhere within hospitals and clinics where sterile environments are crucial to the welfare of patients and medical staff.

UV Air Disinfection

Ultraviolet air disinfection is a highly effective way to destroy microorganisms including viruses, bacteria, yeasts and mould spores. Airborne microorganisms such as these are especially prevalent in high footfall locations such as hotels, airports, hospitals and theatres and anywhere where food is prepared and served.

Disinfecting air using ultraviolet light within air ducts ensures the air stream and surfaces are exposed to germicidal wavelengths of light which destroy or deactivate the genetic material in the microorganism, preventing replication.

Air purification using ultraviolet light is safe, economical, simple to use and low maintenance. It, therefore, has many residential, commercial and industrial applications, primarily within duct installations and room air sanitisers.

Low-Pressure Amalgam

Ultravio offers high-quality amalgam UV lamps available in standard or custom configurations. Amalgam lamps provide increased UV power density over conventional low-pressure mercury lamps.

Amalgam lamps, which contain an alloy of mercury and another metal, are offered in two key varieties: ozone-free or ozone-generating. Ozone-free lamps offer an optimised output at 254 nm for disinfection. Ozone-generating lamps are optimised at 185 nm and produce ozone for alternative disinfection applications. These technologies can be combined if required. Amalgam lamps are more energy-efficient than MPUV lamps but are generally larger in size.

We offer customised amalgam lamp designs to accommodate higher or lower working temperatures to suit the application. Our amalgam lamps remain efficient throughout their long operating lifetimes, maintaining a high 'end of life' UV-C output.

Applications for high-output low-pressure amalgam lamps include:

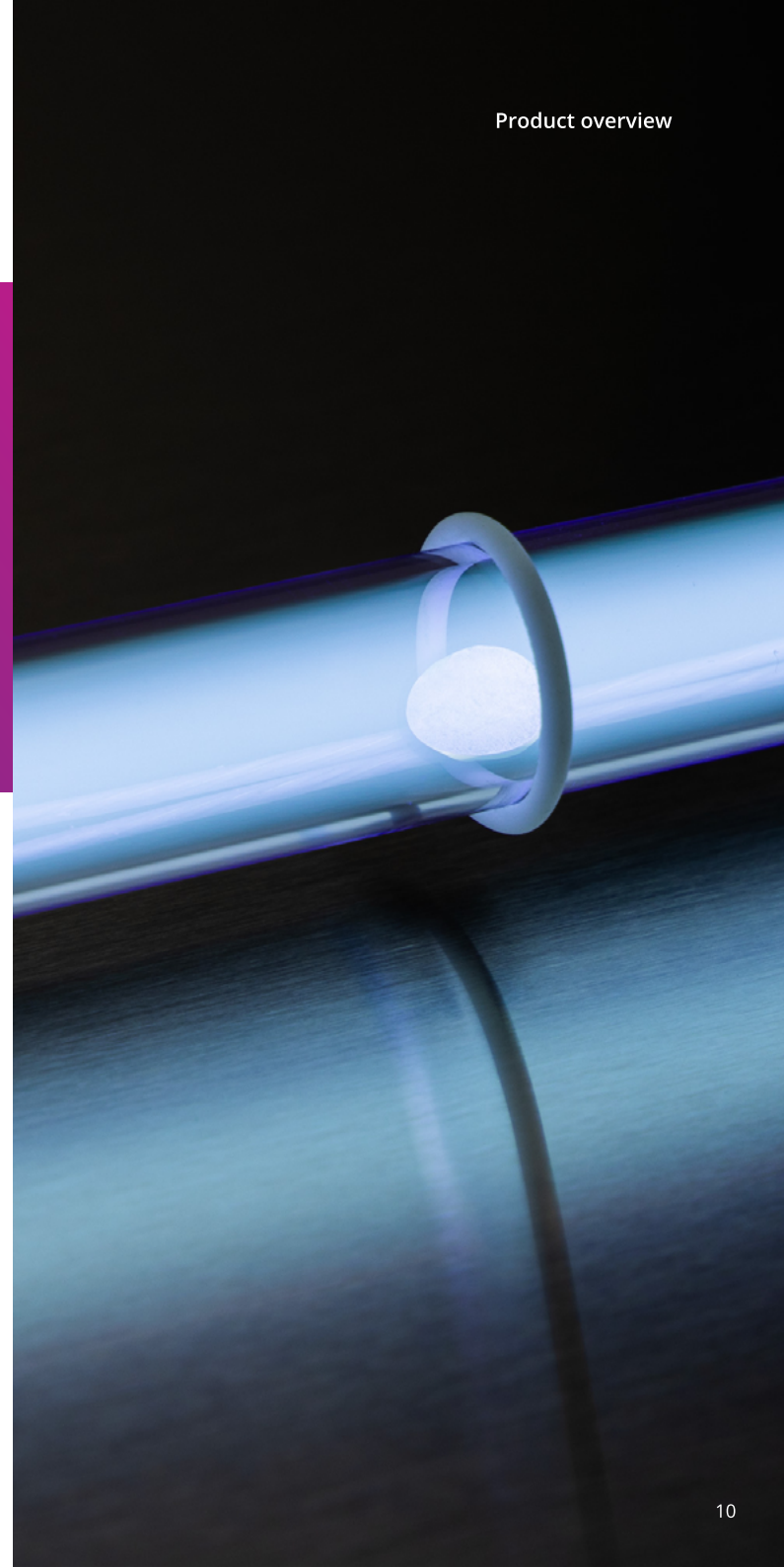
- Municipal Drinking and Wastewater
- Industrial Water
- HVAC Air Systems
- Surface Treatment
- Grease and Odor Control in Industrial Kitchens

