

Operating Instructions

UV Medium Pressure Lamps

Standard Medium Pressure Lamps

Doped Medium Pressure Lamps

Medium Pressure Submersion Lamps



Imprint

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Warning notes and symbols in the operating instructions

These operating instructions describe the UVC medium pressure lamps, their installation, operation and capabilities. The safety and warning notices explain the safe, proper handling of the lamps.

You will find the symbols listed below next to all safety and warning instructions in these operating instructions where there is danger to life and limb. An additional signal word indicates the severity of a possible danger.

Observe these notes closely and be especially careful in these cases in order to prevent accidents.

DANGER! This signal word marks a danger with high risk or an immediately threatening danger. If it is not avoided, death or very severe injuries/damage to health will result. Damage to property is possible.

WARNING! This signal word marks a danger with medium risk or dangerous situation. If it is not avoided, death or very severe injuries/damage to health could result. Damage to property is possible.

CAUTION! This signal word marks a danger with low risk or marks a possible danger. If it is not avoided, slight injury/damage to health could be possible. Damage to property is possible.

The symbols used in these operating instructions have the following meaning:

These symbols warn of hazards:



These symbols recommend protection against hazards:



The two following symbols are used to address practices for optimal operation and/or prevention of damage to the equipment. This information is not related to hazardous situations. Additionally, the signal words **ATTENTION** and **NOTE!** are used.

ATTENTION!



This symbol with signal word is found at those places in the operating instructions which must be observed so that damage or destruction of the equipment is prevented.

NOTE!

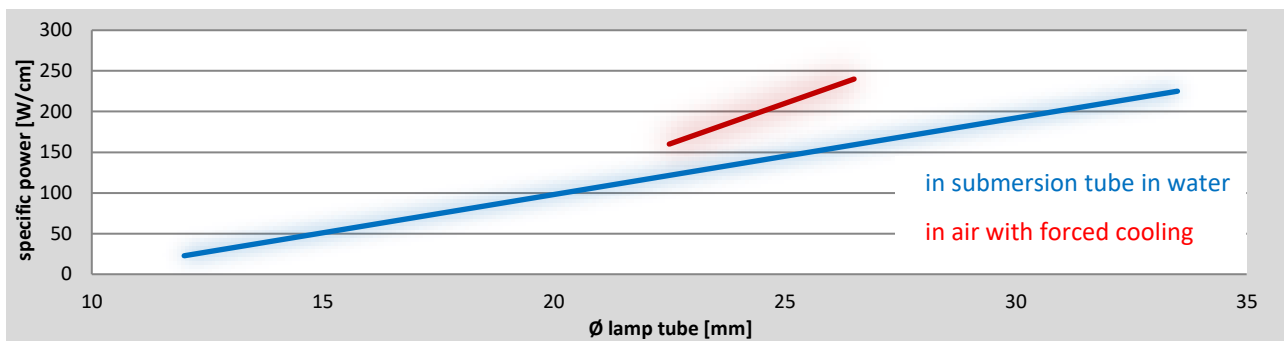


This symbol is found next to notes, tips on operation and useful information.

