

Installation & User Manual

VGE UV INOX MP Compact

VGEM001-GB250

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1 Introduction

Thank you for choosing and purchasing a VGE B.V. UV system.

Our UV systems are designed to reliably and safely treat your water for a long time with UV-C radiation. A great deal of attention has also been paid to a service-friendly design so that it is easy for you as a user to install and maintain the UV system.

Before you start installing the UV system in your water treatment process, you must first have carefully read and understand the complete manual in order to use the system correctly and safely. Special attention must be given to safety instructions and comments. You then check whether the delivery has arrived complete and properly.

We wish you every success with the installation and use of your VGE Pro UV system!

1.1 Company introduction

VGE B.V.

Clean and safe water is of vital importance. Sustainable developments in the field of water disinfection is therefore an important theme worldwide. VGE B.V. is aware of this as a producer of UV-C equipment. As a company, we are therefore focused on new, sustainable developments in the field of water disinfection for the private, recreational and industrial sectors. VGE B.V. supplies its customers with a unique range of high-quality UV-C equipment and good service. We are proud that we are part of the Dutch top technological region, Brainport Eindhoven. Innovation is our top priority. We have our own product development department, which regularly introduces new products. The existing products are also continuously examined critically and, where necessary, further developed. Our product developers ensure that the products meet the wishes and needs of the current market and the applicable safety standards. Sustainability, energy saving and environmental friendliness are central to the development and production process. Thanks to our many years of experience (since 1982), we can offer you an extensive range of UV-C equipment that is used worldwide.



VGE B.V.

T: +31 88 222 1999

Nieuwe Eerdsebaan 26

W: www.vgebv.com www.bluelagoonuvc.com www.vgepro.com

5482VS Schijndel

E: info@vgebv.nl

Netherlands

Member of:



wateralliance



NWP | Netherlands
Water Partnership

1.2 Our passion

Combination of our passion for water and technology

Clean and safe water is of vital importance. Sustainable developments in the field of water disinfection is therefore an important theme worldwide. VGE B.V. is there as a producer of UV-C systems of awareness. As a company, we are therefore focused on new, sustainable developments, solutions and technologies in the field of water disinfection. We do this by combining our passion for technology and knowledge of water, which results in high-quality products and innovations.

VGE UV-systems: professional water disinfection systems

The VGE product range consists of a complete range of industrial UV-C disinfection systems.

The devices ensure reliable and efficient water radiation. VGE UV-C disinfection systems are the finishing touch in your water treatment installation; they ensure that the water is treated efficiently against bacteria, viruses, protozoa, algae and fungi. It is essential that the UV-C system seamlessly connects to the design and the other components of a water treatment system. When you choose VGE UV-C, you choose guaranteed quality at a fair price.

What makes the VGE UV-C systems unique?

- VGE UV-C systems have a 316L stainless steel housing or a high quality HDPE housing;
- The lamp can be placed / replaced while the unit is under pressure (except for 3S and 3L);
- Each system is equipped with the possibility to visually check the irradiation chamber whether the UV lamp (s) are (are) in operation;
- VGE systems can be equipped with a UV-C sensor and/or temperature sensor;
- VGE systems with low pressure UV lamps are equipped with the unique Smart Pin Technology (S.P.T.) for easy and safe replacement/placement of the lamp without disconnecting the electrical connection;
- For special applications the VGE low pressure lamp systems can be equipped with S.U.T. (Special Use Technology) mounting of the UV lamps in extreme conditions;
- VGE systems with medium-pressure UV lamps in the are equipped with the unique Single-end Bayonet Technology (S.B.T.) lamps, ensuring a safe and simple replacement/placement of the lamp without disconnecting the electrical connection;



Medium pressure UV lamp, Single-end Bayonet Technology (S.B.T.)

- Low pressure amalgam UV lamps have a high performance level in combination with a life expectancy of 16,000 hours;
- Our medium pressure UV lamps have a wide light spectrum and therefore many extensive applications, are water temperature independent and have a long life expectancy of 9,000 hours!
- Single systems can handle a flow from 0.5 m³/h to 550 m³/h;
- It is possible to adjust the devices to your own specifications

1.3 Manual is intended for

This manual is intended for everyone who has to work with and with the VGE UV system such as:

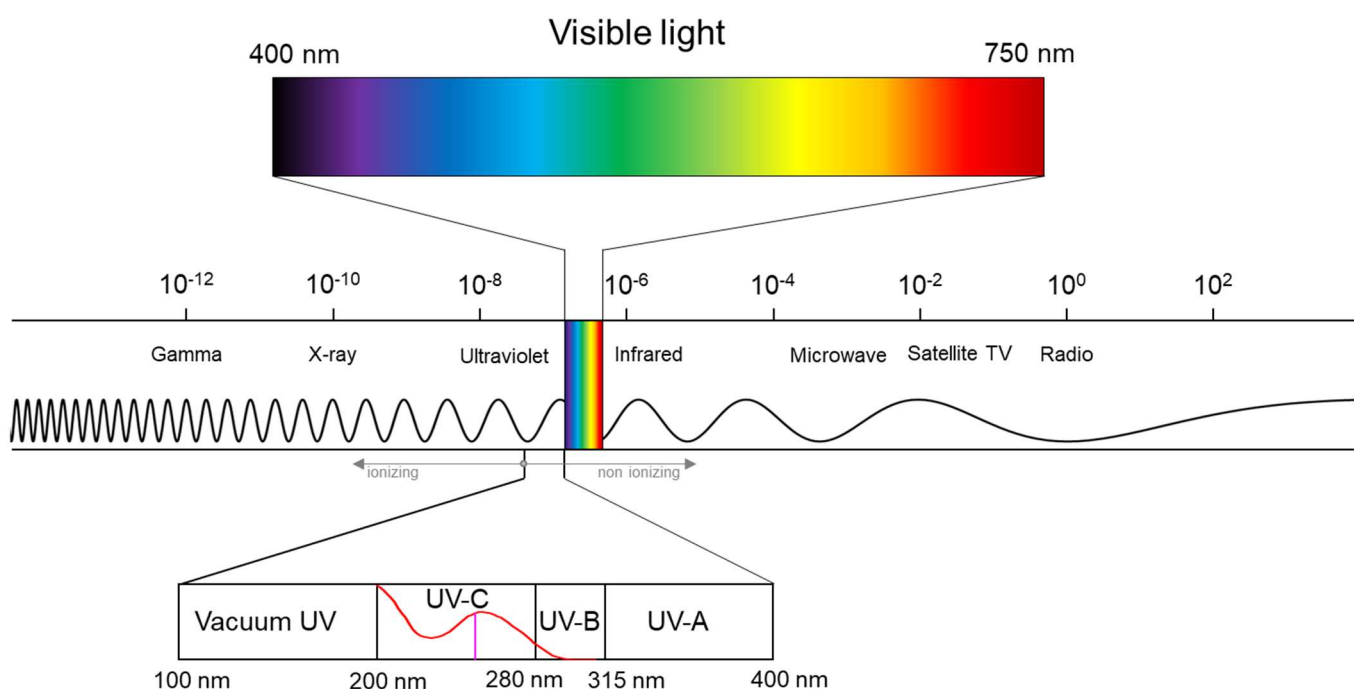
- Installation staff;
- Operating staff;
- Service staff.

All persons who wish to work on or with the VGE UV system must have carefully read and understood this manual before they can use the system in a correct and safe manner. Special attention must be given to safety instructions and comments.

1.4 Optical radiation

Light is essential for humans. However, in some cases employees may be exposed to too much "light" during their work, which may damage eyes and/or skin. For this type of situation, the EU Directive 2006/25/EC on artificial optical radiation (1) is intended. This describes what effects can occur and what the exposure limit values are. The term optical radiation includes the visible, ultraviolet and infrared spectrum. The term light is a looser term that generally refers to the visible part of the optical spectrum.

Optical radiation is part of the family of electromagnetic radiation (EM radiation). The electricity network emits EM-fields with a very large wavelength. If we shorten the wavelength, we end up with the long wave, medium wave, short wave, ultra short wave (FM radio) on TV, GSM, microwave and radar. The following is the optical area starting with the far infrared. After the infrared, the (fairly narrow) visible area follows, followed by the ultraviolet, which cannot be seen with the human eye. After the hard UV-C, the optical area and also the non-ionizing part of the EM-spectrum ends. This is followed by the ionizing region with X-ray, gamma and cosmic radiation.



Source: Optische straling in arbeidssituaties
Praktische aspecten bij implementatie in Nederland van de EU-richtlijn betreffende de blootstelling aan bronnen van kunstmatige optische straling
F.P. Wieringa, C.J.P.M. Teirlinck en J.W.A.M. Alferdinck
Review: prof. D. van Norren
30 juni 2006
TNO-Rapportnummer KZ/2005.190

- (1) EU. 2006. Directive 2006/25/EC of the European Parliament and of the Council of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (artificial optical radiation) (19th separate Directive in the meaning of Article 16 (1) of Directive 89/391/EEC). Official Journal of the European Union.

1.5 UV lamp types

UV lamps (ultraviolet) radiate optical radiation in, among others, the range between 200 nm and 400 nm on which the name "UV lamp" is also based. Low pressure (incl. Amalgam) UV lamps produce UV radiation with a wavelength of 253.7 nm where medium pressure UV lamps radiate at a wide spectrum of wavelengths (see graphs with spectral data). Depending on the type of UV lamp, energy is also emitted in the visible area of the electromagnetic spectrum:

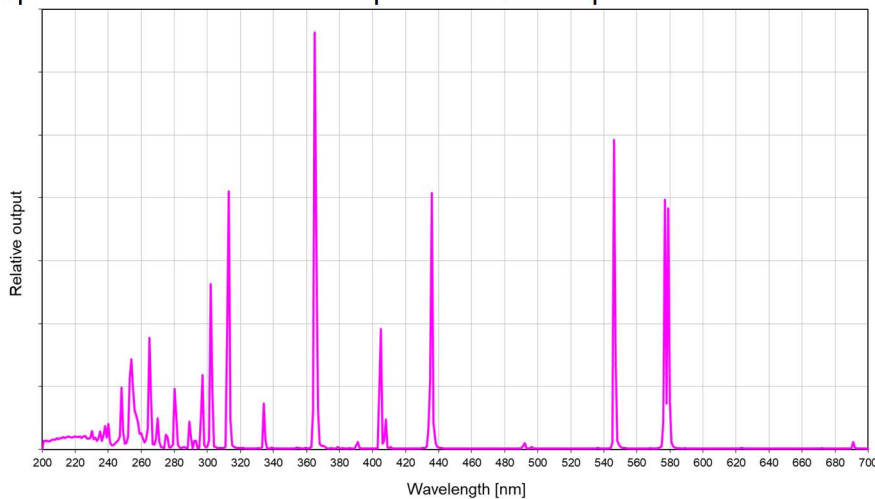
- Low pressure (LP) UV lamps: blue light (400 nm)
- Low pressure (LPHO) UV lamps: blue light (400 nm)
- Amalgam UV lamps: blue light (400 nm)
- Medium pressure (MP) UV lamps: white light (400 nm - 750 nm)

UV lamps contain a small amount of mercury that is responsible for the UV radiation produced.

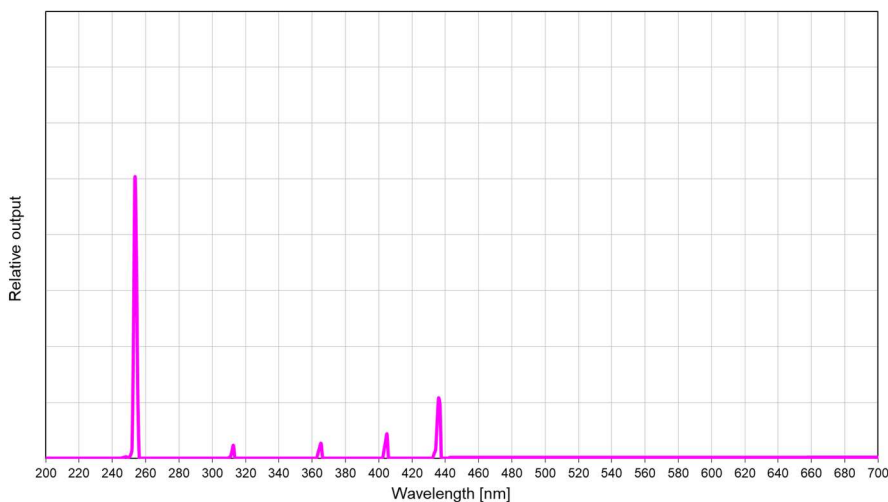
A properly working UV lamp needs a certain operating temperature in order to function reliably and efficiently, with the lamps used in the VGE Pro UV series these temperatures are as follows:

- Low pressure (LP) UV lamps: approximately 45 °C
- Low pressure (LPHO) UV lamps: approximately 45 °C
- Amalgam UV lamps: approximately 95 °C
- Medium pressure (MP) UV lamps: 600 °C - 900 °C.

Spectral data of the medium pressure UV lamps:



Spectral data of the low pressure UV lamps:



1.6 UV disinfection

For non-chemical disinfection of liquids, disinfection with UV-C radiation is a proven and reliable technology that has been used since the beginning of the 20th century. From around the middle of the 20th century, the application of UV disinfection on liquids has seen a sharp increase because it then became possible to produce good quality UV-C lamps on a large scale. The discovery of the by-products produced by chemical disinfection of water also led to a strong growth in the demand for UV-C radiation for the disinfection of (drinking) water.

UV radiation (see also the section on optical radiation) can be divided into four main categories: UV-A, UV-B, UV-C and vacuum UV. The UV-C spectrum (wavelength range of 200 to 280 nanometre) is the most effective range for controlling microorganisms. UV-C radiation is capable of causing permanent damage to microorganisms. Each type of microorganism requires a certain amount of UV-C energy (UV fluence, also known as the UV dose) for the disinfection process to be successful. The microorganisms must be directly and long enough exposed to UV-C radiation, so that the radiation can penetrate the cell wall of the microorganism to damage the DNA (deoxyribonucleic acid).

Depending on the intensity of the UV-C radiation, it only takes a short time (in some cases a fraction of a second) to penetrate the cell wall, irreparably damage the DNA and inactivate the microorganisms in the water. This causes the reproductive mechanism of the microorganisms to be damaged and in some cases even killed.

UV-C disinfection is a non-selective process, as is the case with certain chemical disinfection processes. UV-C disinfection can be used against bacteria, viruses, fungi, yeasts, algae and (chlorine-resistant) protozoa.

1.7 Water quality

The quality of the water to be treated determines the sizing and effectiveness of the UV system. If, after realization of a UV system, one or more parameters are worse than specified for the dimensioning, the intended result will not be achieved.

Any contamination on the quartz sleeves in the treatment chamber and on the measuring window of the optional UV sensor is caused by substances present in the water. Substances that can cause contamination of the optical components in the treatment chamber include: iron, manganese, calcite, etc..

The following maximum concentrations are often used for drinking water disinfection applications:

- Iron concentration $\leq 50 \mu\text{g/l}$
- Manganese concentration $\leq 20 \mu\text{g/l}$
- Calcite precipitation capacity $\leq 10 \text{ mg/l CaCO}_3$ (according to DIN38404-10)
- Turbidity $\leq 0.3 \text{ FNU}$

The effect of the transmittance of the water can be compensated by using more or less UV-C power and/or changing the design of the UV treatment system.

Turbidity, Total Suspended Solids (TSS) however can not be compensated by using more UV-C power or changing the design of the treatment chamber. The solids protect the microorganism and viruses by shading or cavities for the UV-C radiation.

1.7.1 Transmittance

The transmittance value of the water indicates the permeability of UV-C radiation with a wavelength of 254 nm, expressed in percent, that passed the water. The layer thickness of the water determines the value, conventional water layer thicknesses are e.g. 10 mm, 40 mm, 50 mm and 100 mm (10 cm), and the value indicates how many percent of the UV-C radiation is still available after passing through the concerning water layer. If transmittance values are used, it is important to know what the water layer thickness was during the determination of the transmittance.

The capacity tables of VGE are based on a transmittance value for a water layer thickness of 10 mm (note: a T10 transmission value in Austria often means $T_{10\text{cm}}$ or $T_{100\text{mm}}$).

The value of the transmittance has a major influence on the dimensioning and effectiveness of a UV system.

The permeability of the water to UV-C radiation can also be expressed as "absorption, Abs", "spectral absorption coefficient, SAC" or "spectral attenuation coefficient, SATC".

For the correct dimensioning of a UV system, the SATC value must be used because the SAC value is determined with filtered water. ($\text{SATC} = \text{SAC} + \text{scattering coefficient}$)

An information sheet is available showing the various transmission related parameters for easy conversion.

1.7.2 Turbidity

The turbidity, or cloudiness, of a liquid is the extent to which small particles in that liquid scatter the light passing through it.

