

Assembly and operating instructions

Bewades T

UV system

EN



General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

➡ Please read the supplementary information in its entirety.

Information



This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Warning information

Warning information includes detailed descriptions of the hazardous situation, see ➡ Chapter 2.1 'Labelling of Warning Information' on page 6.

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

Tab. 1: More symbols

Symbol	Description
1. ➡	Action, step by step.
⇒	Outcome of an action.
➡	Links to elements or sections of these instructions or other applicable documents.
■	List without set order.
[Button]	Display element (e.g. indicators). Operating element (e.g. button, switch).
'Display /GUI'	Screen elements (e.g. buttons, assignment of function keys).
CODE	Presentation of software elements and/or texts.

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1 About this UV system

Certification

The UV system has been tested and certified in accordance with the currently applicable ÖVGW requirements and characteristic lines. The UV system must be set up, installed and operated in accordance with the design table.

Application

The UV systems are used to disinfect:

- Potable water
- Industrial water

The water to be disinfected is subjected to short-wave UV radiation during the UV disinfection process. This UV radiation kills any germs quickly and reliably.

The UV systems are supplied ready wired. The UV systems are available in different designs, defined by their identity code. The performance data can be found in the data sheet enclosed with the UV system.

Scope of delivery

- Reactor
- Lamp with lamp protection tube
- UV-C sensor
- Pt 1000 temperature sensor
- Control cabinet with control
- Documentation

Available options:

- LAN/Wi-Fi communication interface,
- Stainless steel control cabinet,
- Air-conditioned control cabinet.

1.1 Correct and Proper Use



Correct and Proper Use

The operator is liable for damage caused by installation and operating errors!

- *The system is intended solely for the treatment of water.*
- *The system may only be used in accordance with the technical data and specifications outlined in the operating instructions!*
- *Any other use or modification of the system is prohibited.*
- *The system may only be operated by trained and authorised personnel!*
- *It is imperative that the information in the operating instructions relating to the different phases of the unit's service life is observed!*

2 Safety

2.1 Labelling of Warning Information

Introduction

These operating instructions provide information on the technical data and functions of the product. These operating instructions provide detailed warning information and are provided as clear step-by-step instructions.

The warning information and notes are categorised according to the following scheme. A number of different symbols are used to denote different situations. The symbols shown here serve only as examples.



DANGER!

Nature and source of the danger

Consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger.

Description of hazard

- Denotes an immediate threatening danger. If the situation is disregarded, it will result in fatal or very serious injuries.



WARNING!

Nature and source of the danger

Possible consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger.

- Denotes a possibly hazardous situation. If the situation is disregarded, it could result in fatal or very serious injuries.



CAUTION!

Nature and source of the danger

Possible consequence: Slight or minor injuries.
Material damage.

Measure to be taken to avoid this danger.

- Denotes a possibly hazardous situation. If the situation is disregarded, it could result in slight or minor injuries. May also be used as a warning about material damage.



NOTICE!

Nature and source of the danger

Damage to the product or its surroundings.

Measure to be taken to avoid this danger.

- Denotes a possibly damaging situation. If the situation is disregarded, the product or an object in its vicinity could be damaged.

***Type of information***

Hints on use and additional information.

Source of the information. Additional measures.

- *Denotes hints on use and other useful information. It does not indicate a hazardous or damaging situation.*

2.2 User qualification



WARNING!

Danger of injury with inadequately qualified personnel

The operator of the system / equipment is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

- All work on the unit should therefore only be conducted by qualified personnel.
- Unqualified personnel should be kept away from the hazard zone.

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to.

Training	Definition
Instructed personnel	An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfils the requirements made of an instructed person and who has also received additional training specific to the system from the manufacturer or another authorised distribution partner.
Trained, qualified personnel	A trained, qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his training, knowledge and experience, as well as knowledge of pertinent regulations. A trained, qualified employee must be able to perform the tasks assigned to him independently with the assistance of drawing documentation and parts lists. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrical technician	An electrical technician is able to complete work on electrical systems and recognise and avoid possible dangers independently based on his technical training and experience as well as knowledge of pertinent standards and regulations. An electrical technician must be able to perform the tasks assigned to him independently with the assistance of drawing documentation, parts lists, terminal and circuit diagrams. The electrical technician must be specifically trained for the working environment in which the electrical technician is employed and be conversant with the relevant standards and regulations.
Service	The Service department refers to service technicians, who have received proven training and have been authorised by the manufacturer to work on the system.

2.3 Safety information



WARNING! **UV-C radiation**

Possible consequence: Serious injuries.

UV-C radiation is harmful to the eyes and skin.

- Only operate the UV lamp  when it is fully fitted and installed.
- Install the UV lamp in the UV system in accordance with the regulations prior to commissioning.



WARNING! **Live parts!**

Possible consequence: Fatal or very serious injuries.

- Measure: Disconnect the device from the power supply before opening it.
- Disconnect damaged and defective devices or devices that have been tampered with from the power supply.



WARNING! **Insufficient water treatment**

Possible consequence: Illness.

Please read the technical data sheet for your UV system.

Ensure that:

- The maximum permissible water flow rate is not exceeded.
- The UV transmission does not fall below the permissible level.
 - Otherwise, adequate treatment of the water cannot be guaranteed.



WARNING! **Falling objects**

Possible consequence: Crushing of feet.

Remedy: Wear safety shoes.



CAUTION! **Overheating of the lamp and reactor**

Possible consequence: Material damage.

- Only switch on the UV system after the reactor has been filled with water.



CAUTION!

Unauthorised operating parameters

Possible consequence: Material damage.

Ensure that:

- The installation place is dry and frost-free.
- There is guaranteed protection for the UV system from chemicals, dyes and vapours.
- The ambient temperature and the radiation temperature in the direct vicinity of the system do not exceed 40 °C.
- The maximum permissible operating pressure is not exceeded.
- There are no solid particles and no turbidity in the water to be treated.
- If necessary, fit an appropriate treatment system upstream of the UV system.

2.4 Safety equipment

Labels on reactor

ATTENTION: Hazardous ultraviolet radiation

⚠ UV-C radiation is harmful to the eyes and skin! The UV lamps may only be operated when installed. The UV system should be installed in accordance with all pertinent regulations prior to commissioning the UV lamps.

ATTENTION: Hazard

⚠ Disconnect the system from the mains power supply or switch off the master switch prior to commencing maintenance work. Depressurise the reactor prior to commencing maintenance work.

Labels on control cabinet

⚠ Disconnect the system from the mains power supply or switch off the master switch prior to opening.

2.5 Information in the Event of an Emergency

In the event of an emergency, switch the red-yellow main switch on the side of the control cabinet to OFF or disconnect from the mains power supply.

