

Operating Manual

UV Sensoric Components

Sensors Measuring windows



Imprint

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Warning notes and symbols in the operating instructions

These operating instructions describe the UV sensoric components, their installation, operation and capabilities. The safety and warning notices explain the safe, proper handling of the device.

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

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

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

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

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

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



This symbol warns of a hazard.



This symbol warns of hazardous electrical voltage.

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

ATTENTION!



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



NOTE!

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

1. Function description of UV sensoric components

1.1 UV-Sensor

The UV sensor is a UV sensoric component whose function is to receive the UV radiation from a UV lamp and to convert it into an evaluable electrical signal. As an active element, a UV sensor contains a diode which is sensitive to UV radiation and whose low signal is usually amplified or converted. The electrical components of the sensor are installed in a protective housing, which withstands the operating conditions on the plant side and defines the optical properties of the UV sensor.

UV sensors are available in a wide variety. They differ in the following points:

- applications (air or water application)
- compliance with standards (DVGW, ÖNORM, explosion protection)
- construction type / housing (SUV13 / 19/20/32 / ..)
- water resistance, pressure resistance
- housing material (PTFE, stainless steel)
- output signal (relative signal of the UV diode or absolute 4-20 mA, 0-2 / 5/10 V or RS485 signal)
- optical properties (opening angle, direction of view)
- calibration value / sensitivity
- spectral sensitivity of the built-in UV diode
- supply voltage
- other

1.2 Measuring window

A measuring window is a UV sensoric component used to accommodate a UV sensor that is matched to it. UV sensors of the type SUV20 correspond in their design to the drinking water standards DVGW W294 as well as the ÖNORM M5873. For their use, these sensors require a measuring window of the FUV type, which produces water and pressure tightness and geometrically and optically also meets the stated standards. By using a measuring window, it is achieved that the UV sensor can be checked or changed at any time during operation, without shutting down the UV system and dewatering the reactor. FUV measuring windows are available in various designs.

2. Safety instructions

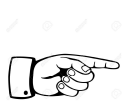
2.1 General information

A sound knowledge of all basic safety regulations is essential to ensure safe and fault-free operation of UV sensoric components. This operating manual contains all important safety regulations to ensure safe operation of the lamps. This operating manual, and in particular the safety instructions, must be observed by all persons working with the lamps. In addition, all relevant rules and accident prevention regulations relating to the operation site must be observed.

In regular intervals, the operator will check that all personnel are observing the safety regulations.

2.2 Appropriate use

The operator may only operate the UV sensoric component as stipulated by the operating instructions in this manual and must follow the relevant rules for accident avoidance.



ATTENTION!

UV-Technik Speziallampen GmbH is not liable for damages resulting from inappropriate use of UV sensoric components.

2.3 Staff obligation

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

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

2.4 Hazards from handling the equipment

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

The equipment may only be used under the following conditions:

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



Danger! – HAZARDOUS ELECTRICAL VOLTAGE!

Switch off the main switch and the main contractor before working on UV sensoric components, to avoid danger of electric shock.

Attention: Danger of death



WARNING! – UV RADIATION!

UV rays, direct or indirect, are a danger of health! Switch off the lamps before working on UV sensoric component . If not possible eyes and skin must be protected with appropriate aids against inadmissible high radiation doses.

Attention: Health risk

2.5 Warranty and liability

The General sales and delivery conditions of UV-Technik Speziallampen GmbH apply. The operator will have received these terms, at the latest upon signing the contract. The UV-Technik Speziallampen GmbH is not liable for any damage to persons or property arising from any one or more of the following:

- inappropriate use of UV sensoric components
- incorrect assembly, commissioning and operation
- operation of UV system with a faulty and/or non functioning safety and protection device
- non observance of the instructions given in the user's manual with reference to the safety, transport, storage, assembly, commissioning, operation and servicing of the components
- unauthorized repair or alterations to the construction of the components
- repairs which are carried out incorrectly
- catastrophes, the action of foreign bodies or acts of God
- damages or losses originated from the use or a defect of the components

2.6 Organizational measures

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

2.7 Informal safety measures

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

Danger due to electricity



DANGER! – HAZARDOUS ELECTRICAL VOLTAGE!

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

The electrical components of UV sensoric components must be inspected regularly.

Before commencing work:

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

Loose connections must be tightened and damaged wiring replaced immediately.

3. Transport, delivery, storage

UV sensoric components will be delivered in an appropriate packing. Any damage detected must be documented at once and reported immediately to your specialist dealer or directly to the UV-Technik Speziallampen GmbH.