1. Function description of UV medium pressure lamps

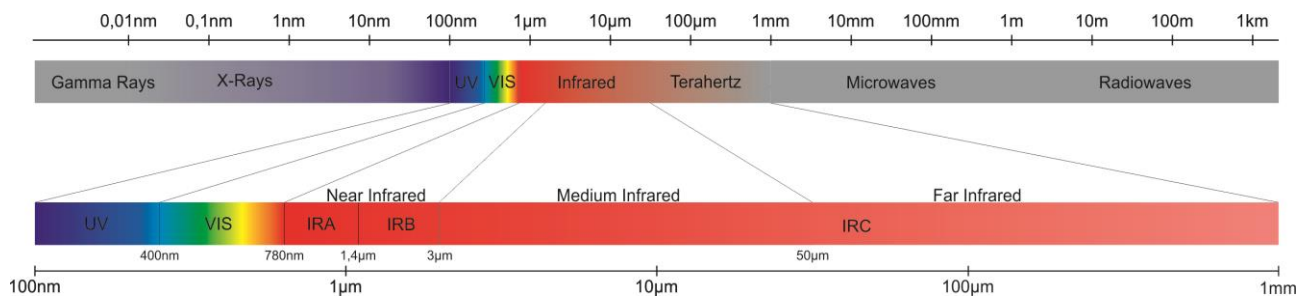
1.1 UV medium pressure lamps

UV medium-pressure lamps are produced as linear lamps as standard. They consist of a sealed discharge tube made of quartz glass. The discharge vessel is filled with noble gas with a low pressure in the range of several millibar. Moreover, UV medium pressure lamps contain a small amount of mercury and dopants, such as iron, gallium, or other elements. During operation, a plasma is generated in the lamps which emits radiation. As a rule, the plasma is excited by establishing a current flow between the electrodes, which are fused or crimped at both ends of the lamp. Electrode free medium pressure lamps can be stimulated to light by means of microwaves. By varying the length, the diameter (*Graphic 1*) and the filling, UV medium-pressure lamps can be influenced in their performance and adapted to different operating conditions. UV medium-pressure lamps must always be operated on a suitable ballast.



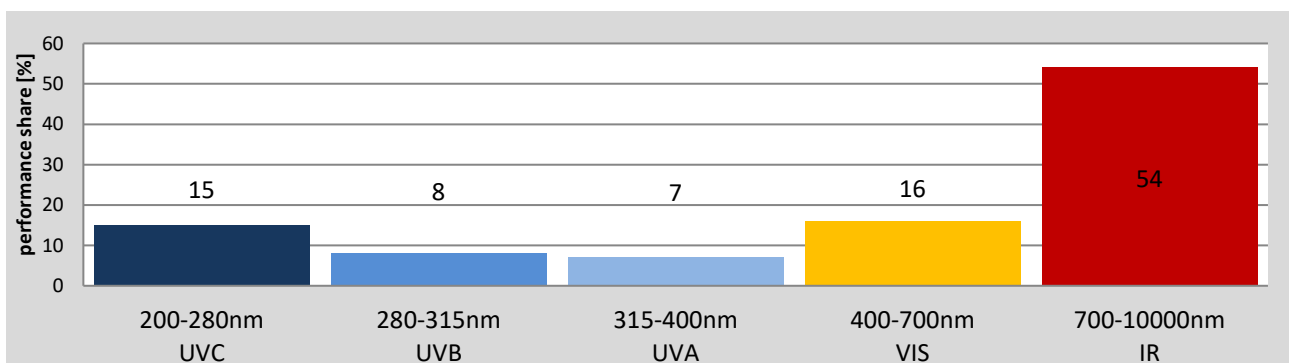
Graphic 1: Typical specific performance of UV medium pressure lamps in W/cm light emitting length as a function of Ø

UV medium pressure lamps emit radiation from the UV range to the infrared (*Graphic 2*).



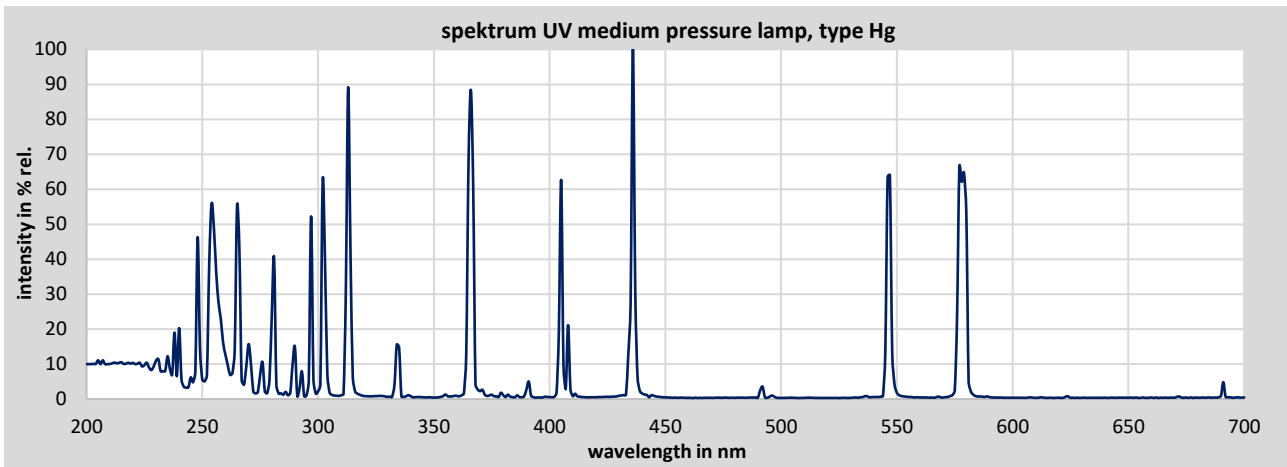
Graphic 2: Section from the electromagnetic spectrum with its typical classification

A considerable part of the radiation power of a medium pressure lamp is in the infrared range (*Graphic 3*). The lamps therefore require cooling.