The turbidity of the water influences the transmittance of the water, but the transmittance does not affect the turbidity. Turbidity of the water is usually measured with a radiation wavelength of 860 nm (infrared), whereby it is determined how this radiation is reflected by the floating substances in the water. The measurement of the amount of reflected radiation takes place at an angle of 90 ° with respect to the incident radiation. The turbidity is expressed in NTU, FTU, JTU or as suspended solids content, for example in mg/l, these values cannot be converted into a transmittance value for the water. Despite the fact that turbidity and suspended matter content both relate to the undissolved substances in the water, there is no direct fixed relationship between the two parameters.

The suspended matter content in water is determined by weighing the amount of undissolved substances of a certain amount of water after filtration and drying.

The suspended matter content in water is determined by weighing the amount of undissolved substances of a certain amount of water after filtration and drying.

For the disinfection of (waste) water a maximum concentration of 15 – 20 mg/l of total suspended solids is allowed to realise an acceptable reduction of microorganisms and viruses.

1.7.3 Corrosive water

The VGE INOX systems are made of stainless steel in the quality 316L, which is a material that is excellent for applications in, among other things, the drinking water industry or swimming pool installations due to the low corrosive properties of the water.






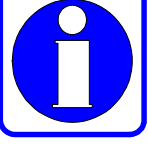


The VGE HDPE systems are made of HDPE which are perfect for applications where corrosive water, like salt water or brine, needs to be treated. The UV-systems with HDPE treatment chamber can not be used in hot water (> 45 °C) applications.




A treatment chamber made of stainless steel 316L can usually be used for a chloride content of up to 800 mg/l in the water to be treated. The water temperature in combination with the chloride content can pose an increased risk of corrosion.

It is not permitted to allow a liquid to flow through the reactor, or to add additives to the water to be treated, which may have a negative effect on corrosion or degradation of the materials used. This to prevent dangerous situations, damage to the reactor and surrounding installations and/or flora and fauna.

1.8 Icons

This manual contains several comments with warnings that are marked with icons. Below the explanation of the icons used.

Icon	Status	Description
	Warning	Immediate danger to body and limbs. If the situation is not handled correctly, there is a risk of death and/or personal injury. Damage to the UV system can occur if the instructions are not properly followed.
	Danger	Electrical danger. Ensure that all metal parts of the VGE Pro UV installation are properly grounded, in accordance with local guidelines and laws. Before carrying out repairs or service work on the UV system, switch off the power at the main switch or remove the plug from the socket.
	Danger	Ensure proper grounding of the relevant metal parts in accordance with local guidelines and laws.
	Danger	Exposure to UV radiation (also short-term) can cause damage to the skin and eyes. Avoid contact with direct and indirect UV radiation. Wear protective, all-covering UV radiation blocking clothing to protect the skin and wear a UV radiation blocking face mask to protect the face and eyes.
	Danger	Risk of burns. Parts of the UV system and the UV lamps remain warm for a certain time after the system has been switched off. Wait long enough to touch these parts to prevent burns.
	Attention	These comments provide information to help you work on or with the UV system.
	Attention	Danger to the environment. The UV lamps contain mercury. Defective lamps must be processed by a chemical waste radiation point.
	Command	Wear UV-blocking face protection to prevent damage to eyes and skin.

	Command	Wear UV-blocking eye protection to prevent eye damage.
	Command	Use the supplied gloves to protect quartz tubes and lamps against fingerprints and dirt that may burn in if the UV system is in operation.
	Command	Wear protective clothing that blocks UV radiation to protect all skin against UV radiation.

2 Safety instructions



Be sure to read and understand the instructions and directions in this section carefully before the UV system is installed and commissioned.

2.1 Intended use

The VGE UV systems have been developed for irradiating liquids with a low viscosity such as water. Irradiating a liquid with UV radiation serves as disinfection, photolysis or as an activator of an AOP (Advanced Oxidation Process). The VGE UV systems are intended for the treatment of liquids that are permeable to UV-C radiation.

The VGE UV systems may not be used for applications other than those mentioned above.

The operational safety of a VGE UV system is only guaranteed if it is used as intended for the specific application. The VGE UV system may only be used in accordance with the purpose specified in the order and within the technical specifications of the relevant system. The VGE UV systems may only be used in non-standard applications after consultation with and with the written approval of VGE B.V. .

Compliance with the intended use also includes reading this manual and complying with all instructions it contains. In addition, all inspection and maintenance work must be carried out at the prescribed intervals.

The user of a VGE UV system bears full and exclusive responsibility if this device is used for any use that does not strictly and exclusively meet this intended use.

2.2 Safety instructions

VGE B.V. values great importance to safety when working with or on a VGE UV system, safety measures are therefore integrated in the design.



The safety instructions in this manual must be followed at all times, but they do not affect the local and/or legally applicable safety measures and instructions.



The VGE UV systems have been developed according to the latest state of the art taking into account the applicable safety standards. However, if a UV system is used by non-trained personnel or if the manual has not been fully read and understood by operating personnel, there may be danger to the body and members for the personnel or third parties concerned, and the UV system may also be damaged. Installation and maintenance as well as work that is not described in this manual may only be carried out by trained and authorized technical personnel. The relevant supervisor of the entire system is responsible for ensuring that only trained and authorized personnel may work on and with the UV system within their responsibility.

Trained and authorized technical personnel means:

- Installation: Technical staff trained and authorized by VGE B.V. or a hydrotechnical engineer;
- Operation: service staff who have received training and instruction from VGE B.V. or an authorized service partner;
- Maintenance: Technical staff trained and authorized by VGE B.V.;

- Electrical work: authorized and qualified electrician.



UV-C radiation can damage the retina of your eyes and unprotected skin. Ensure that you are not directly or indirectly exposed to UV radiation. Everyone involved must be informed about the specific hazards associated with a VGE UV system.



Installation, maintenance and service work must be carried out by VGE B.V. trained and authorized persons.



The metal control box and the treatment chamber must be connected at all times with the protective ground in compliance with local rules and laws.



If, while the UV lamp is switched on, the flow of the treatment chamber is cut off for any reason or if the treatment chamber comes to dry completely or partially, the treatment chamber will heat up very quickly, which may result in burning symptoms when touched. As standard, VGE UV systems with medium pressure UV lamps are equipped with a temperature-sensitive monitoring switch (bimetallic switch) that moderately switches off the UV lamp (s) hardware in the event of overheating (approximately 60 °C).

The maximum treatment chamber temperature is 60 °C, damage can occur above this temperature.



Correct operation of a VGE UV system is only guaranteed if original spare parts and components are used as described in this manual. If the instruction is not followed, there is a risk of malfunction or damage to the UV system. The use of non-original spare parts and components will void the warranty on the entire UV system.



Applying modifications, modifications, changes and / or extensions to a VGE UV-C system is not permitted without written permission from VGE B.V., this may have consequences for the operation and safety of the UV-C system.



Ensure that materials that have been replaced or system parts are disposed of and processed in an environmentally friendly manner in accordance with local and legal regulations.

2.3 Environmental conditions

For the installation, commissioning and use of a VGE UV system, the following points must be observed and followed:






- protect against rain, direct sunlight and frost;
- do not use outside without protection against weather conditions;
- the environment must be free of corrosive and/or explosive gases or gas mixes, steam, condensation, dripping liquids, salt-containing air and dust;
- the ambient temperature must not be lower than +5 °C and higher than + 40 °C;
- the relative humidity must not exceed 90 % and must not be condensing;
- the UV system must not be exposed to shocks and vibrations;
- the UV system must not be exposed to magnetic and/or electrostatic fields and not to ionizing radiation;
- the fluid pressure in the treatment chamber must not exceed the maximum pressure specified in the technical specifications;
- the treatment chamber must not be exposed to pressure surges of liquid (also known as water hammer);
- ensure that the environment of the UV system is clean and sufficiently lit.

2.4 Safety instructions on the UV-system


Everyone who is involved in working on or with the UV system must be informed of the dangers that may occur.

The following safety instructions and / or symbols are provided on the treatment chamber and on/in the control box.


On the treatment chamber:

    	<div style="background-color: yellow; text-align: center; padding: 5px;"> Attentie! Vorsicht! Attention! </div> <div style="border: 1px solid black; padding: 5px;"> <p>NL Lees de handleiding voor installatie, gebruik en onderhoud voor meer informatie!</p> <ul style="list-style-type: none"> • Schakel de spanning af voordat u aan onderhoud begint en/of de unit opent! • Sluit de bestralingskamer af van de water toe- en afvoer en maak deze drukvrij voor begin van het onderhoud! • Het oppervlak en UV-lamp kunnen heet zijn! • Bij ingeschakelde UV-lamp(en) de bestralingskamer volledig met water doorstromen! • UV-licht is schadelijk voor ogen en huid! • In geval van toepassing in openbare zwembaden mag de UV-desinfectie alleen als aanvullende desinfectie gebruikt worden, gebruik in combinatie met een goedgekeurd desinfectie chemicaliën voor de vereiste restconcentratie! </div> <div style="border: 1px solid black; padding: 5px;"> <p>DE Lesen Sie das Handbuch vor Installation, Bedienung und Wartung für weitere Informationen!</p> <ul style="list-style-type: none"> • Schalten Sie die Stromversorgung aus, bevor Sie mit der Wartung beginnen und/oder das Gerät öffnen! • Schließen Sie die Bestrahlungskammer von der Wasser Zu- und Abfuhr und machen Sie sie druckfrei, bevor Sie mit der Wartung beginnen! • Die Oberfläche und UV-Lampe können heiß sein! • Bei Eingeschaltetem UV-Strahler der Bestrahlungskammer Komplet mit Wasser durchströmen! • UV-Licht ist schädlich für Augen und Haut! • Bei Verwendung in öffentlichen Schwimmbädern darf die UV-Desinfektion nur als zusätzliche Desinfektion verwendet werden. Verwenden Sie sie in Kombination mit einer zugelassenen Desinfektionschemikalie für die erforderliche Restkonzentration! </div> <div style="border: 1px solid black; padding: 5px;"> <p>GB Read the manual before installation, use and maintenance for more information!</p> <ul style="list-style-type: none"> • Switch off the power before you start maintenance and/or open the unit! • Close the irradiation chamber from the water supply and drain and make it pressure-free before starting maintenance! • The surface and UV lamp may be hot! • When the UV lamp (s) is switched on, water flow through the complete irradiation chamber must be ensured! • UV light is harmful to eyes and skin! • In case of use in public swimming pools, UV disinfection may only be used as additional disinfection, use in combination with an approved disinfection chemical for the required residual concentration! </div>
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On the control panel:

	Attentie! Vorsicht! Attention!
	NL Voor het openen van de besturingskast de hoofdschakelaar uitschakelen!
	DE Vor dem Öffnen des Steuerschranks den Hauptschalter ausschalten!
	GB Before opening the control panel switch off the main switch!

In the control panel:

	Attentie! Vorsicht! Attention!
	NL Bij uitgeschakelde hoofdschakelaar kunnen er externe vreemde spanningen aangesloten zijn!
	DE Auch beim ausgeschalteten Hauptschalter können extern angeschlossene Fremdspannungen vorhanden sein!
	GB Other external voltages may be present when the main switch is switched off!



Make sure that the safety instructions are always and remain legible and easy to read!

2.5 Handling of UV lamps and quartz sleeves

The VGE UV systems are equipped with UV lamps and quartz tubes, the quartz parts must be clean when they are put into operation.

If a UV lamp comes in contact with the skin, traces of grease remain on the lamp. When the UV lamp is switched on, the traces of grease that remain behind block the light that wants to shine out of the lamp. Because light is converted to heat, it will become very hot at the location of the grease (or other contamination) and the lamp will burn out at this location.

To prevent the UV lamps and clean quartz tubes from being grabbed with bare hands, a set of white fabrics and lint-free gloves are included with every delivery of a new UV system.

The supplied gloves are intended to prevent UV lamps and quartz tubes from remaining clean. These gloves offer no protection against cuts due to breakage of a UV lamp or quartz tube.



Never touch the glass of the lamp to prevent contamination of the quartz!

2.6 Quartz tube breakage

To protect the UV lamps from the water, they are positioned in quartz tubes in the irradiation chamber. To ensure that the UV-C light emitted by the lamps is radiated in the liquid to be treated with minimal losses, high-quality quartz tubes have been used. Quartz tubes should be handled with care and should not be exposed to large forces due to the risk of breakage.

During service work with quartz tubes, protective gloves and eye protection (preferably a face mask) must be worn to prevent possible injury.

The quartz tubes built into the irradiation chamber are robust and can handle high water pressures. However, there are a number of reasons why quartz tubes can break during the UV-C treatment process:

- The water pressure is higher than the specified maximum pressure for the irradiation chamber;
- Water hammer, pressure change in a very short time;
- Fixed parts/objects that are led through the irradiation chamber with the water;
- Overheating of the irradiation chamber;
- Mechanical vibrations of the pipe network in which the irradiation chamber is mounted;
- At high water flow rates through the irradiation chamber, possibly causing vibrations due to cavitation.

If a quartz tube is damaged or broken, the UV system must be switched off by the main switch on the front of the control panel, switch it off and lock it to prevent unintentional switching on of the installation. Stop the flow of the irradiation chamber by turning off the pump and/or closing valves in front of and behind the UV irradiation chamber and draining the water from the irradiation chamber.

Follow the instructions in this manual for removing the quartz tube(s) and opening the irradiation chamber and carefully remove any possible quartz tube remains. Carefully follow the instructions for rebuilding the irradiation chamber and starting the process.



Warning!

Broken quartz tube parts can be very sharp and should not end up in the process water. The user of the UV installation must therefore take measures to ensure, in the event of a quartz tube break, that quartz tube parts cannot cause damage if they end up in the process water.



If a quartz tube (or several) in a UV system cracks or breaks, the quartz tube and the relevant UV lamp connector will be filled with water. The speed with which this happens depends on the water pressure and water supply.

Because of the leakage risk we recommend for the area where the UV system is located:

- regularly check (for example daily) for water;
- the UV system to be installed between 2 automatically controlled valves that are automatically closed in the event of a fault message from the control UV system;
- provide the room with a monitoring system that can register water on the floor with a reporting system and/or pump connected to it.

2.7 Lamp breakage

The UV lamps which are used in the VGE UV systems that are fragile and therefore need to be treated with great care. The storage of UV lamps must also be done in the original packaging to protect the lamps.



UV lamps contain a small amount of mercury (milligrams). Depending on the type of lamp the Mercury is present as liquid or bound in amalgam. Mercury is a metal that is liquid at room temperature and is generally poorly absorbed when ingested. The mercury vapor, on the other hand, is well absorbed by inhalation and is very toxic. It is therefore important not to allow mercury to come into contact with skin or hair and to properly ventilate the area where mercury has been released and not to breathe the vapours.

When a UV lamp is broken, mercury can be released, this must be collected and processed as chemical waste. The droplets of mercury are difficult to collect, but with a special mercury collector (see chapter 'Mercury collector') this is possible. A mercury ball can also be covered with sulphur powder, which gives it a solid shape and can be easily cleaned up. In this state, evaporation no longer occurs.

Mercury can also be released with a special mercury sponge and disposed of as chemical waste.

During service work with UV lamps, protective gloves and eye protection (preferably a face mask) must be worn to prevent possible injury.

The UV lamps built into the treatment chamber are properly mounted, but there are a number of reasons why UV lamps can break during the UV-C treatment process:

- Fixed parts/objects that are passed through the treatment chamber with the water;
- Overheating of the treatment chamber;
- Mechanical vibrations of the pipe network in which the treatment chamber is mounted;
- At high water flow rates through the treatment chamber, possibly causing vibrations due to cavitation.

Follow the instructions in this manual for replacing a UV lamp, if the quartz sleeve is also damaged, follow the instructions for replacing a quartz sleeve as described in this manual.

2.8 Electrical isolation

The UV system works with a high voltage which can be life threatening when touched. If work is to be carried out on the UV system, the system must be electrically insulated (de-energized) prior to the start by removing the power cable plug from the socket.

2.9 Electrical grounding



The UV system, control panel and irradiation chamber must be earthed in accordance with local rules and laws.

In addition to good safety, good grounding of the irradiation chamber reduces the risk of possible electrolytic corrosion.

2.10 Operating conditions



The VGE Pro INOX MP series UV systems can operate at an ambient temperature between +5 °C and +40 °C and at a relative humidity of 10% to 90% (non-condensing).

Before switching on the UV lamps, the treatment chamber must be completely filled and flowed through with sufficient water. This is to prevent dangerous situations for the UV system, the environment and users.

The water that flows through the UV system may have a temperature between +1 °C and +45 °C. A temperature switch is mounted on the treatment chamber as protection, which switches off the UV lamp at a maximum treatment chamber temperature of +60 °C.