3 Storage, transport and ambient conditions

3.1 Permissible ambient conditions

During storage

Permissible ambient temperature: - 20 °C ... + 70 °C.

Humidity: maximum 95 % relative air humidity, non-condensing.

Other: No dust, no direct sunlight.

During operation

Permissible ambient temperature: + 5 °C ... + 40 °C.

Humidity: maximum 92 % relative air humidity, non-condensing.

Other ambient conditions: No dust, no direct sunlight. No corrosive gases, vapours and dust.

3.2 Packaging material



Packaging material

Dispose of packaging material in an environmentally responsible way. All packaging components carry the corresponding recycling code ♻️.

The packaging is intended to protect the components from damage before installation. Do not damage the packaging and only remove just before installation.

4 Function

The water to be treated flows through the stainless steel reactor past the UV lamp. UV radiation disinfects the water.

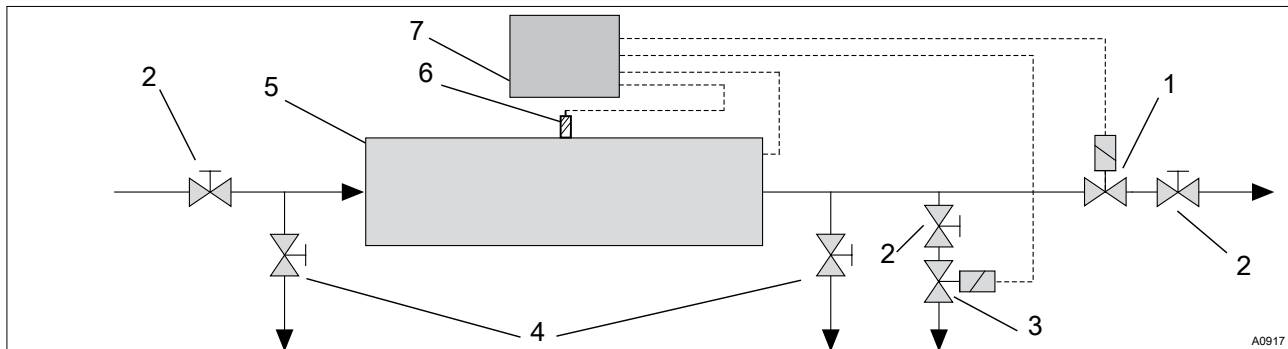


Fig. 1: Typical installation diagram for a UV system

- 1 Shut-off valve
- 2 Shut-off valve
- 3 Flushing valve
- 4 Sampling taps, fireproof

- 5 Reactor
- 6 UV sensor
- 7 Control

The UV low-pressure lamp used generates a very high output of UV radiation, which is effective for the treatment of water. The UV lamp is located in a quartz lamp protection tube with good UV-transparency.

The compact design of the reactor and the flow result in evenly distributed radiation of the entire stream of water.

A control monitors the UV system together with the UV sensor.

4.1 Commissioning

Once the UV system has been switched on, the UV lamps are ignited. Following ignition, the UV lamps need several minutes until the UV lamps reach operating temperature.

The UV sensor monitors the UV lamps. As soon as the UV output has exceeded the minimum radiation intensity threshold, the rinse valve opens for the start rinse.

If the minimum radiation intensity is not exceeded within the maximum permissible warm-up time, then the rinse valve will open regardless. However, if the minimum radiation intensity is also not exceeded within the maximum rinse duration, then the control switches the UV system off and goes into fault mode.

The shut-off valve is opened after the start rinse is completed. The UV system goes into normal mode.

Operation of the UV system in 'Control' operating mode: To ensure the fault-free control of the UV lamps, control of the UV lamps starts 5 minutes after the UV system has started.

4.2 Normal mode

In normal mode, the UV sensor continues to monitor the UV output:

If the UV output falls below the warning threshold: A warning is output.

If the UV output falls below the minimum radiation intensity threshold: The shut-off valve closes and the rinse valve opens. However, If the minimum radiation intensity threshold is also not exceeded within the maximum rinse duration, then the control switches the UV-system off and goes into fault mode.

All UV lamps are monitored to ensure that they operate optimally. If a UV lamp fails, the shut-off valve is closed and the control switches the UV-system off and goes into fault mode.

4.3 Temperature monitoring

The water temperature in the reactor is monitored continuously while the UV lamp is in operation.

As soon as the water temperature exceeds the maximum temperature, the UV system goes into fault mode.

4.4 Switching off

When the UV system is switched off, the shut-off valve closes and the UV lamps are turned off. If the UV lamps require postburning, then the lamps are switched off after the lamp postburning duration has elapsed.

5 Operation and control of the Comfort control, certified

5.1 Control Elements

Control elements

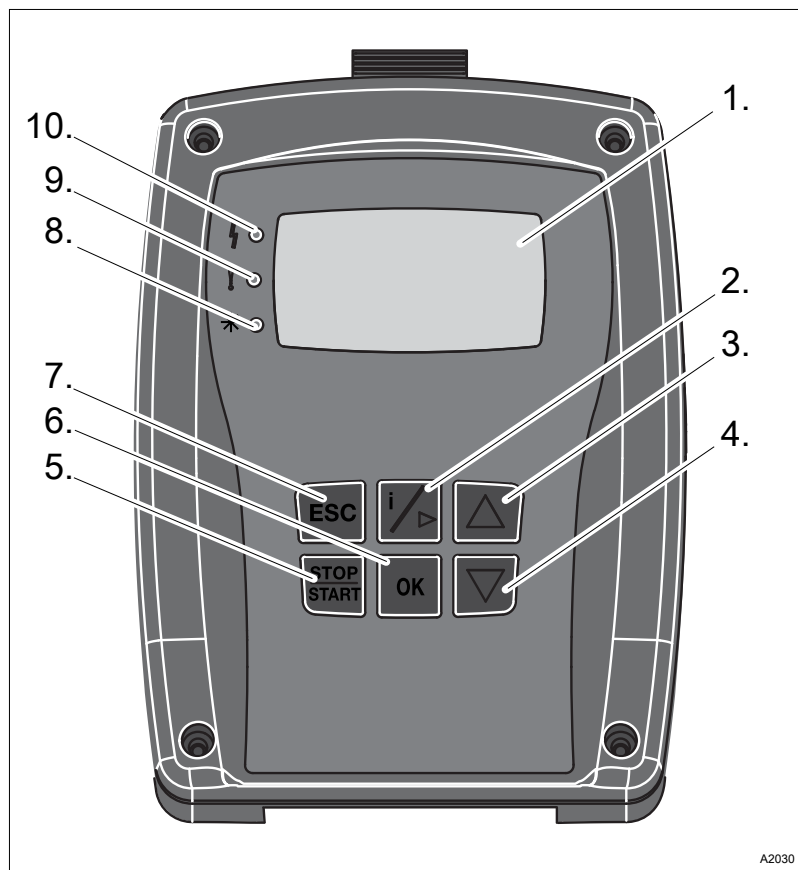


Fig. 2: HMI control elements

- 1 LCD display
- 2 $[i]$ key / jump to value and move to right
- 3 $[UP]$ key
- 4 $[DOWN]$ key
- 5 $[START/STOP]$ key
- 6 $[OK]$ key; jump to the menu.
- 7 $[ESC]$ key
- 8 Operating indicator (green)
- 9 Warning indicator (yellow)
- 10 Fault indicator (red)