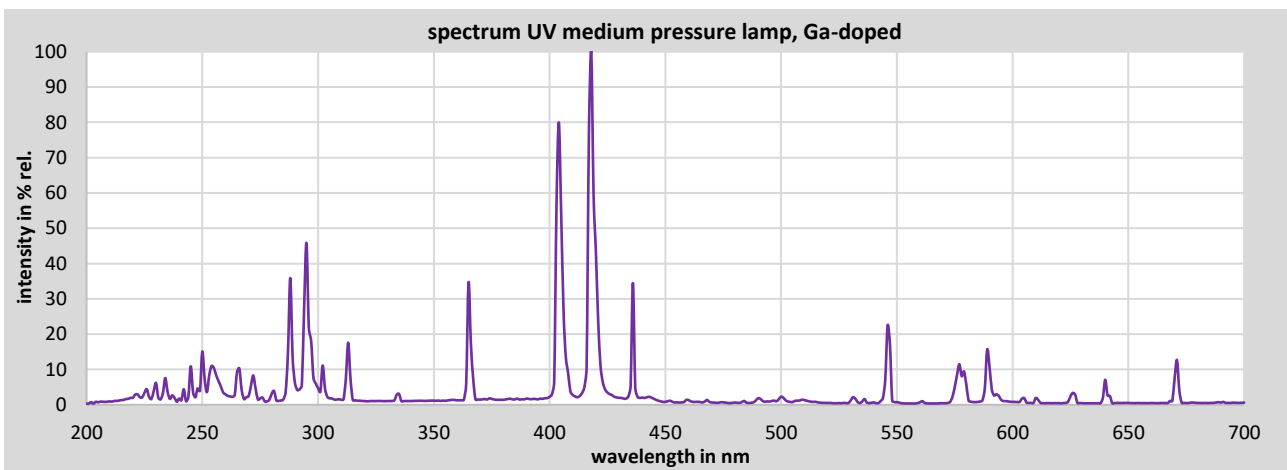
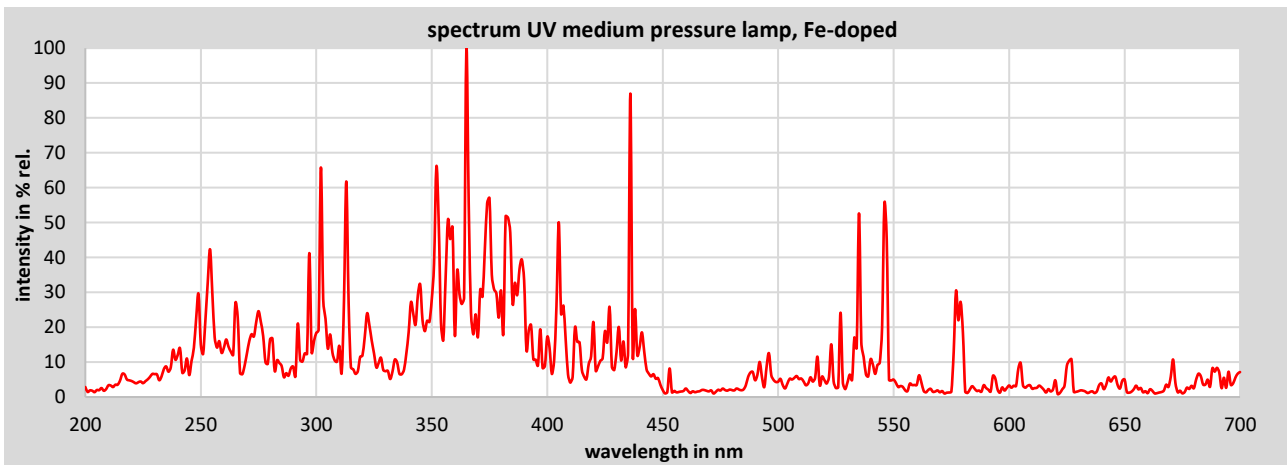
Graphic 3: Distribution of the power of a typical UV medium pressure lamp, Hg type across the spectrum

UV medium pressure lamps emit a so-called discontinuous spectrum or line spectrum (*Graphic 4*) during operation. In such a spectrum, there are separate (discrete) points of increased intensity, so-called spectral lines.