The maximum operating pressure of the treatment chamber is indicated on the type label on the treatment chamber, this value may not be exceeded. Water hammer can irreversibly damage the treatment chamber or parts thereof.

The control panel and the treatment chamber must not be mounted in direct sunlight and must be protected against rain and other moist precipitation. The environment must be free of chemical vapours, (liquids) substances and/or radiation that can damage the UV system.

The control panel and treatment chamber must also be mounted vibration-free.

3 Scope of delivery, transport and storage

3.1 Scope of delivery

Immediately after receipt, check the delivery for completeness and visible damage on the basis of the waybill. Contact the supplier immediately if the product is incomplete or damaged.

The delivery of a UV system includes:

- Treatment chamber;
- Control panel (depending on the model with mounted or separately supplied cables);
- One or more UV lamps (depending on the model);
- Instruction manual;
- A set of gloves.

The following accessories may be supplied depending on the order:

- Safety glasses;
- Lamp tester;
- Mercury collector;
- Torque screwdriver with suitable bit.

3.2 Transportation

The VGE UV systems are packaged in a sound manner so that they are suitable for transport. Always transport the UV systems in the VGE B.V. packaging materials as supplied.

Always transport the product in a safe and responsible manner, the packaging must always be handled with care and not exposed to rain and moisture. Sensitive parts have been incorporated in the UV installation.

Check the packaging for damage immediately upon receipt of the UV system. If damage is found, it must be reported immediately to the transport company. Failure to do so will void the right to compensation.

There is a risk of (im)material damage if the UV installation (or part of it) falls or is damaged.



If the UV irradiation chamber has been dropped and/or damaged, the following parts may be damaged or defective:

- Irradiation chamber;
- UV lamp(s);
- Quartz sleeve(s);
- Ceramic lamp connection(s);
- Present sensor(s);
- Cables.



In the case of a damaged UV lamp or quartz tube, follow the instructions stated in the sections 'Lamp breakage' and 'Quartz tube breakage'.

Always wear cut protective gloves when clearing quartz fragments/residue!



The electrical connections are not suitable for mechanical loading.
The product may never be lifted or transported at the electrical connections.

The UV systems are supplied with the UV lamps packed separately.

If a UV system has to be moved to another location after installation, the following must be taken into account:

- Remove the UV lamps from the irradiation chamber and pack them in their original packaging;
- Ensure that the cables connected to the UV system are completely disconnected;
- Pack the UV system in such a way that it cannot be damaged or contaminated during transport;
- If necessary, use properly maintained and approved lifting material to prevent damage to the irradiation chamber and/or control panel;
- Cables may not be used to lift or move the irradiation chamber and/or the control panel.

Upon receipt of the UV system, check whether the delivery is complete based on the waybill.

3.3 Storage

If possible, only unpack the product shortly before assembly.

Protect the product during storage against:

- Rain and moisture;
- Dust and dirt;
- Shocks and vibrations;
- Radiation (electromagnetic, electrostatic and ionizing);
- Temperatures outside the range of +1 °C to +60 °C.

If a UV system is (temporarily) taken out of operation, we recommend rinsing the treatment chamber with clean water to remove sand, salt and other corrosive substances to prevent corrosion. Ensure that the treatment chamber is dry and clean to prevent contamination, microbiological contamination and corrosion.

If a UV system is (temporarily) taken out of operation and dismantled, we recommend that the individual components are stored in their original packaging and that the above storage instructions are observed. Make sure the treatment chamber is dry and clean to prevent contamination, microbiological contamination and corrosion.

3.4 Warranty

The warranty period for our VGE UV systems is twelve (12) months from the moment of acceptance (acceptance is the first use of the relevant UV system or a validated acceptance/start-up protocol). The moment of acceptance must be within three (3) months after shipment of the relevant product. If the acceptance is not realized within three (3) months after shipment, the warranty period starts on the date three (3) months after the shipment date. Consumables (for example: UV lamps, quartz tubes, O-rings, etc.) of the VGE UV systems are excluded from this warranty. A prerequisite for this guarantee period is error-free installation and start-up, fully documented periodic inspection and maintenance on a minimum of half a year and the operating instructions must be followed.

4 The UV system

4.1 UV applications

Treating water (and other liquids) with UV-C radiation has now become a proven and widely used environmentally-friendly way to achieve reliable disinfection without chemicals, especially in applications where no deposit operation is necessary. UV disinfection has the following advantages:

- Fast disinfection, only short exposure time required (system dependent only a fraction of a second);
- No disinfection by-products;
- No odour and taste changes to the water;
- UV radiation is not corrosive.

With correct dimensioning, UV systems are also applied for reducing bound chlorine (chloramine) in swimming pool applications. This has the following positive effects:

- Decrease in the typical pool odour;
- Extra disinfection, also from chlorine-resistant organisms;
- Strong decrease in:
 - Red eyes;
 - Headache;
 - Skin and mucous membrane irritations;
 - Stress among swimming pool staff;
- Improved "wellness" effect:
 - Clearer water;
 - More pleasant indoor climate;
 - Enthusiastic swimmers and increase in visitor numbers.
- German DIN 19643 and Austrian M 5890 standards specify the use of medium-pressure UV lamps for breaking down bound chlorine in swimming pool applications.

Furthermore, there are also applications in which UV is used in combination with hydrogen peroxide (H_2O_2), ozone (O_3) or other oxidizing agents to produce OH radicals that have a very high oxidation potential with which non-filterable, difficult-to-degradable substances can be oxidized. The collective name for this type of application is Advanced Oxidation Process (AOP).

Regardless of the application, it can generally be said that a UV system is positioned in the water treatment after filtration. If products still need to be added to the water or if the water needs to be heated, it is advisable to do this after the UV radiation of the water.

4.2 UV system composition

A VGE MP UV system is always composed of a UV treatment chamber and a control panel, both are interconnected with supplied cables for controlling the UV lamp (s), temperature monitoring of the treatment chamber and optional for the UV sensor and Pt100 temperature sensor. The treatment chamber must also be grounded.



The heart of the UV system is the treatment chamber which is provided with one medium-pressure UV lamp which combine a compact design with a high lamp power. An inline design of the treatment chamber has been chosen with a UV lamp placed perpendicular to the direction of the flow in order to obtain good treatment of the water in combination with a very low hydraulic pressure loss.

The choice of the irradiation chamber, the UV lamp type and the number of lamps is tailored to the application in order to realize a reliable treatment of the water with the least possible loss of pressure.

The control panel controls the UV lamp by means of an electronic ballast with high efficiency. The control panel also ensures that it is not possible to switch the UV lamp on again immediately after switching off (10 minutes waiting time, indicator LED will light up orange) and when the end of the UV lamp life is approaching, an indicator LED will flash.



Attention!

After switching on the unit locally, via a remote signal or flow switch, it will always takes approx. 10 minutes (indicator LED will light up orange) before the UV lamp is switched on.

4.3 Treatment chamber

4.3.1 Treatment chamber

The heart of a VGE MP UV system is the treatment chamber in an inline construction which, in combination with the medium pressure UV lamp, gives a low pressure loss and is easy to install because the supply and discharge connections are in one line.

Due to the compact design, no sampling connections are available on the treatment chamber because they would be directly treated with UV light, which should not be the case with sampling connections.

The UV lamp is mounted in a lamp socket. No cap and/or cable needs to be removed to remove or install the UV lamp, the cable for controlling the UV lamp is connected to the lamp socket and remains connected to it.

The UV lamp comes with a lamp base with 2 contacts that make contact with the UV lamp socket. The UV lamp is equipped with a return wire so that only one-sided mounting of the UV lamp is required, this also saves installation and service space.

As a basic protection against overheating of the treatment chamber, a bimetallic switch is attached to the chamber by means of a wire end, which immediately switches off the UV lamp when the maximum treatment chamber temperature is exceeded.

4.3.2 Quartz sleeves

Because UV lamps cannot be placed directly in the water (they do not reach their operating temperature, so the UV production does not reach the desired level or they switch off again), they are placed in a protective UV-C-permeable quartz sleeve in the treatment chamber. In the VGE UV systems the quartz sleeves are mounted in such a way that the UV lamp can be replaced without dismantling the quartz sleeve while the water pressure remains on the treatment chamber. In order to have as few openings as possible in the treatment chamber (better for hygienic applications), a quartz sleeve is used that is closed on one side. As a result, only on one side of the treatment chamber free service space is required.

The quartz sleeves are made of high quality quartz in order to allow the entire UV spectrum radiated by the UV lamp to pass through with the lowest possible losses.

Depending on the water quality, quartz sleeves can become dirty. It is therefore important to ensure that, if necessary, the sleeves are regularly cleaned or replaced. See the 'Maintenance' chapter for this.

4.3.3 UV lamps

The VGE UV medium pressure UV lamps feature the unique S.B.T. (Single-end Bayonet Technology) concept. The lamps are one-sided (Single-end) installed. If the lamp is completely inserted in the quartz tube and the lamp socket, it can be fixed with a short rotation.



When working on the lamps, wait at least 15 minutes after switching off the UV system before dismantling the lamps. Before dismantling the lamps and/or quartz tubes after the lamps have been in operation, the temperature of the components must be checked to prevent burns.



UV lamps, both low pressure (incl. Amalgam) and medium pressure, emit UV radiation which can cause damage to skin and eyes.



See the chapter 'Lamp breakage' in the event of a lamp breakage.

4.4 Control

4.4.1 Control

The controller consists of a completely closed control box with the cables connected. The control box cannot and may not be opened. Cables may not be shortened or extended.

The control box is designed to be mounted on the wall and can easily be connected to the electricity grid with a plug.



Before the control system is connected to the electricity grid and the lamp is switched on, the treatment chamber must be completely and properly installed in the relevant pipeline network, flow through with sufficient water and be completely connected to the control cabinet.



The UV system must be connected to a properly earthed socket with the cable fitted to the control box and plug.

The cable length between the control and UV treatment chamber is approximately 2 m, the cable with plug for connection to the electricity grid has a length of approximately 1 m.



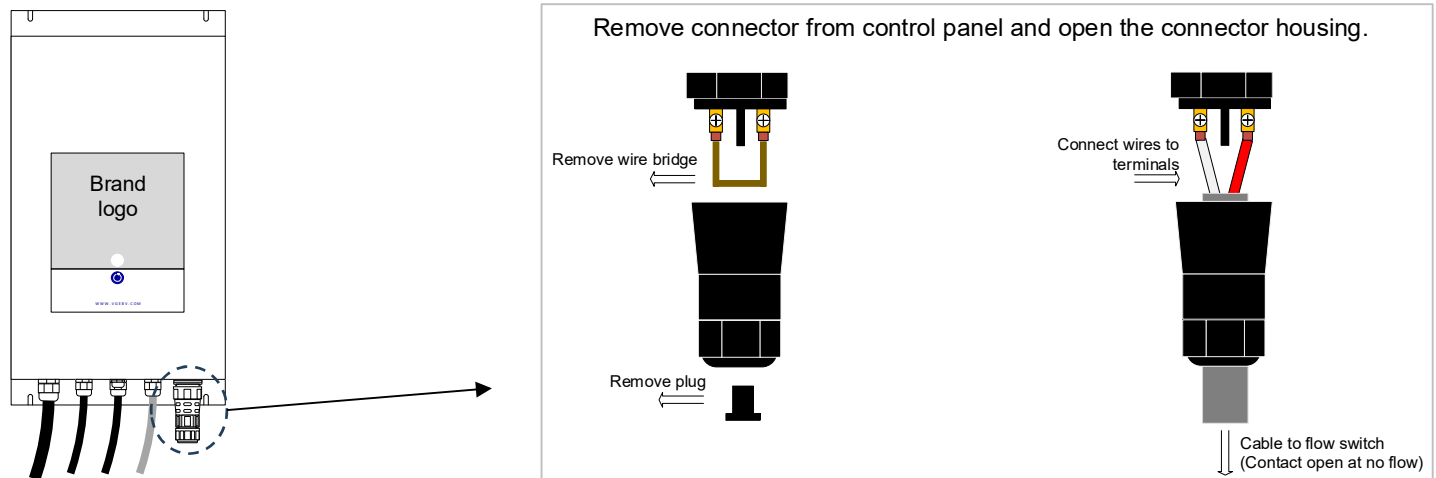
The UV lamp may only be switched on if it is 100% certain that the UV treatment chamber is completely filled with water and that it is continuously circulated with sufficient water. The treatment chamber bimetallic switch must also be mounted correctly on the treatment chamber.

4.4.2 Messages

The "Compact" control is very basic in its functionality, to check whether the UV lamp is in operation, the optical control in the lamp base must be viewed, if it lights up then the lamp is switched on. There is also an operating hour indicator on the control that lights up or blinks depending on the number of operating hours. See the chapter "LED hour meter" for a description of the functionality.

4.4.3 Operation

The control panel is supplied standard with a connector with an internal bridge between the two internal connections. The lamp cannot be switched on without this connector being plugged into the chassis part on the control panel. The bridge-connection present in the connector can be replaced by a flow switch or another potential-free contact (for external control).



The control contains a fuse to protect against electrical overload and a bimetallic switch for monitoring control at too high temperatures. There is also a bimetallic switch on the irradiation chamber for monitoring the irradiation chamber temperature. Both bimetallic switches are closed as standard so that the UV lamp can be switched on.



Attention!

After cooling of the irradiation chamber and/or control panel, the lamp will be switched on again automatically if the control signal is available for this. Check the operation and conditions of the UV installation regularly (daily).

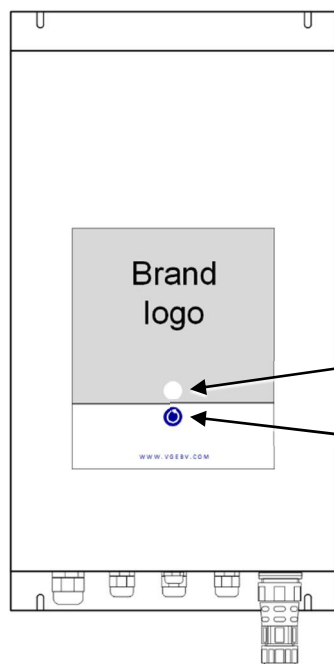
If a flow switch or an external potential-free contact is used for controlling the UV lamp, it will take approximately 10 minutes before the UV lamp is switched on after activation. This is to ensure that a switched-off UV lamp is not switched on again within its cooling time. As a result, the UV lamp would be overloaded and the life of the lamp would be adversely affected.

If no external signal is used for control, the plug with a connection must be placed in the connector. When the mains voltage is switched on, the waiting time of approximately 10 minutes will be started immediately to switch on the UV lamp after this.

When the external control signal and/or the mains voltage is removed, the UV lamp will be switched off immediately.

If an external control contact is used to switch the UV lamp on / off, then this contact must be able to switch at least 264 Vac, 1 A, AC1.

4.4.3.1 Timer operation



On the front of the control box is a sticker with a brand logo (colour may vary), a push button and a LED indicator.

If the UV unit is switched on, the program performs a self-diagnostic test. The LED flashes red quickly for about one second. After this the LED lights orange for 12 minutes, this includes the waiting time for cooling down the medium pressure lamp and the heat-up time of the lamp.

Then the LED lights green, flashes green or lights red. This depends on the number of hours that the system has already been in operation.

When the UV lamp is first switched on or after the "reset" function is used, the internal operating hour counter has a value of 9,000 hours. The number of operating hours is adjusted to the lamp in your device. Each UV lamp has a maximum number of operating hours, during which the lamp guarantees optimum disinfection. If the number of operating hours of the UV lamp has been reached, it must be replaced. When the system is switched off or after a power failure, the system will remember the remaining number of operating hours. After switching on, the system will continue to count from the moment it was stopped.

Operating hours counter status:

- Orange light: cool down and heat-up of the lamp;
- Green burn: the UV-C lamp burns within the normal lifespan;
- Flashing green: the UV-C lamp needs replacement within 500 hours;
- Red light: the UV-C lamp must be replaced as soon as possible.

4.4.3.2 Resetting the hours counter

After replacing the UV lamp, the operating hours counter must also be reset. A reset resets the operating hours counter to 9,000 hours.

Resetting the operating hours counter:

- Hold down the push button;
- The LED will flash quickly and then turn green. This takes a total of approximately 5 seconds;
- As soon as the hour counter lights up green, you can release the push button;
- The operation hours counter will start a new cycle.

4.4.4 Temperature switch control panel

A temperature switch is provided as standard in the control panel to monitor the temperature. The temperature switch are closed as standard so that the UV lamp can be switched on.



If the control panel temperature becomes too high ($> 50\text{ }^{\circ}\text{C}$) due to a too high ambient temperature, the temperature switch will be activated and the UV lamp will switch off. If the temperature switch is activated, the UV lamp will be switched off immediately.