Continuous display

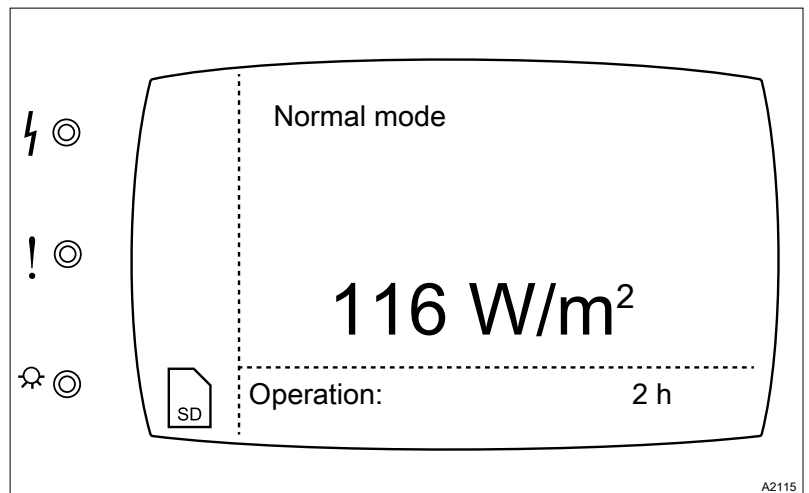


Fig. 3: Continuous display: Normal mode. Display in W/m^2 or J/m^2

LED indicators and symbols

LED and symbols	Function
Red LED	The system is in fault mode.
Yellow LED	The system has warning messages.
Green LED	The system is in operation.
	The SD card is in its socket and is active.
⇒ or ⇐	The flashing arrow symbol means that the wiper is operating and indicates the direction of movement.

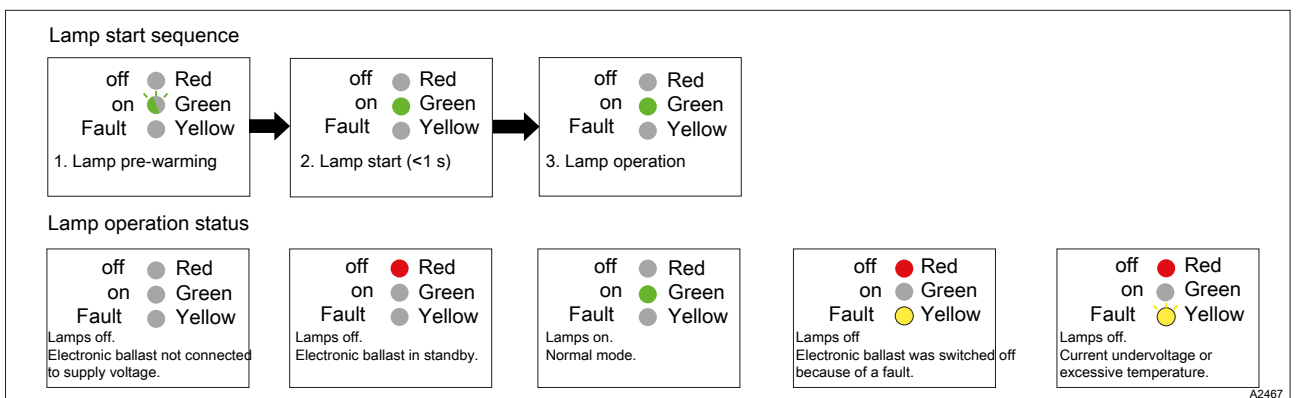


Fig. 4: Operating status and LED displays of lamp operation equipment.

5.2 Data Backup and Menu navigation

SD card



Data backup / limited service life

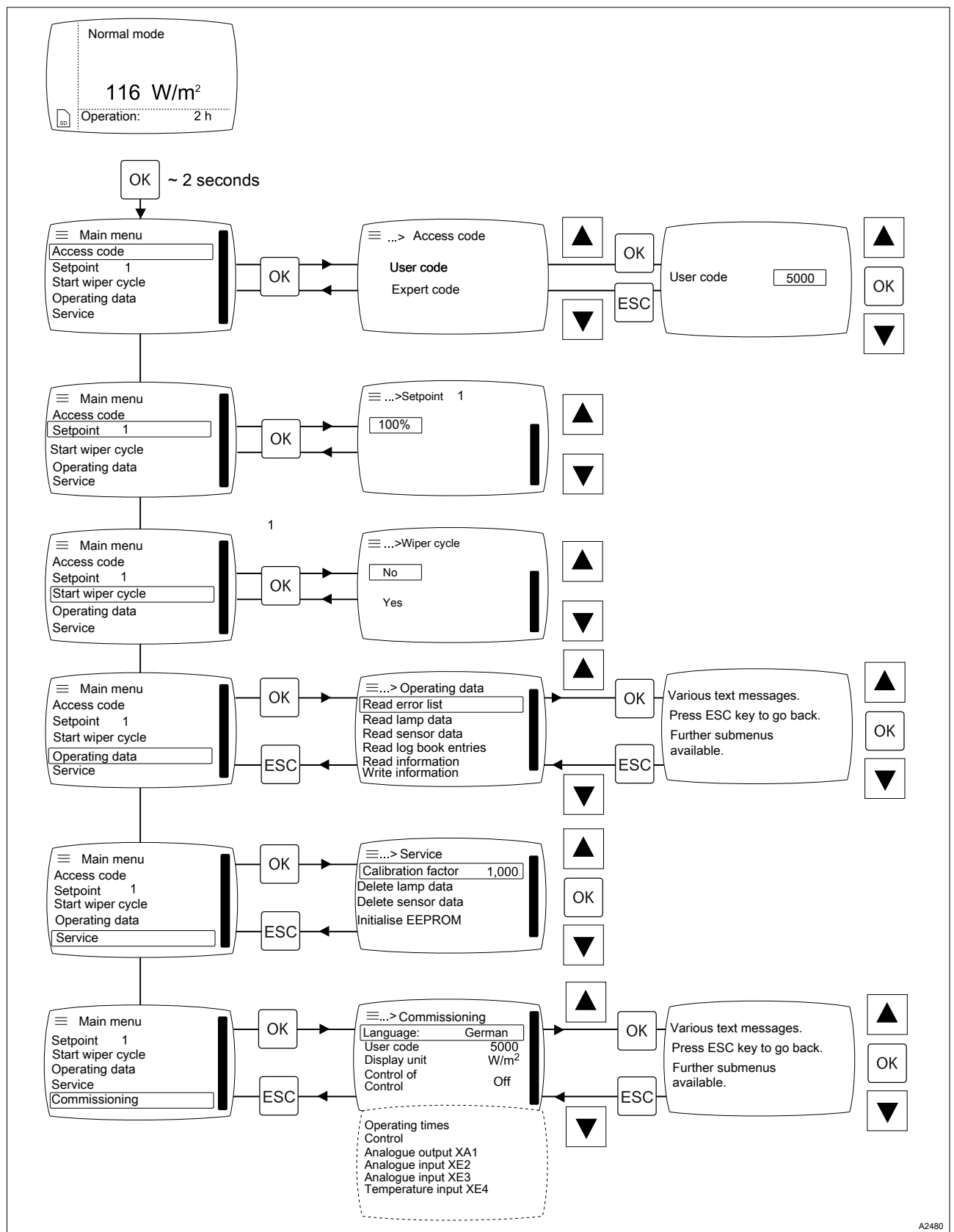
There is a possibility of loss of data with all types of data storage. Data loss can be caused by damage to hardware, software, or unauthorised access etc. The operator of the device is responsible for backing up data recorded by the data logger. This has to be done in accordance with the national and international requirements, regulations and standards applicable to the operator of the device. Define and document this data backup in a backup or recovery plan.