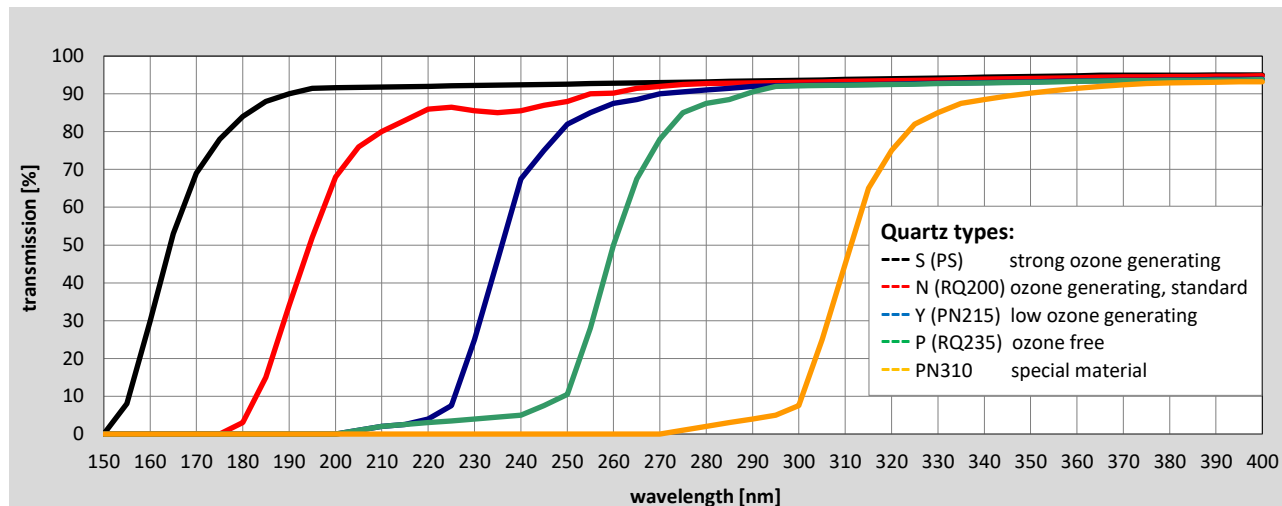
Graphic 4: Typical spectrum of a UV medium pressure lamp, type Hg for disinfection application

The above spectrum is well suited for disinfection. In addition to disinfection, another main application area is curing of printing ink or varnish. The spectrum of UV medium pressure lamps can be influenced by doping (*Graphic 5/6*). Thus, within the scope of the physical possibilities, wavelengths can be selectively generated, or reduced, to adapt the lamps to curing and other applications.



Graphic 5,6: Typical spectra of doped medium pressure lamps for curing and special applications

By selecting the material for the lamp tube (*Graphic 7*), the spectrum of UV medium-pressure lamps can be trimmed in the short-wave range. The graph shows the transmission curves for the possible types of quartz. Since medium-pressure lamps become hot during operation at 700-900 ° C, it is important to note that the slope of the depicted transmission curves is somewhat flattened during operation and shifted by approx. 10 nm towards longer wavelengths.



Graphic 7: Transmission curves of possible types of quartz

1.2 Medium pressure submersion lamps

These lamps are characterized by a one-sided electrical connection for use in an immersion tube. They are mainly needed in water treatment (disinfection) and in laboratory operations to trigger or support various chemical reactions.

The picture shows a typical submersion lamp. As a specialized manufacturer of such lamps, we can adapt the lamps regarding geometry to your application. As an accessory for plant manufacturers, suitable immersion tubes and immersion tube heads made of stainless steel are also available.



1.3 Start-up behaviour of UV medium pressure lamps

The start-up behaviour of UV medium pressure lamps depends on temperature, geometry (length/diameter) and their filling. The longer and thinner the lamps and the lower the ambient temperature, the higher are the required ignition voltages. The immediate re-ignition of still hot medium pressure lamps is not possible due to the high internal pressure. Please allow them to cool sufficiently before re-ignition.