The temperature switches has an automatic reset function, as soon as the temperature switch has cooled down sufficiently (approximately $35\text{ }^{\circ}\text{C}$ (control panel)), the contact will automatically close again.

4.5 Accessories

4.5.1 Lamp tester



The UV lamps used in the VGE UV systems have a long life expectancy. However, it is possible that a lamp will not start, to be able to check whether a lamp can still start you can use our UV lamp tester.

By simply holding the metal tip of the lamp tester against the quartz of the lamp or pressing one of the electrical connections and then pressing the test button, this light will illuminate blue when the lamp is still functioning.

The lamp must be completely removed from the irradiation chamber for testing.

Article number: SP0055

4.5.2 Mercury collector



The UV lamps used in the VGE MP UV systems contain a small amount of mercury. If a lamp breaks, this mercury can be released and since the mercury vapor is toxic, mercury released must be completely cleaned up as quickly as possible.

Because of its liquid properties, mercury is difficult to collect and pick up, we advise you to have a mercury collector ready and to use it to clean up spilled mercury.

Article number: SP0057



Ensure that when mercury is released, this is cleaned up as quickly as possible and that the room is well ventilated!

4.5.3 Face protection

With normal use of a VGE UV system, UV light cannot escape. If a UV system is equipped with a UV sensor that is placed in a so-called measuring window, UV light can be radiated into the room during a reference measurement. This UV light can be harmful to the environment that is being radiated. Because it is inevitable when carrying out a reference measurement that you come into contact with UV light, you should protect yourself well against this. See chapter "Safety instructions".



To ensure that the face is protected from UV radiation, we recommend that you use a polycarbonate face shield in addition to good, fully covering clothing. You can order this from us.

4.5.4 Gloves



The VGE UV systems are equipped with UV lamps and quartz tubes, the quartz parts must be clean when they are put into operation. If a UV lamp comes in contact with the skin, traces of grease remain on the lamp. When the UV lamp is switched on, the traces of grease that remain behind block the light that wants to shine out of the lamp. Because light is converted to heat, it will become very hot at the location of the fat (or other contamination) and the lamp will burn out at this location. To prevent the UV lamps from being grabbed with bare hands, a set of white fabrics and lint-free gloves are supplied as standard with every delivery of a new UV system. If these gloves are worn or dirty, new ones can be ordered with article number: B299800

4.5.5 Torque screwdriver

To be able to mount the ceramic lamp socket correctly, the screws must be tightened with a specified torque. If the correct torque is used, the ceramic lamp socket will not be damaged and the seal will get sufficient pressure to properly seal the irradiation chamber.



The torque screwdriver can be ordered from us with the article number: SP0058

5 Technical data

5.1 General

The VGE UV INOX MP series UV systems have a treatment chamber with an inline design to create a compact design that is easy to install in existing but also new water treatment installations.

Description	Specifications
Material	316L Stainless steel
Maximum pressure	10 bar (with a manual cleaning mechanism 3 bar)
Finish, internal	RA 0,8 µm (except weld seam, optionally possible)
Finish, external	Glass bead blasted
Protection	IP54
Environment temperature, storage	+1 °C tot +60 °C
Environment temperature, operation	+5 °C tot +40 °C
Max. relative humidity	90 %, not condensing

5.2 System specific

Description	Specifications for the VGE UV INOX MP		
Type	400-85 / MultiMax	600-85	
Number of lamps	1	1	
Lamp type	400	600	
Lamp connection*	S.B.T.		
Weight, dry	2 kg	11 kg	
Weight, wet	3 kg	14 kg	
Flange connection	2" male thread	DN80	
Installation length	156 mm	280 mm	

*S.B.T. Single-end Bayonet Technology

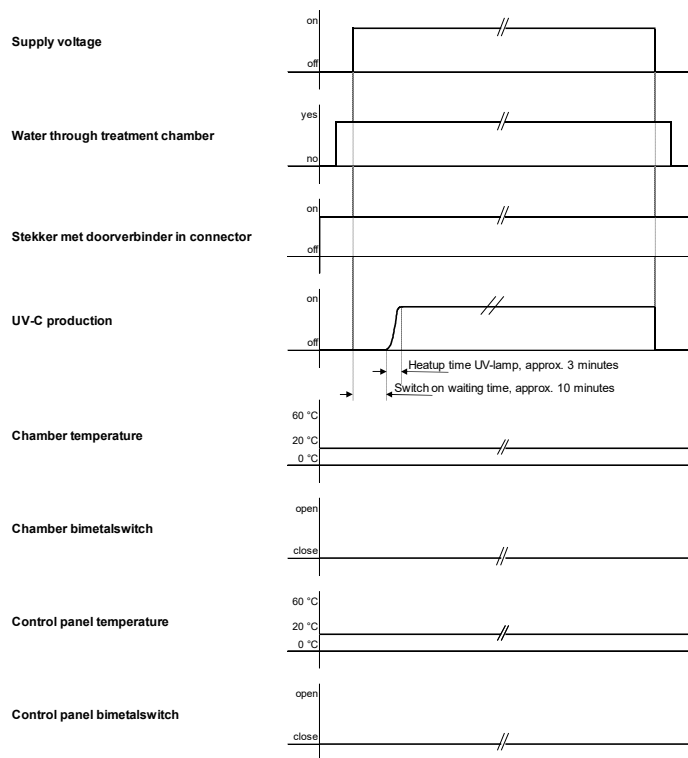
5.3 Control panel

The UV system is supplied as standard with a Compact controller for controlling the UV lamps, monitoring the process and the interface with the "outside world".

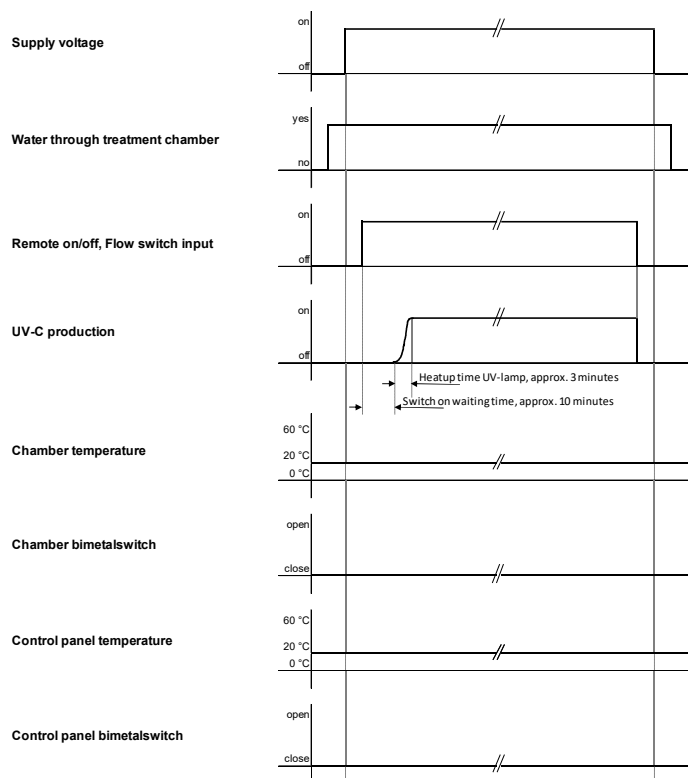
Description	Specification
Material	Aluminum wall mounting enclosure
Finish	Structure powder coating, RAL 7035
Protection	IP54
Ambient temperature, storage	-20 °C to +60 °C
Ambient temperature, operation	+5 °C to +40 °C
Max. relative humidity	90%, non-condensing
Environment	Protected against direct sunlight and rain
Installation height	Max. 2.000 m
Supply voltage	1/N/PE 180-264 Vac 50/60 Hz
Power consumption MultiMax	430 W
Power consumption 600-85	640 W
Power factor, cos φ	0,98
Dimensions (H x W x D)	460 x 250 x 150 mm
Weight	5 kg

5.4 Time sequence diagram

5.4.1 Direct switch-on with mains voltage (plug with connection)



5.4.2 Activation via flow switch / external contact



The diagram illustrates the timing sequence for the UV-C disinfection process. It consists of seven channels:

- Supply voltage:** A rectangular pulse indicating the power supply is active.
- Water through treatment chamber:** A signal indicating when water is flowing through the chamber.
- Remote on/off, Flow switch input:** A signal indicating the start and end of the disinfection cycle.
- UV-C production:** A signal showing two pulses of UV-C light production. The first pulse is preceded by a 'Heatup time UV-lamp, approx. 3 minutes' and a 'Switch on waiting time, approx. 10 minutes'. The second pulse occurs after the temperature has cooled down.
- Chamber temperature:** A graph showing the temperature rising from 20 °C to 60 °C and then cooling down. A 'reset temperature control' point is marked at 60 °C.
- Chamber bimetal switch:** A signal showing the switch closing when the temperature reaches 60 °C and opening when it cools down.
- Control panel temperature:** A graph showing the temperature of the control panel, which remains constant at 20 °C.
- Control panel bimetal switch:** A signal showing the switch remaining open throughout the process.

5.4.4 Control panel temperature



6 Installation

6.1 Application examples

UV disinfection is a method for inactivating microorganisms in the water and thereby disinfecting the water without using chemicals and without influencing the odour and taste of the water. It is also a non-selective disinfection technique where the dose must be adjusted depending on the type of microorganism. As far as known, there are no UV-resistant microorganisms. Cryptosporidium and Giardia protozoa are known to have very high chlorine and ozone resistance but only require a low UV dose for inactivation.

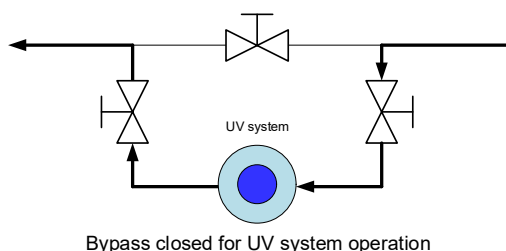
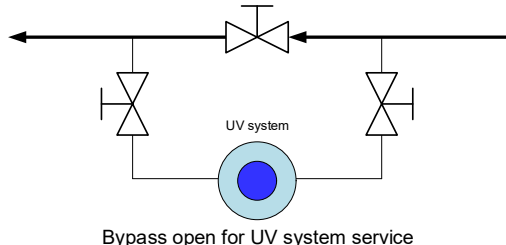
UV disinfection can be applied effectively, including applications in:

- Drinking water;
- Waste water;
- Swimming pools (private);
- Soft drink industry;
- Breweries;
- Aqua culture;
- Horticulture;
- Food industry:
 - o Washing water disinfection;
 - o Transport water disinfection;
 - o Packaging water disinfection;
 - o Process water disinfection;
 - o Product water disinfection;
- Offshore Industry, injection water;
- Electronics industry;
- Automotive industry;
- Irrigation water;
- Maritime applications;
- Paper industry;
- Petro and chemical industry;
- Snow production machines;
- Mobile applications such as in trains.

Furthermore, with correct dimensioning (higher UV doses than are necessary with disinfection), UV radiation can also be used for oxidative applications. Due to photolysis properties of UV radiation, UV systems can be used very effectively in the reduction of bound chlorine (chloramine) that has the so-called "swimming pool" odour and e.g. cause red eyes in swimmers.

UV radiation can also be used as a catalyst in so-called "Advanced Oxidation Processes" (AOP). The UV radiation is used to oxidize an oxidizing agent (e.g. H_2O_2 , O_3 , Cl , etc.) by means of photolysis. This process releases hydroxyl radicals ($\cdot OH$) that have the second highest oxidation potential (2.80 V) which micro-contaminants can be broken down in the water.

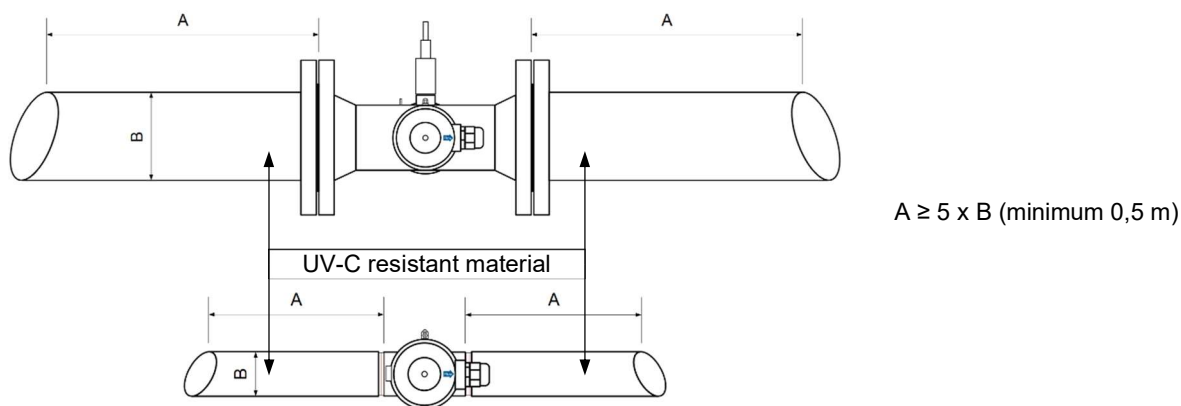
It is for all type of applications advised to install the UV treatment chamber in a by-pass to allow service on the system without draining the complete system or without interruption of the process when an alternative disinfectant is available.



6.2 Mechanical installation

The following aspects must be taken into consideration when installing the UV treatment chamber:

- The treatment chamber must be mechanically fixed. This can be done by e.g. attaching the connecting flanges to a mounting frame or building by means of a brackets. With fixed metal pipes in which the treatment chamber is mounted, no additional fixation of the treatment chamber is usually required;
- The treatment chamber must be mounted free of any mechanical stress;
- The treatment chamber can be installed in both a horizontal pipe and a vertical pipe;
- It is necessary that the treatment chamber is mounted in such a way that the **UV lamp** is always placed completely **horizontally**;
- If the treatment chamber is mounted in a vertical line, it is recommended to flow through the treatment chamber from bottom to top, in order to prevent air from remaining in the treatment chamber;
- For an installation in a horizontal pipe, care must be taken to ensure that no air can remain in the pipe and treatment chamber by installing a properly functioning deaerator system;
- The treatment chamber must be installed on the pressure side of a pump;
- In connection with the return wire of the UV lamp, there is a preferred flow direction, depending on how the lamp holder is mounted, it can be changed. The cable from the lamp holder indicates the flow direction, this means that the arrow on the lamp socket also points in the flow direction;
- The VGE INOX MP systems are designed for a working pressure of up to 10 bar;
- The treatment chamber may only be put into operation if it has been properly grounded by skilled personnel, for this the treatment chamber is provided with a threaded end with an earth symbol. The earthing cable (not supplied) must be connected to the wire end, which must also be connected to the earthing terminal in the control box for this purpose;
- The treatment chamber has been developed for installation in a dry and clean environment out of the direct sunlight. Humid air, dust particles and dirt in combination with aggressive vapours/air (such as chlorine vapor, hydrochloric acid vapor, salt air, etc.) can cause corrosion to the UV system, so ensure that your system remains clean;
- A treatment chamber is made of 316L stainless steel and must therefore be mounted in a piping system in which other metal components are used that are also made of stainless steel 316L to prevent electrolytic corrosion;
- Use suitable UV-C resistant seals for mounting the treatment chamber;
- All materials that are directly or indirectly exposed to UV light must be made of UV-C resistant material (think of plastic pipes, seals of valves, valves, flow meters, etc.). When using plastic pipes one can e.g. use black HDPE as a UV-resistant material. PVC is not UV resistant, the plasticizers present in the PVC (and in other plastics) are broken down by the UV light, making the material hard and brittle with an increased risk of breakage;
- The radiation depth of UV light in the pipes (radiation zone) before and after the treatment chamber depends on the UV transmittance of the water. As a guideline, 5 x the pipe diameter with a minimum length of 0.5 m is used as the radiation depth where the material used must be UV-resistant;



- Although the treatment chamber is made of stainless steel 316L, it can still corrode. It is therefore important to regularly clean the treatment chamber to prevent precipitated dirt from causing corrosion. Starting corrosion must be professionally removed and repaired;
- Never position sampling points on an treatment chamber, the sampling connections must be outside the range of UV radiation. For this, the above-mentioned radiation depth can be used as a distance;
- When mounting the treatment chamber, ensure that sufficient space is available around it for replacing quartz tubes and UV lamps and for safely performing maintenance and service work;
- For an ideal hydraulic installation, a straight pipe length of 7 x the pipe diameter before the treatment chamber and 5 x the pipe diameter after the treatment chamber is recommended;
- If you want to install 90° bends directly before and/or after the treatment chamber, it is advisable not to choose a bend radius smaller than 1.5 x the pipe diameter;
- During the installation of the treatment chamber, ensure that no objects remain in the pipes or treatment chamber that could damage the UV system when starting the flow;
- After mounting the pipe, fill the treatment chamber slowly to prevent damage due to water hammer;
- Before mounting the lamp and putting the UV system into operation, check the system for leaks and repair it before putting it into operation;
- After installation of the pipes and treatment chamber, it is recommended to clean the entire hydraulic system before commissioning.