The manufacturer of the device is not responsible for backup or recovery of data.

SD cards only have a limited service life. This service life is based, for example, on the general ageing of the SD card and due to the memory type (Flash Memory) from the fundamentally limited number of write processes. Bear this in mind with your data backup strategy and ensure that you regularly use your SD card.

The maximum size of the SD card is currently 512 MB.

The SD card is currently supplied as an industrial 512 MB SD card. Unlike 'consumer' cards, industrial SD cards have an operating temperature of up to 85 °C and the data is stored twice in the SD card's memory for security reasons.



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Fig. 5: Main menus and sub-menus of the user interface.

5.3 The main menus and the sub-menus

1st level	2nd level	3rd level	4th level	5th level
Main menu	Access code	User code		
		Expert code		
	Setpoint 1 or 2	0 ... 100%		
		or 0 ... max. value m ³ /h		
	Operating data	Read error list	Error number with texts	
		Read lamp data	Lamp number with texts	
		Read sensor data	UV sensor with texts	
		Read log book entries	Measured values	Measured values with texts
			Controller values	Controller values with texts
			Events	Events with texts
		Read information	Software versions	Operator actions with texts
				IO type UVCb-LP
				IO ware 01.00.00.00
				HMI type UVCb-LP
				HMI ware 00.02.06.04
				HMI data 01.00.00.00
				EEP data n02.03.00.02
			Hardware versions	IO board 01.00.00.00
				HMI 01.08.00.00
			Current identity code UVCb*****	
		Write information	Yes/No All setting data is written to the SD card.	
	Service	Calibration factor 1000		
		Delete lamp data		
		Delete sensor data		
		Initialise EEPROM		
	Commissioning	Language German		
		User code 5005		
		Display unit (Physical variable)	W/m ² / J/m ²	

1st level	2nd level	3rd level	4th level	5th level
		Transfer pump control	Yes/No	
		Operating times	Maximum rinsing time	
			Start rinse time	
			Maximum free rinse time	
			Lamp post-burn time	
			Date	
			Time	
			Measured value recording	
		Control	Controller operating mode	No control
				Manual flow
				External flow
			Controller values 1	Setpoint 1
			Delay period of thresholds	Delay period of thresholds
		Analogue output XA1	Current signal: 4 ... 20 mA	
			Max. radiation intensity 100 W/m ²	
		Analogue input XE2	Function	OFF
				Flow
		Analogue input XE3	Function	
			Current signal	
			Max. turbidity	
		Temperature input XE4	Function	OFF
				Temperature

5.4 Adjustable parameters / access code

Tab. 2: Adjustable parameters / access code

Description	Starting value	Increment	Minimum value	Maximum value	Access code	Access condition
Main menu						
Access code	5000	1	1	9999	---	---
Setpoint 1 or 2	100%	1 %	43 %	120 %	User code	---
Setpoint 1 or 2	20 m³/h	0.1 m³/h	0 m³/h	999.9 m³/h	User code	---
Operating data					---	---
Service level 1						
Calibration factor	1	0.001	0.800	1.200	Expert code	System On
Delete lamp data					Expert code	System Off
Delete sensor data					Expert code	System Off
Initialise EEPROM	No	No Yes			Expert code	System Off
Commissioning level 1						
Language	German	German English French Spanish Italian			User code	None
User code	5005	1	1	9999	User code	System Off
Display unit	W/m²	W/m²/ J/m²			User code	System Off
Transfer pump control	Off	Off On			Expert code	System Off
Operating times level 2						
Maximum rinsing time	5 min	1 min	1 min	99 min	Expert code	System Off
Commissioning of rinsing time	1 min	1 min	0 min	99 min	Expert code	System Off
Maximum free rinse time	0 min	1 min	0 min	99 min	Expert code	System Off
Lamp post-burn time	0 min	1 min	0 min	20 min	Expert code	System Off
Date	01.08.2015		01.01.2014	31.12.2100	User code	System Off
Time	12:00		00:00	23:59	User code	System Off
Measured value recording	60 sec	1 sec	1 sec	600 sec	Expert code	System Off
Control level 2						