1.4 Operation of UV medium pressure lamps

After the start, the flowing lamp current heats up the lamp. The contained mercury evaporates and dissipates in the discharge. A certain amount of time elapses until the operating temperature is reached (depending on lamp, specific power and cooling conditions). Only then the correct lamp voltage/power appears, and the lamp emits UV radiation uniformly.

In operation, the temperature of the lamp tube must be maintained at 700-900°C by means of cooling and regulation (dimming) of the lamp power. This is especially important for lamps with a halogen cycle. If lamps are operated at a lower temperature for a longer time period, we recommend periodically heating them up to the ideal operation temperature in order to increase their lifetime. Undercooling damages the lamp (blackening) and, in extreme cases, leads to the extinction of the lamp.

Avoid also the overheating of the lamps. This can lead to deformations and, in extreme cases, to bursting of the lamp. Highly loaded lamps should be preferable operated horizontally, since critical heat accumulation can occur in case of vertical operation in the upper area.

When installing ozone generating lamps in an immersion tube, a gentle rinse with dry nitrogen is recommended. As a result, the low power of the photochemical effective radiation is not wasted by the formation of ozone, and no oxidation occurs at the lamp terminals due to the dry and oxygen-free atmosphere.

ATTENTION!

There is no claim to compensation for damages caused by incorrect operation and/or inappropriate ballasts. The operating instructions must be understood and observed. Please contact us in case of doubts.

1.5 Switching of UV medium pressure lamps

Each switching operation slightly wears the electrodes of UV medium pressure lamps. Frequent switching is not recommended because of the required cooling phase/heat up time. The conventional supply with ballast and ignitor strains the lamps most strongly. We recommend the matching electronic ballasts from our product range for the operation of our lamps.

1.6 Monitoring of UV medium pressure lamps

Medium pressure lamps can be monitored by electronic ballasts and by measuring the UV radiation. The operational control of the electronic ballasts provides information on the correct operation as well as measured values of voltage/current/power. By means of the UV measurement, a statement can be made whether the UV lamp is operated optimally and if the UV output has decreased due to aging.

**NOTE!**

uv-technik Speziallampen GmbH offers both the electronic ballasts as well as UV sensors and monitors. Our sales department will gladly advise you.

2. Safety instructions

2.1 General information

A sound knowledge of all basic safety regulations is essential to ensure safe and fault-free operation of the UV medium pressure lamps.

This operating manual contains all important safety regulations to ensure safe operation of the UV lamps.

In particular the safety instructions must be observed by all persons working with the lamps.

In addition, all relevant rules and accident prevention regulations relating to the operation site must be observed. In regular intervals, the operator will check that all personnel are observing the safety regulations.

2.2 Appropriate use

The operator may only operate the UV lamps as stipulated by the operating instructions in this manual and must follow the relevant rules for accident avoidance. UV medium pressure lamps must be always supplied with an appropriate ballast.

ATTENTION!

uv-technik Speziallampen GmbH is not liable for damages resulting from inappropriate use of the UV lamps. Also, all claims for replacement expires in case of damages by using an appropriate ballast.

2.3 Staff obligation

Before commencing work, all persons entrusted with work to be performed on the UV lamps undertake the following:

- to observe the safety at work and accident prevention regulations
- to read the chapter on safety and the warnings printed in this manual and to observe them at all times while using the equipment

2.4 Hazards from handling the equipment

The UV lamps have been manufactured in accordance with the very latest state-of-the-art technology and the recognized rules of safety technology.

The equipment may only be used under the following conditions:

- it is used for the purpose for which it was constructed
- in a condition in which the equipment complies with all safety technology requirements



Danger! – HAZARDOUS ELECTRICAL VOLTAGE!

Attention: Risk of death

Switch off the main switch and the main contractor before working on the lamps or their ballasts, e.g. during lamp replacement, to avoid danger of electric shock.



WARNING! – UV RADIATION!

Attention: Health risk

UV rays, direct or indirect, are a danger of health. Switch off the lamps before working on them. If not possible eyes and skin must be protected with appropriate aids against inadmissible high radiation doses. Protective goggles must be equipped with UV-impermeable and dimmed lenses due to the risk of glare.



WARNING! – OZONE!

Attention: Health risk

UV lamps can form ozone in operation. Ozone is a poisonous gas which is heavier than air. Ozone is a danger of health. Inadmissible high ozone concentrations must be avoided. Ventilate if the situation arises.