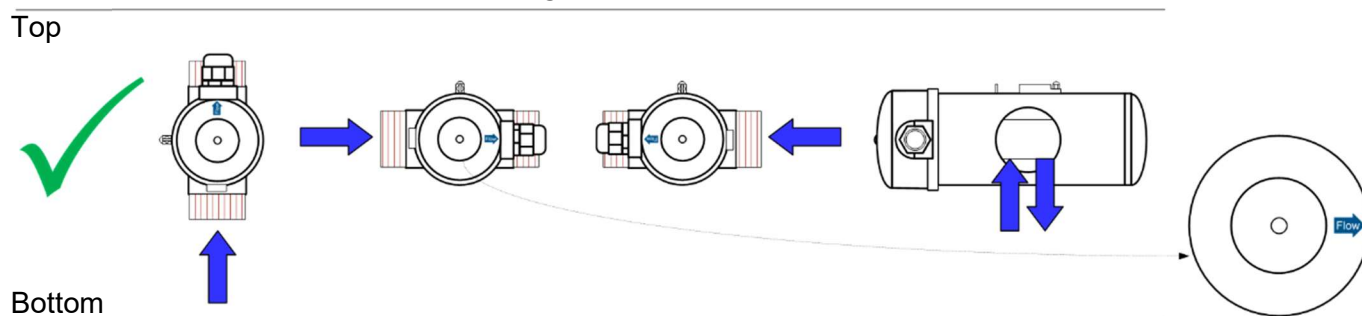
6.3 Installation drawings

The VGE MP systems can be mounted in both horizontal and vertical pipes. When mounting, however, care must be taken that the UV lamp(s) are always placed horizontally. Below are some examples of how the UV system can be installed. With vertical piping systems the recommended flow direction is upwards, as a result air is forced out of the treatment chamber. With downward flow, there is a risk that air will remain trapped in the treatment chamber.

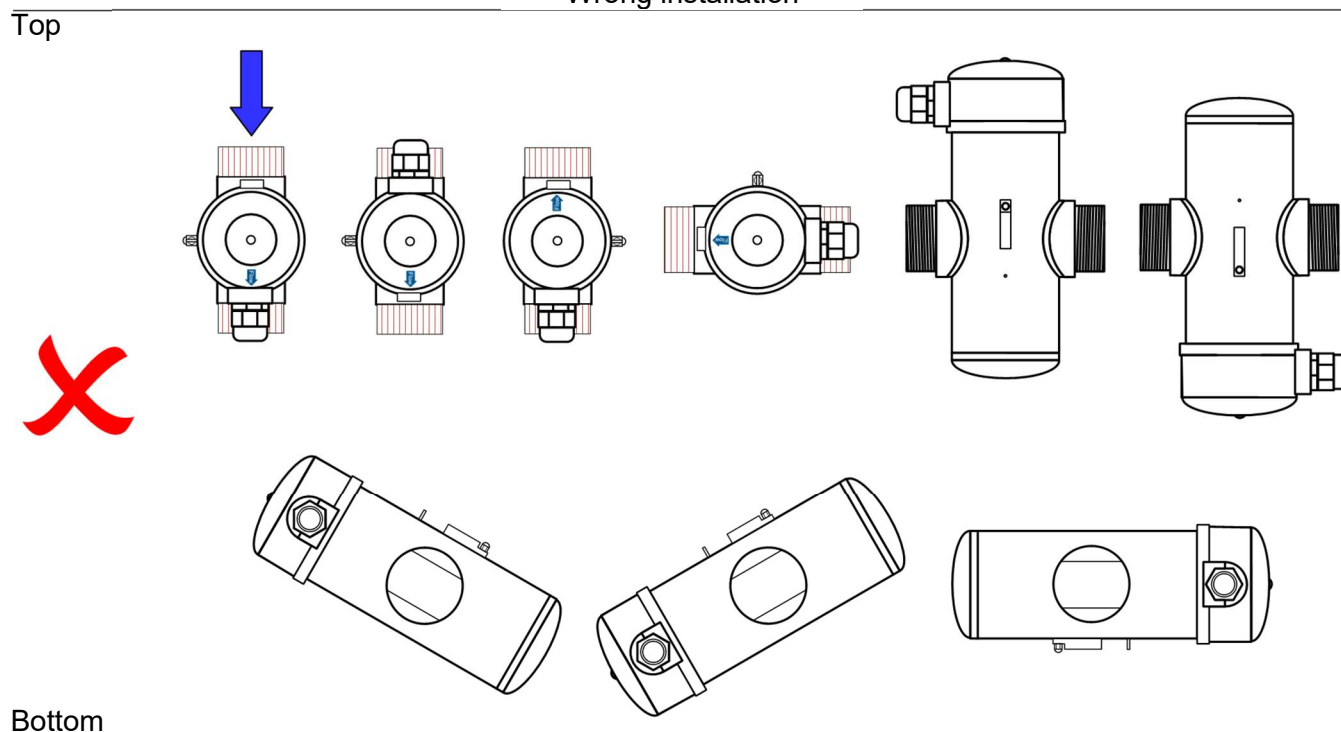
The UV systems can be flowed through in both directions, the lamp holder must be mounted depending on the flow direction. There is an arrow on the lamp base that must correspond to the flow direction and because the lamp can only be placed in the lamp holder in one way, it is important to position it correctly. With correct installation, the arrow on the lamp base points in the direction of the flow and in the direction of the cable gland of the lamp holder. The cable gland in the lamp holder must therefore be mounted with the flow direction, see the examples below.

6.3.1 Systems INOX MP 400-85 and MultiMax

Correct installation

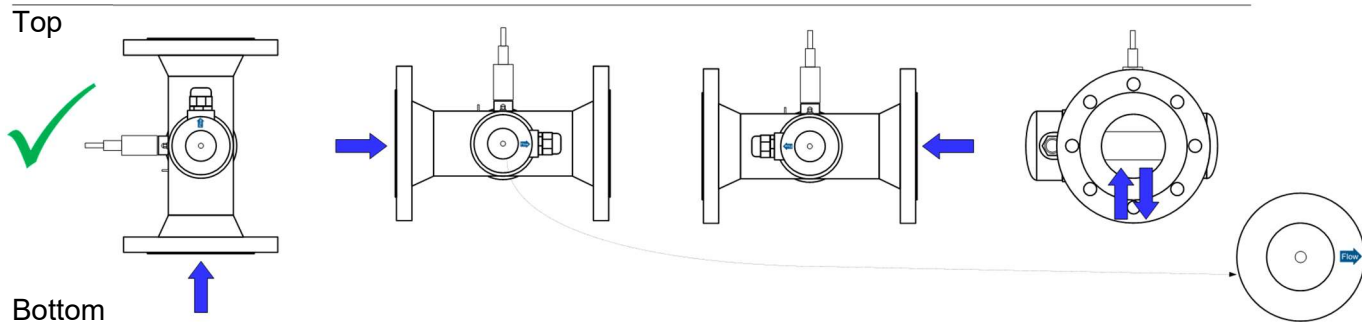


Wrong installation

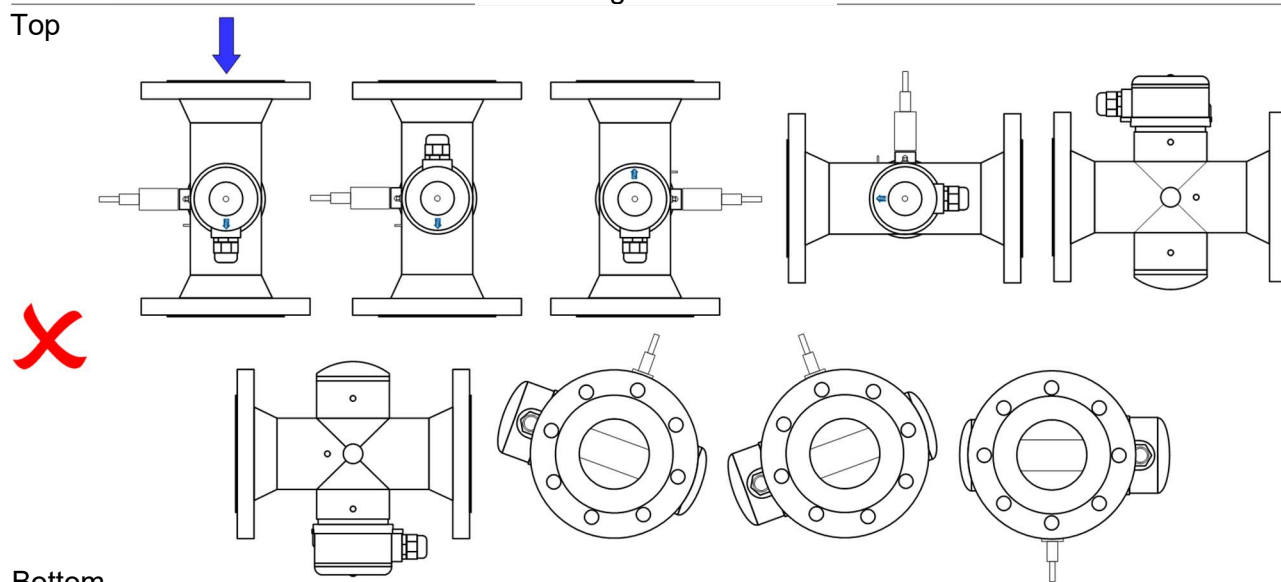


6.3.2 System INOX MP 600-85

Correct installation



Wrong installation



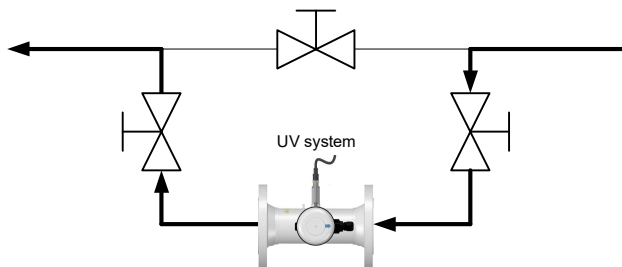
6.4 Bypass installation

In order not to have to stop the operating process during service work on the treatment chamber, which must be opened, it is advisable to place the UV system in a bypass.

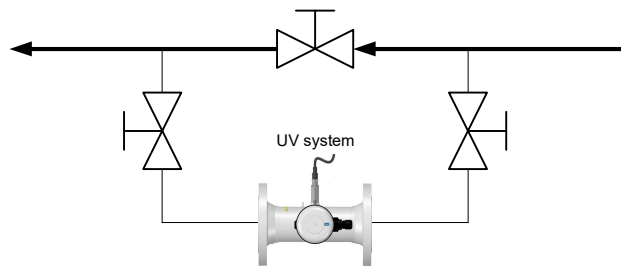


If the water to be treated is no longer flowing through the UV treatment chamber, this water is no longer disinfected/treated. The following measures must be taken:

- Alternative (chemical) disinfection of the water;
- Do not use and drain the water;
- Stop water flow;
- No UV treatment of the water for a short time is no problem (circulation of swimming pool water where chloramine is reduced), no measures.



Bypass closed for UV system operation

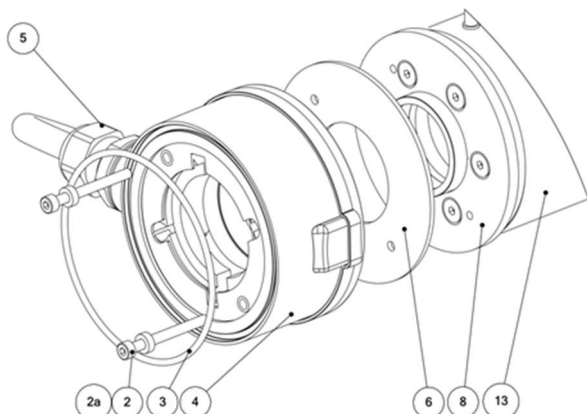


Bypass open for UV system service

When disinfecting liquids, the full flow must flow through the UV system, if only 1% of the flow does not flow through the treatment chamber, a log 2 reduction of microorganisms is the maximum attainable. An exception to this is a process in which the water is circulated in which only a part flows through the UV system, which controls the amount of microorganisms required for the specific process.

When reducing the bound chlorine (chloramine) in swimming pool water, the UV system must be dimensioned for the total circulation flow that goes through the water treatment. If the UV system is dimensioned for a partial flow of the total flow, the reduction of the bound chlorine will take longer or even will be unrecordable. Always dimension a UV system to be used in swimming pools at the full circulation flow rate and install the UV system in such a way.

6.5 Lamp socket assembly



The lamp socket (4) is the electrical connection between the lamp and the lamp driver. It also plays an important role in the positioning and temperature management of the lamp. The lamp socket is mounted onto the mounting flange (8) by two screws and plastic spacers (2, 2a). The mounting holes are symmetrically positioned on the mounting flange, allowing the lamp socket to be mounted in two ways. In other words the socket can be rotated 180°.

The lamp socket must be mounted so that the cable(gland) (5) points in the direction of the water flow. (see Chapter 'Installation drawings' for correct and incorrect positioning)

If the lamp socket is mounted correctly in relation to the water flow, the return wire is always "downstream". This is important for optimum irradiation of the water.

Ensure that the O-ring (3) is not lost. Tip: store it temporarily.

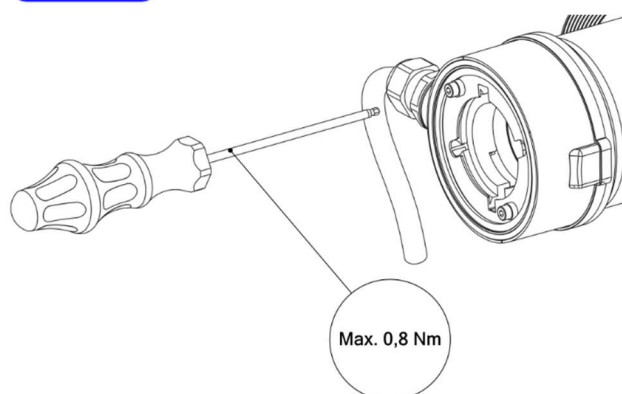
Insert both M4x45 screws (2) with the spacers (2a) around them in the holes of the lamp socket. Place the foam gasket (6) at the ends of the screws so that it can be placed as a whole on the mounting flange.

Position the cable (cable gland) (5) in the direction of the water flow (see also chapter 'Installation drawings'), until the screws fall into the holes of the mounting flange (8). The lamp socket (4) with foam gasket (6) can be secured by means of the supplied M4x45 screws and spacers (2 and 2a).

If the O-ring (3) has been taken out of the lamp socket, it can now be put back clean again. Check the O-ring and groove for contamination. If dirty, clean thoroughly with a brush or dry cloth.



Use only the original screws. These are provided with a special coating to prevent "solid eating" from stainless steel to stainless steel. Use a screwdriver with an adjustable torque (Nm) at all times. Also called torque screwdriver/key. Screw the screws into the mounting flange by hand. **Do not screw in the screws by machine!** It must be easy to screw in the screws. If this is not the case, check the thread for dirt or damage. Tighten the screws evenly using the torque screwdriver, with a maximum force of 0.8 Nm.



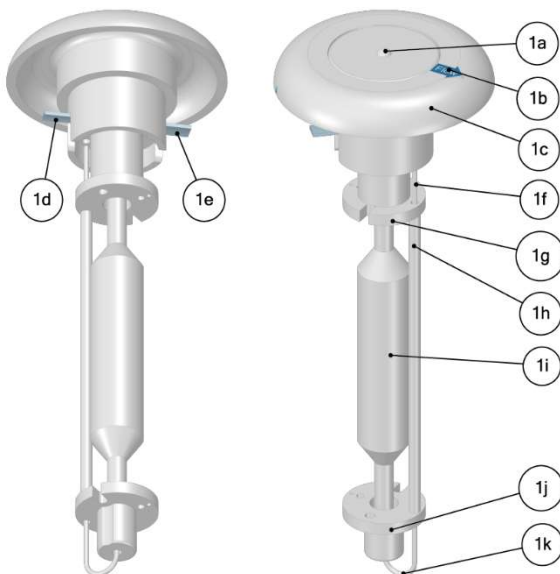
6.6 Lamp installation

The lamp consists of a ceramic base, with the lamp attached to it. Together they form a lamp unit, which is placed in the UV-C system without tools.