Description	Starting value	Increment	Minimum value	Maximum value	Access code	Access condition
Controller operating mode	Controller values 1	Controller values 1			Expert code	System Off
		Delay period of thresholds				
Control values 1 level 3						
Setpoint 1	100%	1 %	50 %	100%	User code	System Off
Minimum radiation intensity	50.0 W/m ²	0.1 W/m ²	0.0 W/m ²	Warning threshold 1	Expert code	System Off
Warning threshold	50.0 W/m ²	0.1 W/m ²	Minimum radiation intensity	999.9 W/m ²	Expert code	System Off
Max. flow	1.0 m ³ /h	0.1 m ³ /h	System-specific	System-specific	Expert code	System Off
Delay period thresholds level 3	0 seconds	1 second	0 seconds	1800 seconds	Expert code	System Off
Analogue output XA1 level 2						
Current signal	4 mA	0 ... 20mA			Expert code	None
		4 ... 20 mA				
Max. radiation intensity	100.0 W/m ²	0.1 W/m ²	0.1 W/m ²	999.9 W/m ²	Expert code	None
Analogue input XE2 level 2						
XE2 functional mode	off	off			Expert code	System Off
		Flow				
XE2 current signal	4 mA	0 ... 20mA			Expert code	System Off
		4 ... 20 mA				
Maximum flow value	System-specific	0.1 m ³ /h	0.1 m ³ /h	999.9 m ³ /h	Expert code	System Off
Analogue input XE3 level 2						
XE3 functional mode	off	off			Expert code	System Off
		Turbidity				
		Combined chlorine				
XE3 current signal	4 mA	0 ... 20mA			Expert code	System Off
		4 ... 20 mA				
Max. turbidity	1.00 NTU	0.01 NTU	0.01 NTU	10.00 NTU	Expert code	System Off
Max. combined chlorine	1.00 ppm	0.01 ppm	0.01 ppm	20.00 ppm	Expert code	System Off
Temperature input XE4 level 2						System Off
XE4 functional mode	off	off			Expert code	System Off

Description	Starting value	Increment	Minimum value	Maximum value	Access code	Access condition
		Temperature				
Maximum operating temperature	50 °C	1 °C	0 °C	Max. water temperature less 5 °C	Expert code	System Off

5.5 Access code



'Access code' display

Under the main menu option 'Access code' you enter the known access code. This access code can be the user code or the expert code.

Once the correct access code has been entered, preferences can be set in the service, commissioning, or configuration menus. Once entered, the access code remains enabled for up to 5 minutes after leaving the respective settings menu.

You can input the user code or the expert code in the 'Access code' main menu item. The extent of your rights depends on which of these access codes you have input. You can use the table [Table on page 22](#) to see which code is matched with a given adjustment option. The access code (user or expert) must be entered in the menu item 'Access code' prior to any actions undertaken by the operator. If you have input an access code that is too low to be able to change a certain parameter, you can select the parameter, but cannot change this parameter.

Name	Enables ...	Access code
User code	Enables functions that users must apply in their day-to-day work.	Factory setting: 5005 Adjustable in the menu: 'Commissioning' > 'User code'
Expert code	Enables additional functions that technical experts must use in their day-to-day work.	Is only disclosed during technical expert training courses or on request as system information.

5.6 Setpoints 1 or 2



Warning messages and system faults

To avoid warning messages and system faults, the lamp output should be set so that the sensor signal at the set lamp output is clearly above the warning threshold.

The control can automatically switch between 2 setpoints via a digital contact input. Only setpoint 1 is activated in the factory setting. Setpoint 2 can be activated by the service technician, if required, during commissioning. Please contact the manufacturer's Service department for subsequent activation.

Adjusting the lamp output in control operating mode *'No control'*

In *'No control'* operating mode, the lamp output can be set within a range of 50 ... 100% of the nominal electrical power of the lamp. If during operation, the output of the UV lamp falls and the radiation intensity (sensor signal) reaches or falls below the warning threshold, the lamp output should be altered accordingly.

Adjusting the setpoint in *'Manual flow'* operating mode



Control of the lamp output

The lamp output is only controlled within a range specified by the electric ballast (50 ... 100%).

You can specify the setpoint (maximum possible flow in m³/h) in *'Manual flow'* operating mode. During operation, the lamp output is then controlled so that the minimum radiation intensity assigned to the maximum flow is maintained. Consequently, there is automatic adjustment of the UV system to changing operating conditions, such as lamp ageing, variations in water quality etc.

After inputting the controller value:

- Setpoint (max. flow in m³/h)

the control then calculates from this the associated target radiation intensity and the minimum radiation intensity for the lamp output.

Adjusting the setpoint in *'External flow'* operating mode



Control of the lamp output

The lamp output is only controlled within a range specified by the electric ballast.

You can adjust the lamp output via the analogue signal of an external flow meter in *'External flow'* operating mode.

the control calculates the associated minimum radiation intensity (sensor signal), target radiation intensity and the control variable for the lamp output from the value:

- Flow signal.

The prerequisite for the use of the *'External flow'* function is the connection of a flow meter (4 ... 20 mA) to the analogue input XE2.

There is automatic adjustment of the UV system to changing parameters, such as:

- Fluctuating flow,
- Lamp ageing,
- Fluctuating water quality,
- etc.

5.7 Operating Data

5.7.1 Read error list

The current faults and warnings are displayed along with the fault numbers.

5.7.2 Read lamp data

Information relating to the electronic ballast and connected UV lamps is displayed.

5.7.3 Read sensor data

Information relating to the UV sensor is displayed.

5.7.4 Read log book entries

All events, operator actions, controller values and measured values are displayed. Number 1 is the most recent entry. As the numbers increase, the entries get older.

5.7.5 Measured values

The recorded measured values for the minimum radiation intensity and, if connected, the measured values for both analogue inputs XE2 and XE3 are displayed.

5.7.6 Control Values 1 or 2

The control values set are displayed for:

- Setpoint 1 or 2 (Maximum flow)

5.7.7 Events

The last events will be displayed.

5.7.8 Operator actions

The last operator actions carried out are displayed.

5.7.9 Read information

The software and hardware information, and also identity code, are displayed.

5.7.10 Write information

The adjustment data is written to the SD card in a text file "Report.txt".

5.8 Service

You can only make changes to the service menu with the correct access code. Every change is entered into the log book with the date and time.

5.8.1 Calibration factor

The following applies to certified systems:



WARNING!

Poor disinfection

Cause: Incorrect calibration of the UV sensor.

Consequence: Poor water disinfection.

Measure: Regularly check the UV sensor using a reference radiometer.



WARNING!

UV radiation

Cause: If the UV sensor is removed,  UV radiation, harmful to the eyes and skin, will be emitted from the sensor window when the UV lamps are switched on.

Consequence: Possible irreversible damage to the skin and eyes.

Measure: Operating the UV system with the UV sensor removed is therefore only permissible when checking and recalibrating the UV sensor. Wear the designated protective gear when checking and calibrating the UV sensor e. g. protective goggles.

Always check the UV sensor at least twice a year using a reference radiometer and once a month with flow rates over 100 m³/h. A certified reference radiometer with a valid calibration certificate is required to check the UV sensor.

In the event of an impermissible deviation between the reference measurement and UV sensor, the measured value of the UV sensor must be adjusted using the calibration factor so that the measured value agrees with the reference measurement. According to worksheet DVGW W 294, the calibration factor may only be set within a range of 0.8 ... 1.2. In the event that the deviation between the UV sensor and reference radiometer is so great that the UV sensor display value can no longer be harmonised, replace the UV sensor with a UV sensor with a valid calibration certificate. On this subject, see the specifications in DVGW worksheet W 294.