WARNING! – DANGER OF CUTS!

Attention: Health risk

UV lamps can break. During installation, suitable cut-resistant, handy, lint-free chemical protection gloves must be worn with good tactility.



WARNING! – MERCURY!

Attention: Health risk

UV lamps contains mercury which will be released if a lamp breaks. Mercury is a danger to health for humans and animals alike. Remove contamination immediately and ventilate adequately.



WARNING! – HOT SURFACE!

Attention: Health risk

UV lamps become hot during operation. To avoid burns the lamps have to have enough time to cool down after switching off, e.g. in case of replacement.

2.5 Warranty and liability

The "General Conditions of Sale and Delivery" of uv-technik international as well as the warranty regulation terms for UV lamps apply. These have been available to the user at the latest since the conclusion of the contract and can be found on our website at www.uv-technik.co.uk.

Warranty and liability claim for personal injury and property damage are excluded if they are attributable to one or more of the following causes:

- inappropriate use of the UV lamps
- incorrect assembly, commissioning and operation
- operation of UV system with a faulty and/or non-functioning safety and protection device
- non observance of the instructions given in the user's manual with reference to the safety, transport, storage, assembly, commissioning, operation and servicing of the device

- unauthorized repair or alterations to the construction of the UV lamps
- unauthorized repairs
- catastrophes, the action of foreign bodies or acts of God
- damages or losses originated from the use or a defect of the UV lamps

2.6 Organizational measures

All safety devices on the equipment must be tested for correct functioning regularly, prior to carrying out work and at each shift change. Look for external signs of damage.

2.7 Informal safety measures

In addition to this user manual, the generally and locally applicable accident prevention and environmental protection regulations must be made available and observed.

Danger due to electricity



DANGER! – HAZARDOUS ELECTRICAL VOLTAGE!

There is a danger caused by direct or indirect contact with electricity!

The electrical components of the UV lamps must be inspected regularly.

Before commencing work:

- check all equipment components for external signs of damage
- check that all electric cables are in perfect condition

Loose connections must be tightened, and damaged wiring replaced immediately.

2.8 Service, maintenance, remedying faults

In case of disturbances during operation of the UV lamps, the chapter 'Faults' offers information on the causes of the fault and possible remedial action.

In the event of faults occurring which cannot be remedied by any of the procedures listed, please contact our customer service department.



WARNING!

Apart from the measures described in these operating instructions and without the approval of uv-technik Speziallampen GmbH, no repair, modifications or alterations to the UV lamps may be carried out.

In the event of claims under the warranty, for our repair and spare parts service, please contact:

uv-technik Speziallampen GmbH
Gewerbegebiet Ost 6
98693 Ilmenau

Tel.: 0049 - 36785 - 520 0
Fax: 0049 - 36785 - 520 21
E-Mail: info@uvtechnik.com
Website: www.uvtechnik.com

3. Transport, delivery, storage of UV medium pressure lamps

The UV medium pressure lamps will be delivered in an appropriate packing. Any damage detected must be documented right away and reported immediately to uv-technik Speziallampen GmbH.

**NOTE!**

Packing material must be disposed of in an environment friendly way or re-used if possible. We would recommend that the packing material be kept to protect the equipment if it needs to be shipped onward or otherwise transported.

Please note our insurance terms and the incoterms, notified in the offer.

The UV medium pressure lamps must be stored in a dry and noncorrosive environment. UV lamps can therefore be stored for a very long time without loss of their properties/performance. To take advantage of the limited warranty of 2 years at the end of the lifetime of the lamps, the storage time should be calculated accordingly.

4. Ordering of UV medium pressure lamps

We are able to manufacture all kinds of UV medium pressure lamps and can adapt their characteristics.

We constantly adapt the technological limits of our production to the market requirements.

The production of UV medium pressure lamps with the following parameters is currently possible:

Power in Watt [W]:	150 – 40,000	Arc length in millimeters [mm]:	45 – 2,600
Voltage in Volt [V]:	100 – 4,000	Tube diameter in millimeters [mm]:	13 – 40
Current in Ampere [A]:	2 – 30	Sockets and connections:	customer specific

UV medium pressure lamps can be ordered at following address:

uv-technik Speziallampen GmbH
Gewerbegebiet Ost 6
98693 Ilmenau

Tel.: 0049 - 36785 - 520 0
Fax: 0049 - 36785 - 520 21
E-Mail: info@uvtechnik.com

For the purpose of unambiguous assignment, the article number and the designation of the lamp must be indicated in the order. For the inquiry of new lamps, a request form is available on our website. If the required information is not known, our sales staff will be pleased to help you to find out the correct lamp and explains differences in detail on request.