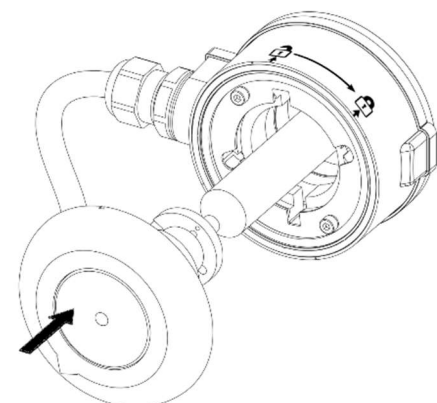
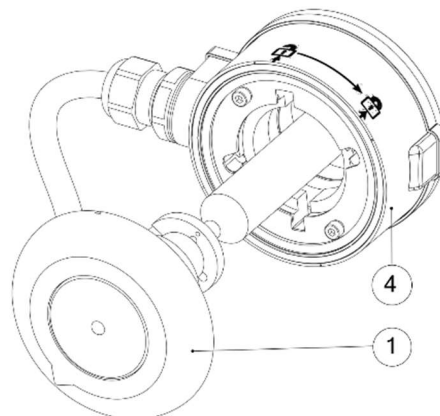
Touching the quartz glass is not permitted and not necessary for placing the UV lamp. If fingerprints or dirt are present on the quartz parts, the UV-C radiation is negatively influenced, so that the UV-C treatment process is also negatively affected. This can also cause the lamp to malfunction.

1a	Visible light window, to indicate the lamp operation. Window does not transmit UV-C radiation
1b	Arrow for the water flow direction. Ensure that this arrow always corresponds to the flow direction
1c	Ceramic lamp base
1d	Lamp contact small
1e	Lamp contact large
1f, 1k	Return wire (lamp power supply)
1g, 1j	Ceramic lamp spacer/temperature stabilizer
1h	Glass return wire stabilizer
1i	Lamp quartz tube



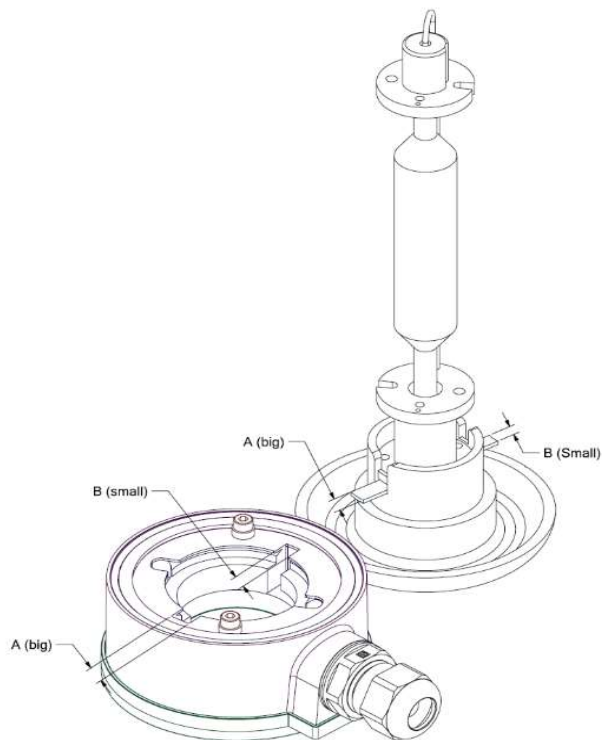
Placement of the UV lamp

Grasp the lamp by the base (1c) and guide it with the spacer (1j) through the lamp socket (4) into the quartz tube.

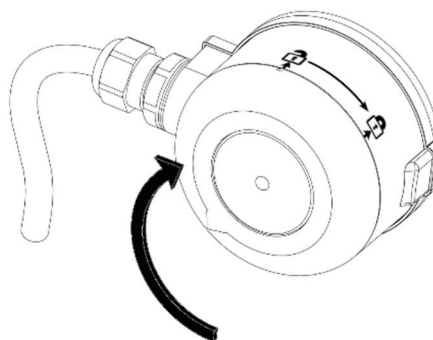
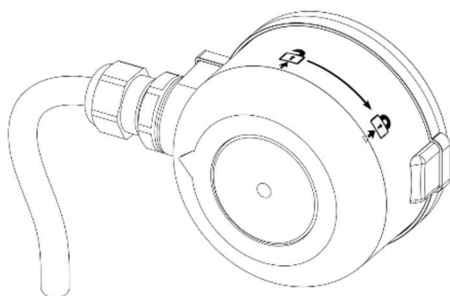




Due to the difference in size in the lamp contacts (1d and 1e), the lamp only fits into the socket in one way. Make sure that the contacts match the openings in the socket.



If the lamp is fully inserted and the ceramic base touches to the O-ring all around (3, drawing 2, 'Lamp socket assembly' chapter), the lamp be secured via the "bayonet closure". Turn the lamp clockwise until it stops. There is an embossed arrow on two sides on the edge of the ceramic base. With correct locking, the arrow corresponds to the closed lock on the socket.



Ensure that the UV lamp is always in the closed position (arrow on the lamp base matches the position of the closed lock on the lamp socket) before switching on the UV lamp.

6.7 Electrical installation



The electrical installation of a UV system must be carried out by a qualified electrician who is authorized to do so in accordance with local rules and legislation. Making changes to the UV system is not permitted.



For the installation of the UV system and therefore also the control panel, follow the guidelines described in the chapter 'Environmental conditions'.



Also follow the instruction as described in the 'Safety instructions' chapter to work safely.

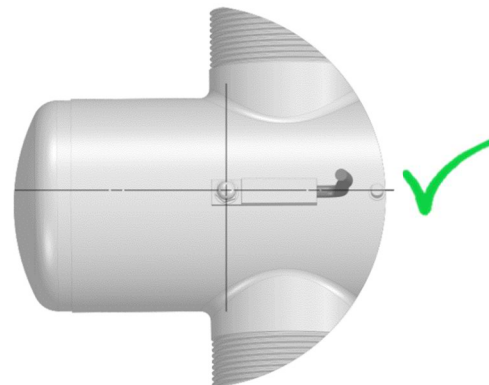


Ensure that the irradiation chamber is connected to the safety ground (in control panel) before the UV system is commissioned.

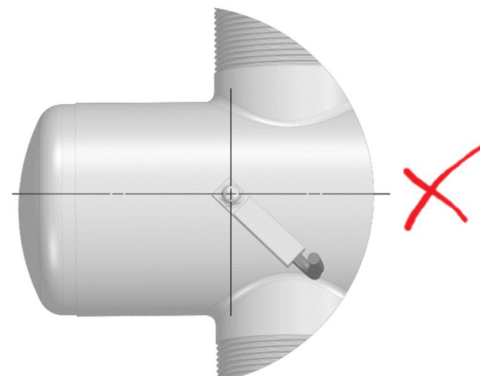
The power cable is not part of the delivery of VGE B.V.. Follow local rules and legislation for a suitable power cable with suitable fuse. The power cable must be connected directly to the corresponding connections on the main switch.

Before commissioning, for safe operation of the UV system, the Bimetal switch must also be correctly mounted on the treatment chamber with the supplied nut as shown in drawing below.

Correct assembly



Wrong assembly



7 Starting up a VGE Pro UV system



Only by VGE B.V. trained and authorized persons may commission a UV system.



Danger of injury and damage to the UV unit!

The UV unit may only be switched on if all lamps are mounted, the control cabinet is closed, all electrical connections are connected correctly and professionally, the UV treatment chamber is correctly and professionally incorporated in a piping system, the UV treatment chamber is completely filled with water and that if the control panel makes the "start flow" signal active enough water can flow through the treatment chamber. The control panel and the treatment chamber must also be electrically earthed.



Risk of skin and eye injury!

Only switch on the UV unit if all lamps are mounted. If in a multi-lamp system one lamp is not mounted in the treatment chamber, UV light will radiate from the treatment chamber if the system is switched on.



If you need to work on a UV unit that is switched on, you must protect yourself appropriately against the possible escaping UV radiation.



Danger of damaging the UV unit!

A UV unit is standard tested in the factory and set according to customer specifications as included in the order. Therefore no settings need to be adjusted by the user in the control panel. If adjustments are necessary due to, for example, changed process circumstances, this must always be done in consultation with VGE B.V..

7.1 Mains voltage

The VGE UV unit is designed to operate at a supply voltage of 1/N/PE 230 Vac, 50/60 Hz.

Supply voltage limits:

- Minimum 180 Vac
- Maximum 264 Vac

Mains frequency:

- At least 47 Hz
- Maximum 63 Hz



Ensure that both the treatment chamber and the control box are properly electrically grounded before the UV unit is switched on.



Before switching on the UV unit, check whether the connected mains voltage meets the above specifications, if the minimum limits are exceeded or the maximum limits are exceeded, serious damage to the UV unit will occur.

The mains voltage must be connected directly to the main switch.

7.2 Water in the system

Before switching on the UV lamp, the treatment chamber must be completely filled with water and continuously flow through with sufficient capacity!

An treatment chamber fully or partially filled with air can become very hot locally after the UV lamp has been switched on, which can damage the UV installation and the environment of the UV installation. There is also a risk of injury to operating personnel.

The water that flows through the UV system may have a temperature between +1 °C and +60 °C. A bimetallic switch is mounted on the treatment chamber as protection, which switches off the UV lamp(s) at a maximum chamber temperature of approximately +60 °C.

The treatment chamber can work with a maximum operating pressure of the water of 10 bar, water hammer can irreversibly damage the treatment chamber or parts thereof.

7.3 Cooling of the UV system

The entire lamp power is eventually converted to heat, which means that the treatment chamber must always be completely filled when the UV lamps are in operation and that there must be a minimum flow to realize sufficient cooling to prevent overheating.

Quantity of cooling water (for a temperature increase of 10 °C in the water, a flow of 100 l/h per kW is required):

Number and type of UV systeem	Power [kW]	Minimum flowrate [m³/h]
1 x 400 W	0,4	0,04
1 x 600 W	0,6	0,06
2 x 600 W	1,2	0,12
1 x 1 kW	1,0	0,10
1 x 1,5 kW	1,5	0,15
1 x 2 kW	2,0	0,20
1 x 2,5 kW	2,5	0,25
1 x 3 kW	3,0	0,30
1 x 3,5 kW	3,5	0,35



If the UV system is included in a circulation process, it must be taken into account that the water is heated when the UV lamp is running. If the process cannot dissipate sufficient heat, a dangerously high water temperature can be achieved and additional protection/cooling must be provided.

The treatment chamber temperature is monitored by a temperature switch that switches off the UV lamp at approximately +60 °C outside chamber temperature.



Above a temperature of ± 42 °C damage to the skin occurs after a while. The higher the temperature, the faster this damage will occur.



Attention!

With small water volumes, such as whirlpools or spa's, the heat from the UV lamp(s) can heat up the water to a higher temperature than the setpoint temperature of the concerning whirlpool or spa. In a situation such as a whirlpool, spa or other water basin where a high temperature can cause a risk of personal injury or material damage, the use of an additional temperature protection is obligated! The interlock connector of the control panel can be used for this.

For your safety: This product should be preferably be installed by a professional service technician, qualified in hydrotherapy bath installation.

In case the UV system is controlled by a "Comfort" control panel and the optional Pt100 temperature sensor is installed and connected to the treatment chamber and the control panel and this function is activated in the control panel, the UV lamp will be switched off standard at +45 °C outside chamber temperature.

7.4 Start-up procedure

If the UV system is completely mechanically, hydraulically and electrically installed, the UV system can be put into operation according to the instructions in the table below.

Nr.	Task description
1	Fill the piping system and the irradiation chamber complete with water, making sure that the system and the irradiation chamber are completely vented.
2	Measure the supply voltage and check whether it corresponds to the specification on the type plate.
3	Make sure that water flows through the irradiation chamber.
4	Plug in the power cord.
5	Ensure that the connector is placed with the wire bridge or with the flow switch connection.
6	If the supply voltage and the connector with wire bridge (or active flow switch) are present, a built-in time relay will become active and the lamp will switch on after approximately 10 minutes .
7	When the waiting time has expired (max. 12 minutes in total), the indicator LED changes from orange to green or red, check on the lamp socket whether the lamp is burning.
8	If the indicator LED flashes green, the UV lamp should almost be replaced (advice: make sure you have a replacement lamp in stock). The UV lamp must be replaced if the indicator LED illuminates red.
9	Instruct the servant staff.

8 Maintenance

The correct functioning of a VGE UV system is only guaranteed if original spare parts and components are used as described in this manual. The parts described must also be inspected, replaced or cleaned in a timely manner. If instructions are not followed, there is a risk of malfunction or damage to the UV system. If non-original spare parts and components are used or if the inspection, replacement or cleaning is not carried out in time, the warranty on the entire UV system will lapse.



The safety instructions in this manual must be followed at all times, but they do not affect the local and/or legally applicable safety measures and instructions.



UV-C radiation can damage the retina of your eyes and unprotected skin. Ensure that you are not directly or indirectly exposed to UV radiation. Everyone involved must be informed about the specific hazards associated with a VGE UV system.



Installation, maintenance and service work must be carried out by VGE B.V. trained and authorized persons.



Grasp all quartz glass parts only with clean gloves on, which do not leave any residues or prints (included). If fingerprints or dirt are present on the quartz parts, the UV-C radiation is negatively influenced, so that the UV-C treatment process is also negatively affected.



Quartz can cause serious cuts in the event of breakage.

General steps of maintenance:

1. Switch off the UV system and lock the main switch;
2. Shut off the hydraulic supply and discharge for the UV system;
3. Drain the water from the unit;
4. Perform the specific maintenance as described in this chapter;
5. Remove the lock on the main switch and switch on the UV system in accordance with the conditions described in the chapter 'Water in the system';
6. Check whether the UV lamp(s) is(are) burning.

All adjustments, actions and controls must be documented in the logbook.

8.1 Who can perform which actions?

Trained and authorized technical personnel means:

- Service: personnel who have received training and / or instruction from VGE B.V. or an authorized service partner;
- Maintenance: VGE B.V. service employee or technical staff trained and authorized by VGE B.V. ;
- Electrical work: authorized and qualified electrician.

The following activities fall under operation:

- Operating the control.

The following activities fall under maintenance:

- Assembly UV-C system;
- Cleaning and / or replacing quartz glass;
- Replace UV lamp;
- General maintenance of the UV system;
- Exchange O-rings;
- Inspection work.

The following activities fall under Electro:

- All electrical work on the irradiation chamber and in the control.

8.2 Maintenance schedule

The maintenance schedule specified below can be used in regular processes. Based on the application, the interval period of inspection, cleaning and / or replacement must be increased or decreased.

It is important that a responsible person and a user are designated and described.



Record all activity carried out on a UV system in the logbook of the relevant UV system.

Point of time	Service-level	Activity
Daily	1	<ul style="list-style-type: none"> - Functional check: - Is the UV lamp working; - Checking for leaks; - The irradiation chamber is completely filled with water.
Monthly	1	<ul style="list-style-type: none"> - Also perform the daily activities; - Test the systems that are on standby by fully switching them on for at least one hour with water flow.
Annually	2	<ul style="list-style-type: none"> - Also perform the monthly activities; - Clean the quartz tube and replace if necessary;
3-yearly	2	<ul style="list-style-type: none"> - Replace the quartz tube.
5-yearly	2	<ul style="list-style-type: none"> - Have the fan replaced in the control panel.

Maintenance level 1 can be performed by operated personnel.

Maintenance level 2 must be performed by technical staff trained and authorized by VGE B.V. authorized service personnel.

Periodic maintenance extends the life of the device. Non-timely or non-maintenance of the system limits the service life of a number of components and the operation can no longer be guaranteed.

8.3 Quartz sleeve disassembly

To be able to disassemble a quartz sleeve, if present, first remove the UV lamp, see the chapter "Replacing the lamp" and follow the instructions up to point 4. After installing the quartz sleeve (see chapter "Quartz sleeve installation"), the UV lamp has to be placed again, see chapter "Lamp placement".

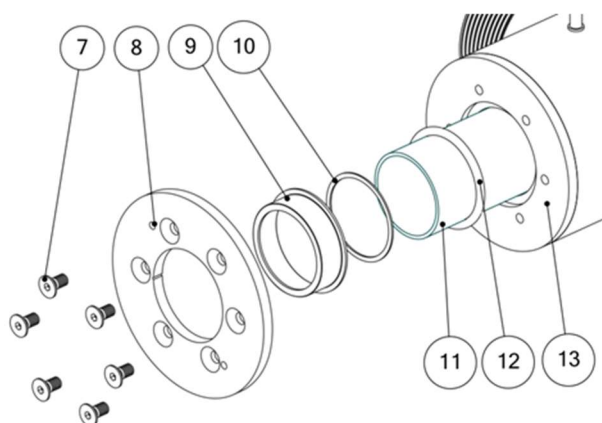


Make sure that the UV treatment chamber is empty and pressure less before disassembling a quartz sleeve.