5.8.2 Delete lamp data

After the lamp has been changed, the operating hours and the number of lamp changeovers can be set to "0" individually for each UV lamp. The total operating hours of the UV system are not affected.

You can reset the lamp data only in the 'Off' state.

5.8.3 Delete sensor data

You can set the operating hours to "0".

The UV sensor data can only be reset in the 'Off' state.

5.8.4 Initialising the EEPROM (restoring factory settings)

If you initialise the EEPROM, then all setting data is reset to its default value:

- All setting data
- All configuration data
- All lamp operating hours and lamp changeovers
- All sensor operating hours
- The operating time of the system

5.9 Commissioning

Adjustments can only be made in the commissioning menu once the correct access code has been entered in "Access code" in the main menu.

5.9.1 Language

You can select between different languages.

5.9.2 User code

The system control has a user code for protection against unauthorised modifications of the system control settings. This user code enables the programming mode for users/operators. You can freely select the user code. The programming mode remains disabled after a change of the user code. The lock is only cancelled when you have input the new user code under *[Access code]*.

5.9.3 Display unit (Physical unit)

The UV sensor monitors the UV output and the disinfection efficiency. The unit of measure of the sensor signal display (radiation intensity) is W/m^2 .

The UV dose of the UV system is calculated depending on the:

- Flow,
- Radiation intensity.

The control calculates the UV dose displayed from these values. The UV dose displayed always lies below the actual UV dose, as the influence of the UV transmission etc. is not taken into consideration. The UV dose can be displayed on the HMI by converting the unit displayed to J/m².

5.9.4 Transfer pump control



CAUTION!

Damage to the UV lamps and reactor

Cause: The UV system may only be operated when the reactor is fully filled with water. With an empty or only partially filled reactor there is a risk of damaging the UV lamps.

Measure: It must be ensured that the reactor cannot run empty when the transfer pump is switched off. As the transfer pump has a certain post-rinse duration, the lamp postburning time should be set to at least one minute. This ensures that water conveyed during the post-rinse period is disinfected.

The pump control system must be activated in order to control the feed pump with the pump relay. The pump relay releases when the UV system is switched off and remains released with *'pump control off'*, even when the UV system is running.

If the UV system is switched on with *'pump control on'* then the UV system will exit warm-up mode only when the warning threshold is exceeded. The pump relay operates.

If the UV system is switched off or the UV system switches over to pause mode, the pump relay will release.

If the minimum radiation intensity is not reached during operation or a UV lamp fails, then the pump relay will release and the UV system switches to fault mode.

5.9.5 Safety threshold



WARNING!

Poor disinfection

Cause: Insufficient radiation intensity of the UV system.

Consequence: Poor disinfection performance of the UV system.

Measure: The safety threshold is dependent on the type of system and the maximum flow through the UV system, which can be taken from the enclosed data sheet for the UV system.

Warning threshold transgressed

The system issues a warning should the UV output drop so far that the sensor signal falls below the warning threshold.

To prevent it from dropping below the warning threshold, clean the UV lamp protection tubes, replace the UV lamps or improve the water quality by means of appropriate water treatment.

Transgression of the warning threshold is signalled on the display (1 downward arrow). A signal device can be connected to the signal relay of the control. The relay is closed when the signal falls below the warning threshold.

Minimum radiation intensity not reached

Reliable and safe water treatment can no longer be guaranteed if the UV output falls so low that the UV sensor signal drops below the safety threshold. In this case, a shut-off valve closes, should one be fitted, and a rinsing process is initiated.

To prevent the value from falling below the safety threshold, clean the lamp protection tubes or replace the UV lamps or improve the water quality by means of appropriate water treatment.

It is indicated on the display (2 downward arrows) if the safety threshold is not reached. If the sensor signal remains below the safety threshold after the rinsing process, the UV system switches off and goes into fault mode. A signal device can be connected to the signal relay of the control. The relay is closed when the signal falls below the safety threshold.

5.9.5.1 Warning threshold

UV systems in operating mode 'No control':

The minimum radiation intensity values and the warning threshold are automatically determined and monitored by the control after input of the maximum flow in accordance with the certified operating characteristics. The warning threshold is 10 % above the minimum radiation intensity.

UV systems in operating mode 'Control on':

The warning threshold is calculated from the flow entered or from the external flow signal.

The warning threshold is 5% above the minimum radiation intensity.

5.9.6 Operating times

5.9.6.1 Maximum rinsing time

The maximum permissible water temperature in the reactor is monitored. In the event of excessive temperature, the UV system automatically activates the rinsing process. If the maximum permissible water temperature does not fall by approx. 5 °C within the maximum permissible rinsing time, the control switches off the UV lamp and enters fault mode.

5.9.6.2 Start rinse time



In most cases, a start rinse time of "1 min" is sufficient.

If there is no rinse valve available, the start rinse time can be set to "0 min".

The start rinse time is intended to ensure that only optimally treated water can flow through to the consumer. As soon as the UV lamps reach operating temperature after ignition and the UV sensor signal has exceeded the minimum radiation intensity, the automatic rinse valve opens (if fitted) for the start rinse process. Only then does the shut-off valve open.

5.9.6.3 Maximum time rinse free

The free rinsing process is primarily used for the disinfection of drinking water. Free rinse times of > 10 hours are often used during drinking water disinfection. After periods of heavy rainfall it is possible that UV transmission will decrease e. g. if the water has poor natural filtering characteristics. The sensor signal then fails to reach the minimum radiation intensity.

During free rinsing the shut-off valve closes and the rinse valve opens. Once the water quality has improved, the UV system switches back to normal mode. However, if the sensor signal fails to exceed the minimum radiation intensity within the maximum rinse free time, then the UV system switches to fault mode.

5.9.6.4 Lamp post-burn time

In large-scale UV systems, it may take some time for the shut-off valve to close in some cases, or for the water flow to be stopped by another means. In the case of drinking water disinfection, the lamp post-burn prevents insufficiently disinfected water from reaching the consumer while the UV system is being shut down. In most cases, a lamp postburning time of 1 minute is sufficient.

5.9.6.5 Setting the date

You can only change the date in the 'Off' state. The European display format is used.

5.9.6.6 Set time

You can only change the time in the 'Off' state. The European display format is used.

5.9.6.7 Measured value recording

You can adjust the time intervals in which the measured values are entered into the log book.

5.9.7 Control

You can set the controller operating modes here.

5.9.7.1 No control

To save energy, the lamp output can be reduced with new UV lamps, and with UV systems operating with a flow rate lower than the maximum permissible flow. There is no control in this operating mode.

The lamp power can be adjusted manually between 50 ... 100% of the nominal electrical power. If during operation, the output of the UV lamp falls and the sensor signal reaches or falls below the warning threshold, the lamp power should be increased incrementally up to the maximum permissible value. The minimum radiation intensity and warning threshold must be set manually.