**NOTE!**

Nearly all of our special lamps will be produced according to the order. Occasionally longer lead times may occur (e.g. if upstream suppliers are not able to deliver or in case of unforeseen events). Hence please calculate your order with a sufficient safety stock, especially for systems in which downtimes are unacceptable. uv-technik Speziallampen GmbH is not liable for damages or losses caused by such delivery delays. In such cases we recommend the conclusion of blanket orders, so that replacement lamps are held on stock. In this regard we refer also to our sales and delivery conditions.

5. Repair

The repair of UV medium pressure lamps is, with a few exceptions, not possible. In doubt please contact us.



ATTENTION!

We accept no warranty for damages to the UV lamps caused by non-observance of the operation instructions. No repairs or changes to the UV lamps other than those described in this manual may be carried out. In case of claims appropriate evidence must prove the observance of the required operation conditions.

For repair or claim the UV lamps normally must be shipped to us. Please contact us in advance to agree the cheapest delivery. Please keep the following disclosures ready:

- lamp type, article number, delivery note number, customer number
- operation hours, switching cycles (prove in an appropriate manner)
- used ballast
- operation conditions (air or water application, submersion tube diameter \varnothing , temperatures, etc.)
- dimensions and weight of the consignment



ATTENTION!

Please note that cash on delivery will not be accepted.

For the complaints process an operation number is assigned either in advance or after receipt. We confirm the receipt of the shipment. After inspection of the UV lamps in our lab you will be notified. We will contact you if consultation is necessary. Inquiries are possible at any time if you tell us the above-mentioned operation number. In case of justified complaints, we provide replacement. Details regarding our warranty conditions can be read at www.uvtechnik.com.

Damaged, faulty or spent UV medium pressure lamps at end of lifetime must be disposed according to the applicable national rules for hazardous waste.

6. Behaviour in case of faults

The following fault list informs about possible disturbances during the operation of UV lamps, their causes and remedying measures.

fault	fault description, possible cause	measures
ignition problem	lamp still too hot connection fault / loose contact ignition voltage drop above the cable too high production defects (e.g. leaky lamp)	cool down the lamp before re-ignition check wiring reduce lamp cable length, increase cross-section replace the lamp and complain faulty lamp
UV power too low	lamp temperature not optimal lamp/sensor/subm. tube/reflector contaminated sensor aged or faulty poor water transmittance lamp aged	check cooling conditions clean all system parts send in sensor/meas. window for examination check transmittance with gauge TMX01 replace lamp
failure	lamp, ballast, sensor, cable, connection faulty	determine failure cause, replace faulty part
changes at lamp tube	blackening in the filament region re-crystallization in the lamp quartz	lamp too cold, wrong current, too many ignitions lamp was too hot or touched with bare hands
glass breakage	transport damage improper handling	immediate information to us replace lamp
other faults		consult us

Additionally, we refer to the installation instructions of the ballasts.
The display of the ballasts can be very helpful for troubleshooting.

If a fault occurs during the operation of the UV medium pressure lamps, which cannot be identified and remedied by means of the information in section 6, contact the customer service of uv-technik international.

Tel.: +44 (0)1582 805410

E-Mail: info@uv-technik.co.uk

7. Further notes



ATTENTION!

Installation, electrical connection, maintenance and care of UV medium pressure lamps must be carried out by qualified specialists.

These operating instructions, the information in the data sheet of the UV medium pressure lamps and the applicable statutory regulations on health protection and electrical safety must be observed. UV lamps have to be supplied with a suitable ballast according to the information on the data sheet. uv-technik lamps may only be operated on suitable ballasts from our product range. If ballasts from other manufacturers are used for operation, a release of uv-technik Speziallampen GmbH is necessary, otherwise the warranty expires.

With regard to electrical safety, it should be noted that the lamp cables can carry very high voltages during ignition and in case of long lamps also during operation. Each lamp must be connected with a separate cable, high-voltage compatible if required. Clamping points should be avoided if possible. If they are unavoidable, they must also be designed to withstand high voltages.