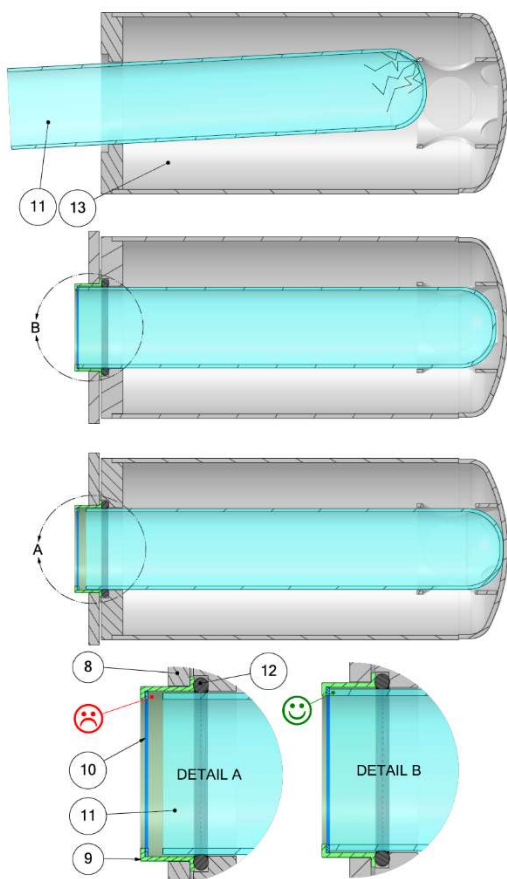
Pay attention! The quartz sleeve may be damaged. Use cut-resistant gloves when handling a quartz sleeve.

The clamping flange must be removed to remove the quartz sleeve from the treatment chamber. Remove by the M5x10 screws (7) using a suitable screwdriver (Allen SW3).

Then the parts: clamping flange (8), quartz sleeve lock (9) and the quartz sleeve protection ring (10) can be removed and then the quartz sleeve (11) can be removed from the chamber.



8.4 Quartz sleeve installation



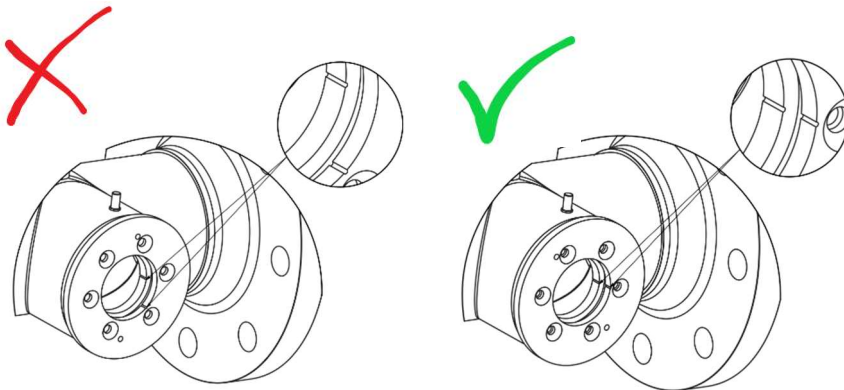
Remove the quartz sleeve (11) from the packaging and carefully check it for damage. Damaged quartz sleeves cannot be used due to the risk of leakage and / or short circuit.

At the end of the treatment chamber there is a "quartz sleeve support". Carefully slide the quartz sleeve into this support, without bumping it into the edge. This could cause a break in the quartz sleeve.

Carefully place the quartz sleeve (11) in the treatment chamber (13) until it protrudes approximately two centimetres.

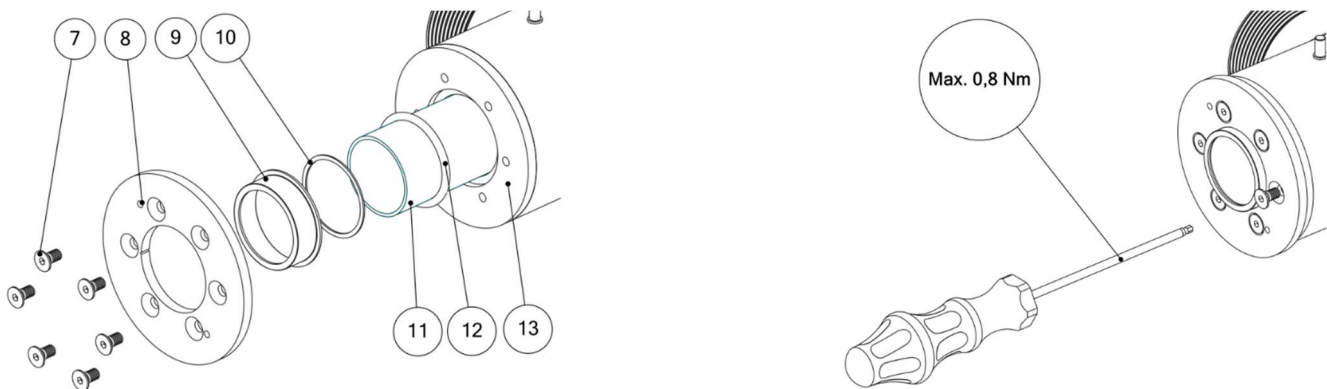
Slide the O-ring (12) over the quartz sleeve into the O-ring groove. Do not use grease, silicone or other means to lubricate the O-ring or to facilitate assembly. This is not necessary, it can damage the O-ring and moreover it leaves UV-C impervious pollution on the quartz glass. The O-ring forms the watertight connection between the quartz sleeve and the treatment chamber.

Now place gasket (10) in the aluminium bush (9) and slide the bush with gasket over the quartz sleeve (11). The gasket (10) provides a protective layer between the quartz sleeve and the aluminium. The aluminium bushing can now be pushed over the quartz sleeve together with the gasket to the O-ring and irradiation chamber. The edge of the quartz sleeve (11) should touch the gasket (10) when everything is in the right place.

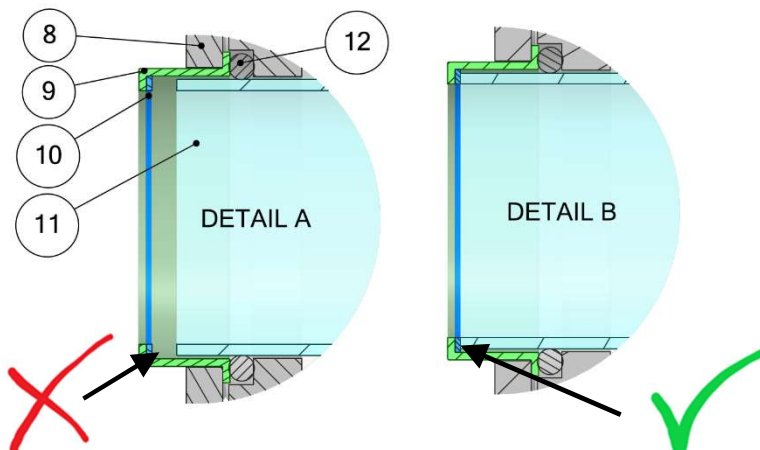


The mounting flange (8) can now be positioned with respect to the hole pattern on the treatment chamber (13). The mounting flange can only be positioned in one way. To simplify correct positioning, markings have been applied to the treatment chamber and to the mounting flange. When the markings are in line, the holes correspond.

The mounting flange can be fixed by means of the included M5x10 bolts (7).



Use only the original screws. These are provided with a special coating to prevent high friction from stainless steel to stainless steel. The coating prevents the screws from blocking. Use a screwdriver with an adjustable torque (Nm) at all times. Also called torque screwdriver/key. Loosely screw in the screws by hand. Tighten the screws using the torque screwdriver crosswise, with a maximum force of 0.8 Nm. **Do not screw in the screws by machine! It must be easy to screw in the screws.**



Check again if the gasket (10) is locked in by the quartz sleeve (11) and aluminium sleeve (9). Check the quartz sleeve again for damage.

8.5 Lamp replacement

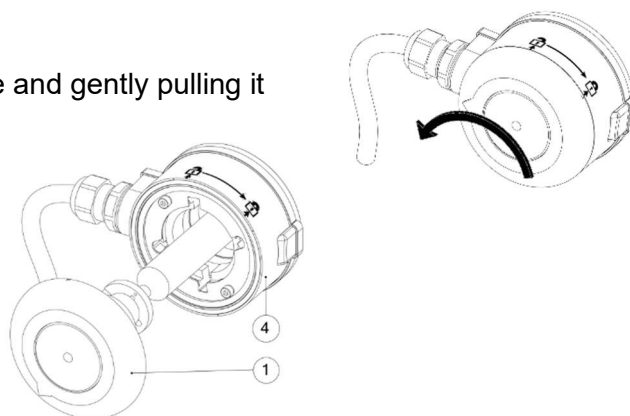
Because UV lamps age slowly as a result of use, with the result that the amount of UV energy produced decreases (the visible light remains practically the same) the dosage in the water to be treated decreases and must be replaced periodically. A UV lamp must also be replaced if it has defects or is defective.

1. Switch off the UV system and lock the main switch;
2. Wait at least 15 minutes until the UV lamp has cooled down sufficiently;



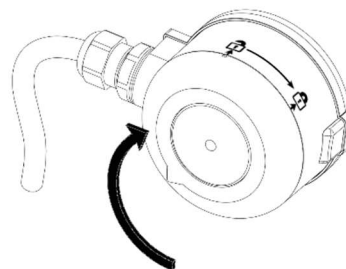
When handling a UV lamp, always wear the gloves supplied with the UV system.

3. Disconnect the lamp by turning it counter clockwise and gently pulling it out of the treatment chamber;
4. Remove the O-ring (3) from the socket (4);
5. Place the new O-ring (3) (supplied with the lamp) in the socket (4);

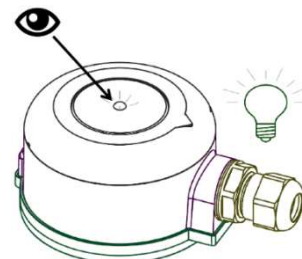


When replacing, always use the supplied components such as O-rings and gaskets.

6. Remove the new UV lamp from the packaging, note: the UV lamp is very fragile;
7. Place the new UV lamp (1) in the socket (4) (see chapter 'Lamp installation' for correct positioning). And turn it clockwise until the arrow is at the height of the lock;
8. Store the old UV lamp in the packaging of the new UV lamp;



9. Remove the lock on the main switch and switch on the UV system in accordance with the conditions described in the chapter 'Water in the system';
10. Check if the lamp (1) is on;
11. Dispose of the old lamp in compliance with local rules and laws. See also chapter 'UV lamp disposal'.



8.6 Cleaning the quartz sleeve

An quartz sleeve must be periodically checked, cleaned and replaced if necessary. The frequency is determined by the water quality. An quartz sleeve must also be replaced if it has defects or is defective.

Follow the instructions in chapter "Lamp removal" to remove the lamp from the treatment chamber. To remove quartz sleeves see chapter "Quartz sleeve disassembly".



Always wear cut-resistant gloves when handling a UV lamp and quartz sleeve.



When replacing, use the supplied components such as O-rings and gaskets.

Depending on the type of fouling on the quartz sleeve the manual cleaning differs.

A non-scratch plastic scouring sponge can be used to remove any coarse contamination. Furthermore, a solution with vinegar or citric acid can also be used, e.g. to remove limescale deposits.



When using acids and/or bases for cleaning the quartz tubes, always observe and follow the safety instructions of the relevant supplier and follow any applicable legislation.

After cleaning the quartz sleeves follow the instructions in chapter "Quartz sleeve assembly" and "Lamp installation" to get the UV system operational again.

8.7 Chemical cleaning the UV system

A UV system must be periodically checked (interval is depending on usage and water quality) to ensure a good performance, especially if no UV sensor is present. Depending on the water quality the quartz sleeve(s) and/or UV sensor measuring window(s) (if a UV sensor is present) can foul which affects the treatment result.

In general with an UV treatment system with an UV sensor a system needs maintenance if the UV intensity read-out results in a warning signal (default if UV < 110 %) and definitely if the UV intensity lowers the alarm threshold level (< 100 %).

The cause an UV warning or alarm can be caused by:

- 1 Lowering of the UV transmittance of the water → check and improve water quality or change the flowrate or accept a lower UV dose (treatment result);
- 2 Fouling of the quartz sleeve(s) and UV sensor(s) → cleaning is required;
- 3 Aging of the UV lamps → if end of lamp life is reached replace the UV lamps.

If fouling is the cause of the low UV intensity read-out the quartz sleeve(s) and UV sensor(s) can be cleaned by disassembling the system, see the chapters about quartz sleeve (dis)assembling.

Even if a UV system is equipped with a cleaning mechanism (manual or automatic) it can be necessary to clean the optical parts of the system (the interval will be longer than without cleaning mechanism).

Without opening the treatment chamber it is also possible to clean the quartz parts chemically using the deaeration and drain connections.

Cleaning process:

- Make sure that valves are installed on the drain and deaeration sockets on the treatment chamber;
- Isolate treatment chamber by closing the valve directly before and after the treatment chamber;
- Connect the hoses of the chemical cleaning system to the drain and deaeration valves;
- Open the drain and deaeration valves;
- Start the pump of the chemical cleaning system;
- Make sure that the total chamber volume is circulated at least 5 times to make sure that the chemical cleaning is effective;
- If the UV system is equipped with a cleaning mechanism operate this cleaning mechanism to support the chemical cleaning process and make it more efficient;
- Stop the pump of the chemical cleaning system;
- Close the drain and deaeration valves;
- If the application can handle the used chemicals open the isolation valves and start the disinfection process;
- If the application can not handle the used chemicals or if the system will not be in operation directly after chemical cleaning, flush out the water with the chemicals and rinse the system with clean water via the drain and deaeration valves to make sure that no chemical residue remains in the treatment chamber. If the treatment chamber is filled with chemicals containing water this can damage the stainless steel chamber by means of corrosion.

Chemicals advised for cleaning			
Type	Supplied concentration	Cleaning concentration	Amount per 100 l water volume
Citric acid		2 – 10 %	

8.8 Broken quartz sleeve

Read also the chapter 'Quartz sleeve breakage' where causes and warning are listed.

If the quartz sleeve does not seal properly or if a breakage has occurred. Then do the following:

12. Switch off the UV system and lock the main switch;
13. Shut off the supply and drain of the treatment chamber;
14. Drain the water from the unit;
15. Disassemble the treatment chamber;
16. Remove the broken quartz;



Note: broken quartz is sharp. Use the correct protective equipment. (The included gloves don't protect against cutting)
Check the total system for quartz fragments. And take the right measures against this.

17. Clean the treatment chamber;
18. Assemble the treatment chamber and replace the quartz sleeve;
19. Fill the treatment chamber complete with water;
20. Check that there are no leaks. Fix any leaks;
21. Reconnect the power supply to the UV system;
22. Switch on the UV system and ensure that the treatment chamber is flowed through with sufficient water (see chapter 'Cooling the UV system');
23. Check whether the UV lamp is burning.

8.9 Lamp breakage

Also read the chapters 'UV lamp breakage' and 'Quartz sleeve breakage' where causes and warnings are described.

If a UV lamp is defective or broken but the quartz sleeve is not defective, do the following:

1. Switch off the UV system and lock the main switch;



Warning! Broken quartz is sharp. Use the correct protective equipment. (The gloves supplied do not protect against cutting). Check the total system for quartz fragments and take the right measures against this.

2. Remove the UV lamp (residues) from the quartz sleeve;
3. Collect any mercury released and dispose of appropriately;
4. If all remnants have been removed, a new lamp can be placed;



In case the UV system is a multi lamp system with an UV sensor then in case the UV lamp in front of the UV sensor is malfunctioning and need to be replaced, the new lamp may not be installed in front of the UV sensor. Remove an "old" lamp which is far away from the UV sensor from this quartz sleeve and install it in the quartz sleeve in front of the UV sensor. The new lamp must be installed in the location of the "old" lamp. See also chapter "Menu structure" to correct the hour counter of the repositioned UV lamp.

5. Switch on the UV system and ensure that the treatment chamber is flowed through with sufficient water (see chapter 'Cooling the UV system');
6. Check whether the UV lamp is burning.

In the case of a broken quartz sleeve, the instructions in the 'Broken quartz sleeve' section must also be followed.

8.10 UV Lamp disposal

Used UV lamps must be disposed according the local regulations and laws.

In an effort to provide a safe and efficient way to dispose of VGE UV lamps, used and defective VGE UV lamps can also be sent to VGE B.V..

We ensure correct processing under to the following conditions:

- Only VGE UV lamps are accepted;
- The UV lamps that are returned must be packed and returned to VGE B.V. in the same way as originally sent to the customer;
- The lamps to be returned must be clearly visible marked with description, number and sender;
- The costs for returning VGE UV lamps are for the sender;
- Any administrative actions with regard to, for example, cross-border transports, must be handled entirely by the sender;
- UV lamps must be sent to VGE B.V..