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

UV sensoric components have to be stored in a dry and non corrosive environment. If sensors are exposed to very low or very high temperatures during storage, they must be acclimatised for a sufficient long time before commissioning. Please refer to the specific information in the respective product information.

4. Ordering data for equipment

The ordering of UV sensoric components is possible at the following address:

UV-Technik Speziallampen GmbH

Tel.: 0049 - 36785 - 520 0

Gewerbegebiet Ost 6

Fax: 0049 - 36785 - 520 21

98704 Wolfsberg/ OT Wümbach

E-Mail: info@uvtechnik.com

To allow clear assignment on all orders the article number and name of the UV sensoric components must be specified. If unknown our sales staff would be pleased to help you.

5. Repair, fault



ATTENTION!

If a fault occurs on UV-measuring technology components, contact the customer service of the UV technology Speziallampen GmbH. No repairs or alterations may be carried out on UV measurement components.

In the case of damage or defects to UV sensoric components, the defective component must be sent to Speziallampen GmbH for inspection and repair.

Please contact us in advance to agree the cheapest delivery. Please keep the following disclosures ready:

- type and number of the component
- dimensions and weight of the consignment



ATTENTION!

Please note that COD will be not accepted.

In advance or after receipt, we issue a transaction number and confirm receipt of the shipment. After checking the component, you will be notified and, if costs arise, a cost estimate. Please contact us if you have any questions. Inquiries with the name of the transaction number are possible at any time. The same procedure also applies to the recalibration of sensors.

The detailed warranty regulations can be found at www.uvtechnik.com.

6. Instructions for the installation of UV sensoric components

6.1 General information

Installation, electrical connection, maintenance and care of UV sensoric components may only be carried out by suitable specialists. These operating instructions, the information given in the product information of the products as well as the applicable statutory regulations for health protection and electrical safety must be observed.

When working in the radiation area of UV lamps, the eyes must be protected with suitable glasses. In addition, it is recommended to protect the skin with long clothing and gloves. If possible, the radiation of the UV lamp must be blocked. If the lamp is to be observed anyway, this can be done, for example, with a pane of glass or acrylic glass. Both materials block the particularly dangerous short-wave radiation below 300 nm.

6.2 Selection of a suitable sensor

Users who are unfamiliar with the subject, we recommend contacting a sales representative of the UV technology Speziallampen GmbH. In the consultation, the necessary questions are clarified so that a suitable sensor is found with little time expenditure. Experienced users will find their way through our product information, which we are happy to send. It is helpful to be clear about the points mentioned in chapter 1.1. This makes it much easier for our sales staff to choose. Many of the mentioned distinction criteria are freely selectable or combinable, so that UV sensors can be configured that are exactly tailored to the application. In principle, the user must decide whether a relative or absolute measurement is required.

Relatively measuring sensors internally have only a UV diode. The output signal is fed to an evaluation unit, amplified there and displayed as a percentage value. Due to the low output currents of the UV diodes, the sensor line must be kept short.

Absolute-measuring sensors internally have an amplifier and give a value (as voltage, current or digital signal) that is proportional to a set irradiation value. Such sensors are factory calibrated (e.g. 20 mA = 100 W/m²). Normal calibration values for low-pressure applications are 50..200 W/m², for medium-pressure lamps, sensors are usually required, which are calibrated with 1000 W/m² and more.

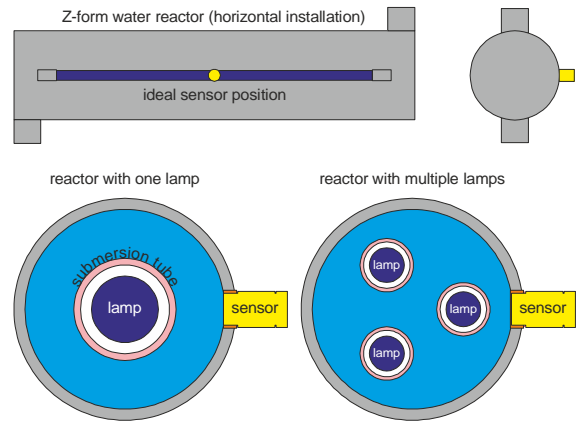
For drinking water applications according to DVGW/ÖNORM, an absolutely measuring certified sensor is required. With the SUV20, the UV-Technik offers both the suitable sensor and the appropriate FUV measurement windows and evaluation devices, such as the UVT 18 monitor. Plant operators, employees of the health authorities, as well as plant engineers and their technical field staff also need the MUV2.4WR respectively the KUV2.4WR reference measuring instrument for the control of DVGW/ÖNORM systems or for calibration of digital sensors. For first-time users or for the testing of new systems, we offer the lending of this reference measuring device as a service. With the aid of the device, the irradiation value achieved in the plant can be measured/checked before ordering a calibrated sensor.