Product code	BF-BF Length mm	Arc Length mm	Diameter mm	Lamp Watts W	Lamp Current A	Lamp Volts V	UVC Watts W	UV Output @ 1MuW/cm2	Lifetime Hours
AM 0105D12	843	767	15	105	1.2	88	35	320	16,000
AM 0190D12	1554	1483	15	190	1.2	164	68	518	16,000
AM 0127D18	843	767	19	127	1.8	71	43	398	16,000
AM 0240D18	1554	1483	19	240	1.8	134	87	663	16,000
AM 0172D21	843	767	19	172	2.1	82	48	450	16,000
AM 0320D21	1554	1483	19	320	2.1	145	105	800	16,000
AM 0333D50	1000	929	32	333	5	66	106	945	16,000
AM 0620D60	1554	1483	32	620	6	105	200	1525	16,000
AM 0800D70	1554	1483	32	800	7	115	260	1983	16,000

* All models can be made with a high purity- non doped quartz for the transmission of 185nm/ozone production

** A wide variety of lengths and wattages can be made to best suit the design of our customers system

*** Both standard base/pin configurations or custom design are available





Medium Pressure

MPUV lamps emit polychromatic light across a wide spectrum of wavelengths. This widens the range of applications for these lamps and can be used to target a given organism which is sensitive to specific UV wavelengths. Different types of quartz can also be used in the lamp bodies to adjust the emission spectrum.

MPUV lamps are highly compact when compared to other lamp technologies. They are available with outputs ranging from 80 to 200 W/cm and arc lengths from 50 mm up to 2 m. Lamp powers range from 0.5 kW to 24 kW.

Ultravio's medium-pressure UV (MPUV) lamps provide a strong source of ultraviolet radiation that can be used in numerous applications including Municipal and Industrial Water Disinfection, TOC Reduction, Sugar Syrup Disinfection, Air Treatment, UV Oxidation, Dechlorination and Deozonation.

Benefits of UltraVio MPUV Lamps

- Highest-quality quartz construction
- High UV output
- Compact size
- Fewer lamps are needed compared to alternative technologies
- Can be designed to produce an emission spectrum that is suitable for your application
- Special requirements can be catered for such as vibration-proofing
- Can operate over a wide range of temperatures compared to low-pressure technologies

Arc Length mm	Quartz type	Diameter OD mm	Lamp Watts Kw	Lamp Volts V	UVC Watts W	Ceramics	Electrical connection	Lifetime hours
47 - 1000	ST (standard) OF (Ozone Free) PS (Pure Synthetic)	14 - 29	0.4 - 10	120 - 1500	31 - 1350	Standard Custom Design	Single end Double end Custom Design	8000

Comment: Lifetime dependant on on/ off cycles and running conditions

Standard and High Output

Ultravio offers high-quality standard low-pressure UV lamps manufactured from quartz tubing, giving a longer life than cheaper, soft glass alternatives.