Return address for used and defective VGE UV lamps:

VGE B.V.
Nieuwe Eerdsebaan 26
5482 VS Schijndel
Netherlands

8.11 Decommissioning

If the UV system is not used for a longer period of time (more than two weeks), it must be switched off completely.

Concerns	Required work
Control panel	Unplug the cable plug from the power supply socket
Treatment chamber	Close the water supply and drain of the UV treatment chamber
	Empty the treatment chamber
	Clean the treatment chamber internally
	Rinse the treatment chamber with clean water
	Remove all water residues from the treatment chamber

8.12 Problem solving

If malfunctions occur during the water treatment process with the UV system, the overview below can be used to determine and resolve the cause of the malfunction or problem.

Problem	Possible cause	Solution
Lamp is not burning. Indicator on control panel does not light up.	Plug not in the socket.	Insert the plug into a working socket.
	No supply voltage.	Provide power supply.
	Waiting time of 10 minutes has not yet expired.	After start command for lamp to wait 10 minutes.
	Fuse defective.	Replace defective fuse.
	Connector (E) with internal bridge not present.	Insert connector (E) with through connection.
	No flow switch or remote contact active that is connected to connector (E).	Ensure sufficient flow if a flow switch is used or activate remote contact.
Lamp does not start. Indicator on control panel lights green.	Lamp not properly placed in lamp socket.	Make sure the marking on the lamp base is positioned opposite the closed lock symbol on the lamp socket.
	Lamp defective.	Place a new lamp or check the lamp with a lamp tester.
	Lamp power supply or control panel defective.	Replace the control box
Irradiation chamber becomes too hot.	No water in the irradiation chamber or not completely filled.	Fill the system completely with water and ensure sufficient flow.
	Water "pours" out of the pipe after the irradiation chamber, creating an air containment.	Ensure there is sufficient back pressure or flow through the irradiation chamber from the bottom up.
	No or insufficient flow of the irradiation chamber.	Ensure adequate flow through the irradiation chamber.
Control panel becomes too hot.	The ambient temperature is higher than 40 °C.	Ensure that the ambient temperature remains below 40 °C.
	Control cabinet hangs in sunlight.	Reposition the control so that it can no longer be irradiated by sunlight or ensure suitable sun protection.
	Control panel hangs too close or against a heat source.	Move the control panel to a cool place.

Problem	Possible cause	Solution
Lamp switches off after a certain time.	Irradiation chamber becomes too hot so that the thermal protection switches the lamp off.	See 'Irradiation chamber getting warm'.
	The control panel becomes too hot, so that the thermal protection switches the lamp off.	See 'Control box becomes warm'.
	Internal fan is defective (no more noise in the control box).	Replace the control panel.
Water comes out of the irradiation chamber.	Damaged or incorrectly positioned O-ring that seals the quartz tube.	Replace O-ring.
	Damaged or broken quartz tube.	Replace quartz tube.
	Seal 1/4" threaded fitting on the chamber is leaking	Replace O-ring.
Effect UV system is not good, not enough reduction bound chlorine.	The UV transmission of the water is too low.	Improve the UV transmission of the water or select another (more powerful) UV system.
	The flow rate is too high.	Reduce the flow or select another (more powerful) UV system.
	Polluted quartz tube	Clean or replace the quartz tube.
	UV lamp has too many operating hours	Replace UV lamp and reset Timer.
	UV lamp defective	Replace UV lamp and reset Timer.
	Control panel defective	Replace control panel.
	Incorrect sampling.	Ensure that the measuring equipment is properly calibrated and perform the measurement again in accordance with the applicable rules.
	Possibly an overload of the bath.	Wait until the UV system has done its work, reduce the number of visitors or select a more powerful UV system.

Problem	Possible cause	Solution
Effect UV system is not good, not enough disinfection.	The UV transmission of the water is too low.	Improve the UV transmission of the water or select another (more powerful) UV system.
	The flow rate is too high.	Reduce the flow or select another (more powerful) UV system.
	Polluted quartz tube	Clean or replace the quartz tube.
	UV lamp has too many operating hours	Replace UV lamp and reset Timer.
	UV lamp defective	Replace UV lamp and reset Timer.
	Control panel defective	Replace control panel.
	Incorrect sampling.	Ensure that the sampling points are properly disinfected before taking the water samples and repeat the measurement.
Indicator on control box flashes green.	Lamp almost needs to be replaced (indicator flashes during the last 500 hours).	Make sure you have a spare lamp on hand.
Indicator on control box lights up red.	Lamp must be replaced immediately, end of life is reached.	Replace UV lamp and reset Timer.

8.13 Logbook

Complete this document and ensure that this document is physically placed with the device.

UV-system	
Serial number	
Date of installation	
Date of purchase	
Responsible user	
Main user	

The following items must be described in the logbook.

- Date of incident/check/serve;
- Reason for action/malfunction/maintenance;
- Work performed, comments;
- Operational hours;
- On/off switches;
- Flow rate;
- Water transmittance;
- UV intensity (if a UV sensor is present).

8.14 Logbook example

LOGBOOK											
Nr.	Date	Problem/Error message	Level*	Work performed, comments	Hours run [h]	On/off	Q [m ³ /h]	T ₁₀ mm [%]	UV [W/m ²]	Carried out by	
*Maintenance level 1 can be performed by serviced staff Maintenance level 2 must be carried out by VGE authorized service personnel											

9 Spare parts and maintenance schedule

9.1 Spare parts



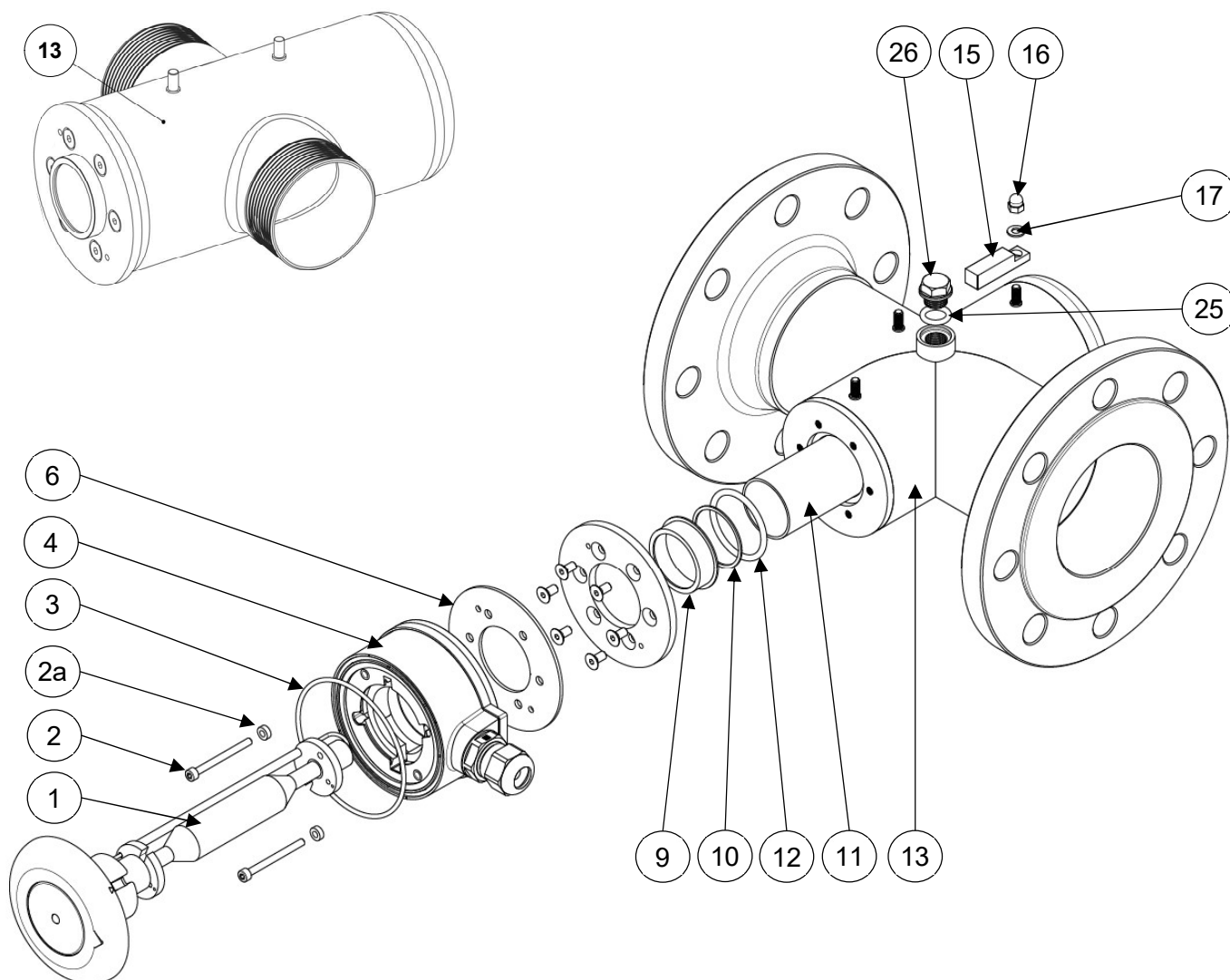
For safety reasons only use original spare parts. Contact your supplier's customer service if you need spare parts.

Register all changes and tasks performed in the logbook, an example of a logbook is attached in this manual.

The item numbers in the material lists correspond to the numbers in the exploded view of the relevant item.

9.2 Spare parts VGE MP treatment chamber

The exploded view below concerns a MP UV system 400-85, MultiMax and 600-85 with 1 UV lamp. For the specific lamp and quartz tube article numbers, see the description of which system they apply to.



Item	Aantal	Artikelnummer	Omschrijving
1	1	F980500	Lamp VGE MP 400 W for INOX 400-85 / MultiMax
		F980505	Lamp VGE MP 600 W for INOX 600-85
2	2	F990898	Screw M4 x 40 mm A2 Stainless steel DIN 912
2a	2	3900750	4,2 mm Nylon 6/6 spacer ring
3	1	3902150	O-ring 83 x 2.5 mm
4	1	F990303	MP lamp socket
6	1	3902170	Foam gasket EPDM clamping flange MP
7	6	F990899	Countersunk Allen screw M5 x 10 RVS A2 DIN 7991 LUBO
8	1	B212195	Clamping Flange Housing MP
9	1	B299616	Quartz sleeve assurance MP 38 mm
10	1	3902172	Quartz sleeve protection 39 x 35 x 1 mm EPDM
11	1	QG101	Quartz sleeve 195 x 38 x 1,5 mm for INOX 400-85 / MultiMax
		QG101	Quartz sleeve 195 x 38 x 1,5 mm for INOX 600-85
12	1	3902174	O-ring EPDM 37,69 x 3,53 mm
13	1	VIM00401H	Treatment chamber VGE UV INOX MP 400-85 / MultiMax
		VIM00601H	Treatment chamber VGE UV INOX MP 600-85
15	1	B290146	Temperature switch 60 °C incl. 10 m cable
16	1	E831400	High cap nut M5 DIN 1587 A2 RVS
17	1	4800040	Washer A2 M5
25	1	B212104	O-ring EPDM 12 x 3 mm
26	1	B212103	Stainless steel 316L plug 1/4" with collar

9.3 Spare parts sets per system

The following spare parts sets are available:

- Service set:
 - o O-ring for lamp socket/socket;
 - o Foam gasket for socket/RVS flange;
 - o Quartz tube protection ring;
 - o O-ring for sealing quartz tube/SS flange;
 - o O-ring for UV sensor/SS plug;
 - o Screws for mounting clamping flanges.
- UV-Lamp
 - o UV-lamp;
 - o O-ring for lamp socket/socket.
- Quartz tube:
 - o Quartz tube;
 - o Service set.
- Temperature switch:
 - o Temperature switch 60°C with 10 m cable;
 - o Cap nuts;
 - o Washers.

Description	Spare parts VGE UV INOX MP		
Type	400-85 MultiMax	600-85	
Service set	SP0054		
Quartz tube	QG101	QG101	
UV lamp	F980500	F980505	
Temperature switch 60 °C	B290146		

9.4 Consumable parts

The following items fall under consumable parts:

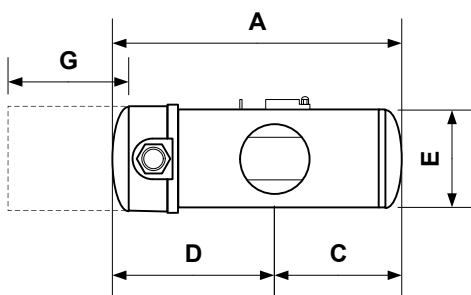
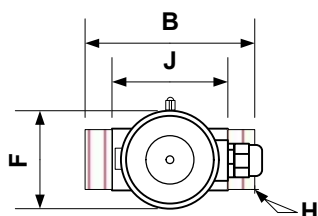
- UV lamp;
- Quartz tube;
- Seal;
- O-ring.

Follow the instructions as described in this manual for replacing these consumable parts.

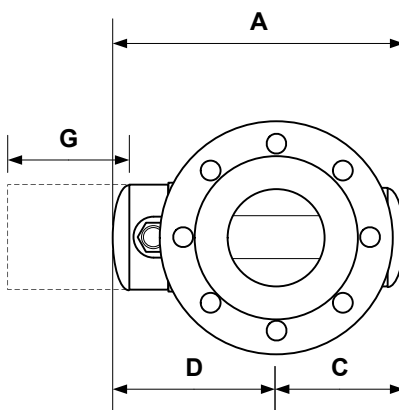
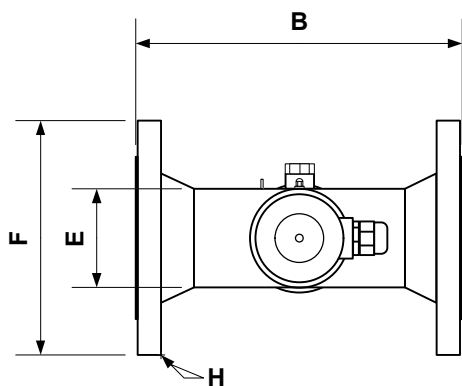
10 Drawings

10.1 Dimensions

10.1.1 Treatment chamber, dimensions



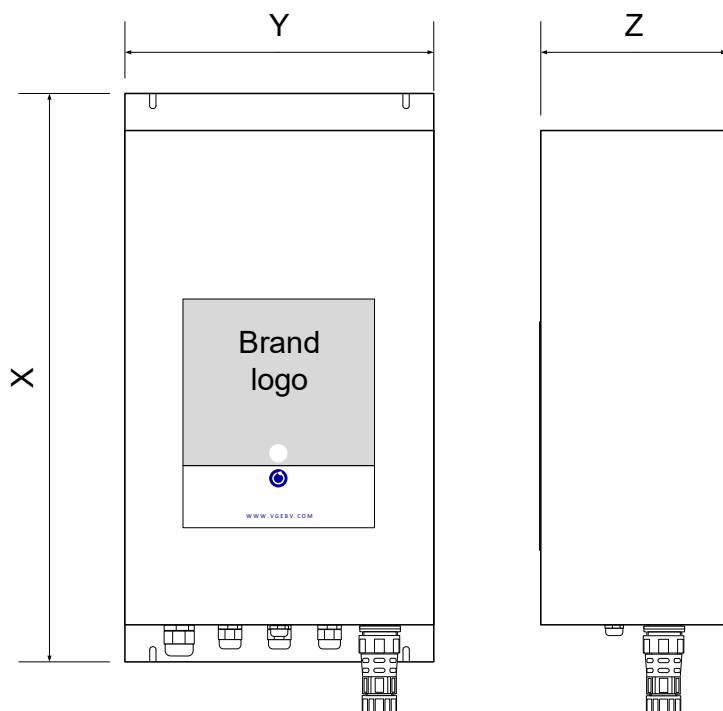
400-85 / MultiMax



600-85

VGE UV INOX MD							Dimensions									
Type	Figure	Shape	Maximum working pressure [barg]	Connection	Weight dry [kg]	Weight wet [kg]	A	B	C	D	E	F	G	H	I	J
400-85 / MultiMax	1	Inline	10	2" male	2	3	250	156	115	135	85	91	230	2"	-	86
600-85	2	Inline	10	DN80	11	14	245	280 +/- 4	115	140	85	200	240	DN80	-	-

10.1.2 Control panel, dimensions



VGE UV INOX	Control panel (height x width x depth, X x Y x Z)						
	Comfort						
	X	Y	Z	U	V		
	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	IP
				Free space for cooling			
400-85 / MultiMax	630	500	245	0	0	23,0	65
600-85	630	500	245	0	0	23,0	65