In addition to electrical safety, attention must also be paid to the EMC problem in the design and installation of UV systems. The installation of ballast, lamp and cables must be carried out accordingly. The lamp cables should be kept as short as possible and separately from other system components and their cabling. In order to avoid disturbances, lamp leads must never be laid parallel to the supply lines of the electronic ballasts. The same applies to control, signal or sensor lines, which usually only have low voltages or currents. Where appropriate, measures should be taken to ensure compliance with the required standards.

7.1 Cabling of UV medium pressure lamps

Any damage of the cable has to be avoided. Cable passages in housings must be isolated sufficiently. The same is valid if cables are routed over edges. Cable glands and kink protections have to be used and the bending radius has to be noted. The cable specification must comply with the ambient conditions. Possibly special cables must be used (e.g. flame retardant, oil resistant, water protected). If the cables are exposed to UV radiation or ozone, they must be isolated with Teflon (PTFE) or glass fibre. All other materials are not sufficiently stable and must be protected appropriately.

7.2 Place of installation

UV medium pressure lamps must be installed and operated in a dry, chemically and biologically inactive environment. Installation in vibrating parts of the system is not allowed. Vibrations can damage the lamps (microcracks up to break and damages at the electrodes). Hints regarding the mounting position have to be observed. The arrangement of UV lamps has to be done so that a proper cooling is ensured. When used in water treatment systems the lamps have to be protected with submersion tubes. The same applies in a humid environment or operating conditions which can harm the lamps.



NOTE!

uv-technik Speziallampen GmbH offers submersion tubes as well as submersion tube systems which facilitate the installation of our UV medium pressure lamps. Our sales staff will be pleased to advise you in this regard.

7.3 Handling of UV medium pressure lamps, maintenance

For the optimal effectiveness of UV systems, a professional maintenance is essential. Depending on the operating conditions a periodical cleaning of UV lamps and other system components like submersion tubes, sensors, sensor ports or reflectors must be taken place.



ATTENTION!

Do not touch UV medium pressure lamps with bare hands. Skin oils and sweat are aggressive against the quartz glass of the lamps and cause re-crystallizations (clouding). Inadvertently touched lamps must be cleaned with an appropriate solvent. We recommend high purity alcohol (Ethanol) for cleaning. Methylated spirits are not suitable since denaturing additives leave residues. Wet cleaning or even an immersing of the lamps into water is not allowed. It is advisable to wear gloves. These gloves should protect also against cuts. Note during installation that the lamps are not tilted during insertion.



NOTE!

To avoid problems during commissioning/installation, we recommend an ignition test or possibly a short practice run prior to delivery.

7.4 Health protection at work with UV medium pressure lamps

Health protection mainly affects protection against the radiation of the lamp and the thereby generated ozone. Moreover, a cut protection has to be considered when working with glass parts.



NOTE!

When using UV lamps the official application recommendations and the health and safety regulations have to be observed. Rules can be found in publications of the World Health Organization WHO and the International Radiation Protection Association IRPA as well as their implementation into national rules.



ATTENTION!

Devices with UV lamps have to be constructed in a way so that no radiation can leak out, even by reflection. The allowed limits according to occupational safety must be not exceeded. Opening the UV units by mistake must be prevented. If applicable the opening should be only possible by qualified personnel with (special) tools. Alternatively, the UV lamps have to be switched off if an operator stays in the radiation area. Ensure there is an emergency off-switch or security lock and mark UV units with warning stickers. If work in the radiation area of UV lamps is unavoidable, eye and skin should be protected by appropriate means (glasses, long clothing, gloves, etc.).



ATTENTION!

Devices with ozone generating UV lamps have to be constructed in a way so that no UV radiation and no ozone can leak out. Measures have to be taken to comply with the legal requirements for occupational safety. Please consider in the planning of systems that ozone is heavier than air. In case of a failure of the ventilation the UV lamps must be switched off. Please ventilate sufficiently in case of accidental leaking of ozone. Ozone is detectable by smell at very low concentrations. On the other hand, it anesthetizes the odour receptors after a short time and so an accidentally too long exposure time to the gas could be possible. Ozone is toxic at higher concentrations and can harm the mucous membranes. Concentrations of 1 to 2 ppm during some hours can cause headache, chest pain as well as dryness and irritation of the upper respiratory tract.

In addition to the known technical contexts, all given instructions of this document are based on our experiences. We take no guarantee of completeness and correctness.