5.9.7.2 Manual Control

In '*Manual control*' operating mode, specify the setpoint of the sensor signal by inputting the values:

- Flow.

The control calculates the required radiation intensity (sensor signal) from the input values. Consequently, there is automatic control of the UV system to changing operating, such as lamp ageing, variations in water quality etc.

5.9.7.3 Flow Control

In '*Flow control*' operating mode, the lamp output is additionally determined by the external command variable of a 0/4 ... 20 mA signal from a flow meter. The control calculates the required radiation intensity (sensor signal) from the current flow signal. Consequently, there is automatic control of the UV system to changing operating, such as lamp ageing, variations in water quality etc.

5.9.8 Analogue output XA1

The signal from the UV sensor can also be recorded for documentation purposes using a recorder. To do so, connect the recorder to the standard output of the control.

You can select between a standard signal of 0... 20 mA and 4 ... 20 mA:

- 0 or 4 mA corresponds to the sensor signal 0 W/m².
- The 20 mA can be assigned to any maximum W/m² value (0 W/m² ... 999 W/m²).

5.9.9 Analogue input XE2

The analogue input XE2 is permanently related to the flow. You may select 0 ... 20 mA or 4 ... 20 mA.

The measured value is displayed in the secondary display and in the log book, and is also archived on the SD card.

5.9.10 Analogue input XE3

Analogue input XE3 may be used for turbidity measurement or measuring the combined chlorine. You may select 0 ... 20 mA or 4 ... 20 mA. When using inputs for combined chlorine you may select this input to set the setpoint of the sensor signal.

The measured value is displayed in the secondary display and in the log book, and is also archived on the SD card.

5.9.11 Temperature input XE4



Maximum operating temperature

The rinse valve must be adequately sized to achieve sufficient rinsing of the UV system.

To prevent the maximum temperature from being reached during the rinsing process, the water temperature in the display must be set to a significantly lower temperature than the maximum permissible operating temperature.

To prevent overheating of the UV system if there is no flow through the UV system, the rinse valve is opened when the maximum operating temperature is reached. If the maximal permissible water temperature does not fall by approx. 5 °C or if the water temperature increases to the maximum temperature within the maximum permissible 'rinse time in the event of excessive temperature', then the control switches off the UV lamp and switches to fault mode.

5.9.12 Minimum mains voltage



Modifications to the minimum mains voltage may only be carried out by the manufacturer.

Monitoring the mains voltage prevents uncontrolled failure of the UV system and the UV lamps due to insufficient mains voltage. If the mains voltage drops to the minimum value, the control switches to undervoltage mode and the UV system is shut down in a controlled manner. If the mains voltage exceeds the permissible minimum value again, the UV system starts up again automatically.

5.9.13 Other inputs and outputs

5.9.13.1 Pause

The UV system can be switched on and off by opening and shutting an external contact that is connected to the pause input of the controller. It is possible to select whether the UV system starts up with an open or closed pause contact. The pause contact is at pause. The UV system starts up when the pause contact is open.

5.9.13.2 External fault switch input



The 'EXTERNAL FAULT' switch input is bridged when the system is delivered. When the bridge is removed without connecting a fault signalling device, the controller switches to fault mode. The UV system can then no longer be operated.



When a fault signalling device is connected, remove the bridge as otherwise no fault will be reported.

An external fault signalling device can be connected to the 'EXTERNAL FAULT' switch input such as e. g. a flow detector.

5.9.13.3 Signal relay operation

A signalling device can be connected to the signal relay operation. If the UV system has reached normal operating mode, the signal relay operation is activated.

5.9.13.4 Alarm signal relay

A signalling device can be connected to the signal relay alarm. The alarm signal relay drops out if there is a fault or in the event of a power failure.

6 Assembly and Installation

- **User qualification, mechanical installation:** trained and qualified personnel, ↗ Chapter 2.2 'User qualification' on page 8
- **User qualification, electrical installation:** Electrical technician, ↗ Chapter 2.2 'User qualification' on page 8

6.1 Reactor

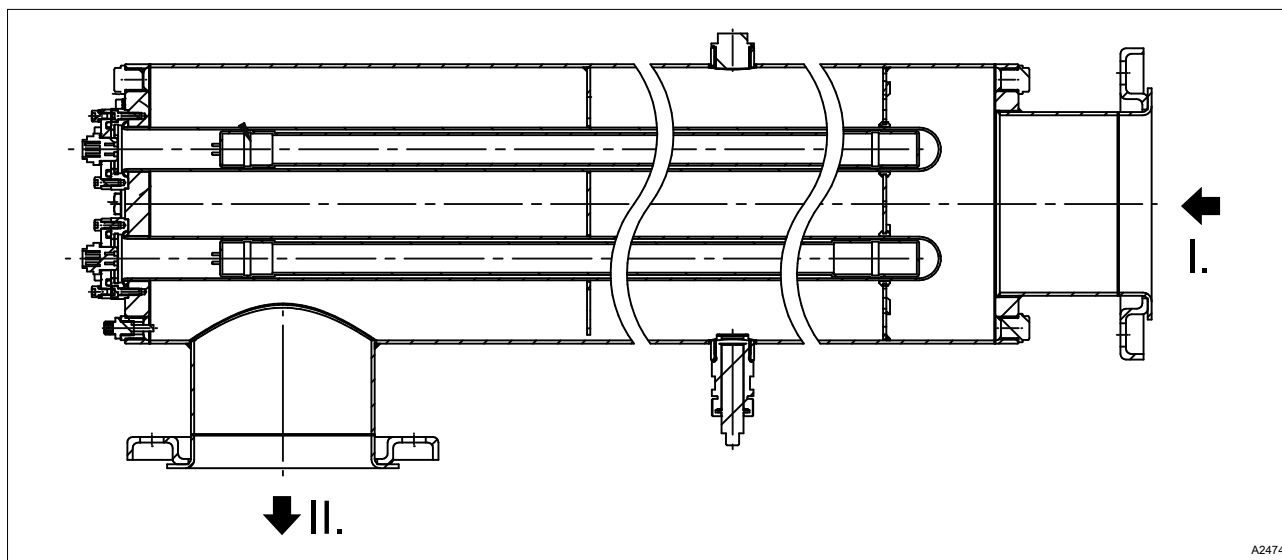


Fig. 6: Reactor

- I. Inlet
- II. Outlet

6.1.1 Assembly

Fitting position



NOTICE!

Maintenance work

Leave adequate room for maintenance work.

The required clearance for maintenance work, e. g. replacing lamp protection tubes and working on the wiper system, can be found in the measurement sheet.