6.3 Instructions for installing UV sensors

UV sensors should be installed in such a way that a meaningful measured value is produced. The sensor signal is usually intended to represent the behavior or the aging of the lamp. Therefore, please consider the following recommendations or, as far as possible, apply them to your application (see the graphic below):

- The screw flange for sensors / measuring windows should be welded in such a way that it is directly aligned with a lamp.
- Welding on sensors / measuring windows itself is not permitted and would render them unusable.
- Installation under water is not permitted. Only the front with the quartz window is water / pressure-tight. The front of the sensors / measuring windows should be flush with the inner wall of the reactor or be inserted into the reactor. This ensures that the sensor or the measuring window can be cleaned with a wiping device or is partially cleaned by the water flow itself.

- Sensors / measuring windows should be placed on the side or horizontal side of the reactor. In the case of installation vertical / above, there is the risk that air bubbles will falsify the measurement; deposits of suspended particles (during standstill periods) during the installation vertically / below could contaminate the sensor or the measuring window.
- Observe the transmission fluctuations that are present during their application. In order to minimize the influence of transmission fluctuations on the sensor signal, the distance between the sensor and the lamp (the water layer to be irradiated) must be kept correspondingly small. The decrease of the UV signal in the water / medium follows a logarithmic relationship. Media with poorer transmission therefore require significantly lower sensor distances than with drinking water. Tables showing this behavior can be found in appendix A of DVGW standard W294. For drinking water, with a very slight fluctuating transmission of > 90% relative to 10 mm, a distance up to 5 cm is no problem. For ballast water with a strongly fluctuating transmission of e.g. 60 ... 90% the distance of the sensor should not be more than 10 mm.
- When installing sensors / measuring windows, the seal must not be forgotten. Sealing at the thread using hemp / Teflon tape is permitted. Measuring windows of type FUV38 can be sealed with an O-ring 33 x 1.5 mm. This is to be ordered separately and is available in various materials (NBR, EPDM and FKM with KTW / DVGW / FDA approval) according to the requirements of the application.
- When mounting sensors / measuring windows, use stainless steel nuts with the appropriate wrench size. The tightening torque as per the data sheet must be observed.
- The standard material of our sensors / measuring windows is stainless steel 1.4404. Special types from 1.4462 are available for salt water applications. The material of the screw-in flange and of the reactor must not be electrochemically more noble than the sensors / measuring windows in order to prevent corrosion damage.
- When installing sensors / measuring windows in the suction branch of UV systems or in the case of steam disinfection of the system, our negative pressure resistant types are to be used.



6.4 Recommendations for the use of FUV measuring windows

FUV measuring windows were designed for use in drinking water disinfection systems according to DVGW worksheet W294-3 and ÖNORM M5873-1. According to the requirements of these standards, the measurement windows are water-tight to 16 bar in the temperature range from + 2 ... + 40 ° C. The geometrical requirements of the standards ensure that the enclosed air volume is minimized by the use of standardized sensors and enable the installed system sensor to be tested with a reference sensor during operation. The SUV20 system sensors are intended for use in FUV measurement windows. With the reference measuring devices MUV2.4WR or KUV2.4WR these sensors can be monitored or calibrated. All of these components are DVGW / ÖNORM-tested, perfectly matched with each other and guarantee safe measured values over a long period of time.

In the meantime, FUV measurement windows are also used in UV systems which have not been designed according to the above standards. For example, we are aware of increased requirements from various applications, which show the values given in the standards or the product information, e.g. In the following respects:

- increased water pressure > 16 bar
- increased operating temperature > 40 °C
- additional vacuum load
- pressure / temperature load due to special cleaning procedures as part of plant maintenance
- salt water / ballast water
- medium pressure applications with very high irradiation intensities

Already our standard measuring windows are designed to withstand loads that are significantly higher than the requirements of the drinking water formats of DVGW and ÖNORM. We therefore assume that the temporary overrun of individual parameters does not lead to any problems. A growing range of special measuring windows is available for increased requirements or exceptional installation situations.