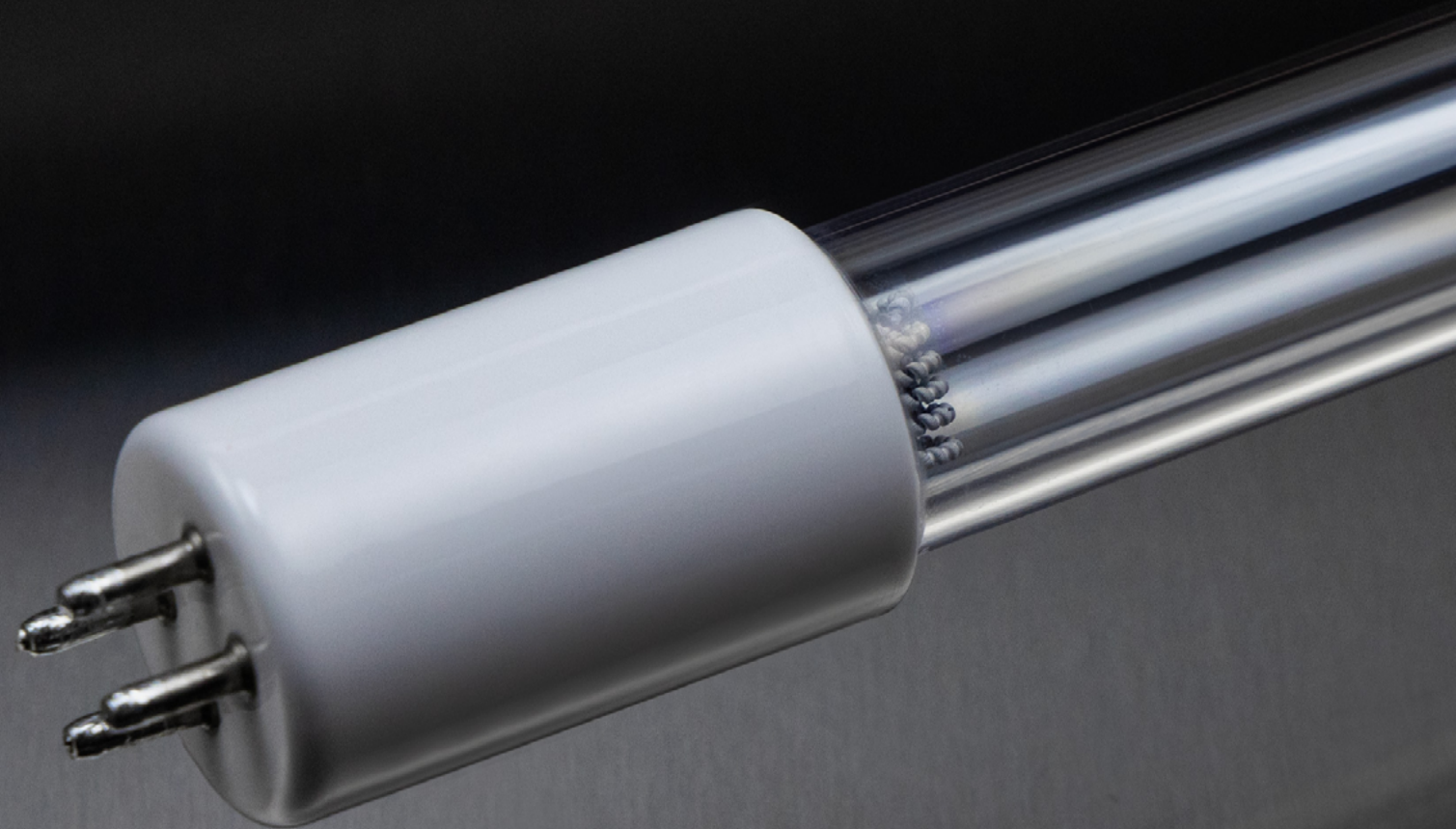
Low-pressure lamps can be used in a variety of applications including wastewater and municipal drinking water treatment, disinfection of air and HVAC systems in food processing and public health service environments, and curing of inks in the printing industry. These lamps are available in two main varieties: ozone-free, optimised at 254 nm and ozone-generating, optimised at 185 nm.

Standard low-pressure lamps offer good energy efficiency; lamps can be specially designed in order to run optimally under specific water temperatures.

Key characteristics of Standard Low-Pressure Lamps

Compared to MPUV lamps, standard low-pressure lamps have:

- Lower energy consumption
- Lower surface temperature
- Higher UV efficiency
- Cost effective



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