Measuring windows and sensors require careful maintenance. The following hints are intended to help avoid use errors and identify problems.

Installation and exchange of sensors

When inserting the sensor into the measuring window, make sure that the inside of the measuring window is free from condensation. The sensor must also be dry. If a sensor is inserted without prior removal of the moisture, it is compressed between the quartz windows of the sensor and the measuring window due to the small gap (fit) and can penetrate into the sensor. As a result, the sensor can be damaged or at least the measured value can be corrupted. Depending on the room temperature, the air humidity and the water temperature in the reactor, such condensation is quite rapid. For dry cleaning of the inside of the measuring window and the sensor, absorbent and lint-free cloths made of textiles or paper are suitable. The use of detergents soaked with detergents is not permitted since residues can affect the display of the correct UV value. The cleaning / drying of the sensor room must be done carefully. If desired, the sensor space can be dried with a dry compressed air (e.g. compressed air 67 of contact chemistry, order number 85513) before the insertion of a sensor. Under no circumstances may metallic tools be used to which a flap is wrapped. The risk of scratching the surfaces or damage to the quartz window is too great. Furthermore, only a small pressure from the inside should be exerted on the quartz disc of the measuring window in order to avoid pushing out. The insertion of the sensor should therefore be slow for this reason, so that the pressure that is generated inside can slowly escape along the fitting. When comparing the system sensor with the reference measuring device / sensor during operation, ensure that the measuring window is never open for a long time without a sensor. In addition to the possibility of condensation, UV radiation also occurs.! Please do not look into the UV light directly, otherwise your eyes will be injured! We recommend to provide appropriate warnings on the system.

Overhaul and Repair

Despite the selection of specific highly stable materials the sealing rings at the quartz glass disk of the measuring window are subject to aging by UV radiation and water constituents. Based on our experience, we recommend a preventive maintenance of the measuring window, preferably before leaks occur and water can damage the sensor. Our measurement windows are designed so that they can be refurbished/repared cost-effectively, assuming there are not damaged at the stainless steel rotating parts. Depending on the operating conditions, we recommend a replacement of the sealing rings latest after 5 years for MP applications respectively after 10 years for LP applications. Own repair attempts are not advisable. Beside the special seals also special tools and test equipment are required which does not have the user.

Detecting leaks

Usually, leaks inside measuring windows are minimal leaks, where dripping water is very seldom visible. Leakage in measuring windows can easily be recognized on the sensors. The following symptoms may indicate leakages:

- strong drop of displayed UV output in a short period
- moisture inside the sensor or in the sensor chamber
- yellow-brown discoloration in front of the sensors or sporadic staining inside the sensors (see upper picture)
- iridescent water stains inside the measurement window by trapped moisture or leaks (see bottom picture)

If there is a suspicion of leakage of a measuring window, a new sensor must never be installed. Consequential damages to the sensors are not covered by our



warranty in such a case. Please send the measurement window together with the sensor in case of complaint. A final assessment can only be made after the examination at the plant. Should leakages occur during the warranty period and our test results in a manufacturing defect, the damaged sensor is also repaired free of charge.

6.5 Cleaning and maintenance

UV systems should normally be subjected to regular cleaning / inspection, at the latest with each lamp change. As well as the immersion tubes of the lamps, sensors / measuring windows must also be cleaned in regular intervals corresponding to the load in the application. As with the immersion tubes, all standard non-abrasive cleaners are permitted. To remove stubborn layers (e.g., iron), weak acids are also allowed. As already described, the cleaning of the interior of the measuring windows should only be carried out with dry cloths. The cleaning of the quartz window of the sensors / measuring windows has to be done very carefully and not only according to the eye. We are familiar with cases where very thin coatings, which are not visible to the eye, have already resulted in significantly lower measured values. When re-installing, the quartz window must not be touched with the fingers, since skin grease strongly dampens the UV radiation, can burn under UV radiation and thus has a strong influence on the measured values.

Apart from a few exceptions, all our sensors / measurement windows have a flat front and are therefore also suitable for systems with automatic cleaning devices. The usual wet-chemical cleaning methods are also allowed. In case of doubt please contact us.

For systems with special cleaning procedures such as sanitization or hot steam disinfection, we recommend our negative pressure resistant measuring windows. The sensor must be shut down or removed during such cleaning procedures if its permissible operating limits are exceeded.

In addition to the known technical connections, all references given in this document are based on our experience. We accept no guarantee for completeness or accuracy.