Fix the reactor in place with appropriate fixing material (pipe clamp, frame). The fitting position can in principle be chosen at random and, if required, can be adapted to conditions on site. With UV systems equipped with a wiper, ensure that the wiper can be serviced easily.

6.1.2 Attaching the Warning Sign and Nameplate to the Reactor



NOTICE!

Attach the self-adhesive warning label supplied to the reactor so that it is clearly visible.

- Attach the “Caution UV radiation” warning sign and the “160° opening angle” label directly adjacent to the sensor connector.

6.1.3 Hydraulic Connections



CAUTION!

Installation regulations

Possibility of incorrect assembly.

Carry out hydraulic connection of the reactor in accordance with the applicable general guidelines and local installation regulations.



Information for appropriate installation

- Provide valves upstream and downstream of the reactor to shut off the reactor for maintenance work.
- It is also recommended with reactors, which are regularly cleaned by filling them with a cleaning solution, that the water drain connector and the vent screw are replaced by appropriate valves.
- With larger reactors, it is recommended that they are filled through the water drain opening using an appropriate acid-resistant pump.
- If the reactor is filled with a pump, it is also useful to circulate the cleaning solution through the vent opening. This shortens the cleaning time and achieves a better result.

6.2 Control Cabinet and Control

6.2.1 Assembly



NOTICE!

Do not lay power cables (lamp cable, mains power line etc.) and signal cables (sensor connector cables etc.) together.

Fit the control cabinet or the mounting panel with control and electronic ballast to the wall or a suitable frame so that the UV lamp and UV sensor can be connected to the cables provided.

6.2.2 Electrical connections



WARNING!

Electrical connections

Possible consequence: Fatal or very serious injuries.

- Please observe all generally applicable guidelines and local installation regulations.
- Only carry out installation work on the UV system if it is disconnected from the mains power supply.
- Connect a protective earth conductor to the reactor and to the reactor cover. Ensure a continuous power supply by means of a suitable fault current protection.
- Only an authorised electrical technician may open the control cabinet!
- Do not lengthen the connecting cable for the UV lamp or the UV sensor cable.
- The electrical installation must be carried out by an authorised electrical technician using the documents supplied (wiring diagram).

6.2.3 Fitting the temperature sensor

Screw the temperature sensor, which monitors the water temperature, into the thread provided for this on the front of the reactor.

1. ➞ Screw the temperature sensor into the thread until hand-tight.
2. ➞ Attach the connecting cable and fix in place.

6.2.4 Connection of the UV Sensor or the Measuring Window



Only use food-safe lubricant.

The quartz window must not come into contact with lubricant.

1. ➞ Guide the O-ring over the thread of the UV sensor/measuring window up to the sealing groove.
2. ➞ Grease the thread of the UV sensor/measuring window.
3. ➞ Screw in the UV sensor/measuring window and gently tighten.
4. ➞ Connect the UV sensor using the sensor connection cable.
5. ➞ Guide the UV sensor into the measuring window and connect the sensor cable.

6.3 Fitting the UV Lamp Protection Tube

1. ➤ Loosen the bracket of the UV lamp protection tube with an Allen key and remove it.
2. ➤ Carefully pull the transport protection (grey plastic pipe) completely out of the reactor.
3. ➤ Carefully push the UV lamp protection tube until it reaches its stop position in the reactor.
4. ➤ Push a new O-ring onto the end of the UV lamp protection tube.
5. ➤



CAUTION!

- Check the UV lamp protection tube for damage before fitting.
- Never re-fit a damaged UV lamp protection tube.
- Ensure that the UV lamp protection tube is sitting correctly.

6.4 Assembly and connection of the UV lamps



WARNING!

Electrical installation

Cause: Danger from electrical voltage.

Possible consequence: Fatal or very serious injuries.

Measure: Prior to assembly and connection of the UV lamps, switch off the master switch or pull the mains plug out of the socket.



WARNING!

UV-C radiation

Cause: Danger from ☠️ UV radiation.

Consequence: UV radiation is harmful to the eyes and skin.

Measure: Only start up the UV lamps when they are properly installed.



NOTICE!

Premature UV lamp failure

Never touch the UV lamp glass with bare hands.

Fingerprints burn into the glass and can result in premature failure. Use a cloth moistened with alcohol to clean off fingerprints from the lamp before installation.



Install the UV system in accordance with all pertinent regulations prior to commissioning

With free-standing UV systems, attach the connecting plug with lamp cover to the UV lamp before the UV lamp is inserted into the lamp protective tube.

1. ➤ Place the O-ring into the groove provided on the lamp protection tube holder.
2. ➤ Insert the UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm.
3. ➤ Attach the connector plug with lamp cover to the UV lamp.
4. ➤ Insert the UV lamp fully into the lamp protection tube
5. ➤ Place the UV lamp cover onto the UV lamp protection tube.
Use an Allen key to screw in the fixing bolts provided and tighten.
6. ➤ Attach the pin plug with the lamp connection cable to the socket on the cover of the lamp and fix in place with the knurled nut.

7 Commissioning

- **User qualification, commissioning:** trained user, see  Chapter 2.2 'User qualification' on page 8



Avoid frequent switching operations

Avoid short switching intervals and switching operations. Frequent switching operations can have a negative effect on the service life of the UV lamp.

7.1 Checking the programming of the control



WARNING!

Insufficient water treatment

Please refer to the technical data sheet for your UV system

Ensure that:

- the maximum permitted flow of water is not exceeded, as otherwise adequate treatment of the water cannot be guaranteed as the radiation dose is too low.

7.2 Leak testing and ventilation of the reactor

1.  Open the bleed valve on the reactor.
2.  Slowly open the shut-off valve upstream of the reactor.
3.  Fill the reactor until water emerges from the bleed valve.
4.  Close the bleed valve.
5.  Check the reactor for leaks.
6.  Open the shut-off valve downstream of the reactor (only necessary with a manual shut-off valve).

7.3 Switching on the UV system

During commissioning, the continuous display of the UV system shows *'Warm-up phase'*.

The following symbols appear in the status display:

- A downward arrow indicates that the warning threshold has been transgressed.
- Two downward arrows indicate that the value has fallen below the safety threshold.
- The disc symbol indicates that a SD card has been inserted.

The following information appears in the secondary display on a continuous rolling basis:

- The remaining warm-up time is displayed.
- If available, the temperature is displayed.
- If available, the measured values for both analogue inputs are displayed.

1. ➤ Switch on the UV system using the *[START/STOP]* key. To do so, hold down the *[START/STOP]* key for at least 2 seconds
 - ⇒ The *'Warm-up phase'* display appears
2. ➤ The *'Normal mode'* display appears
 - ⇒ Once the UV lamps have ignited, it can take several minutes until the full UV output has been reached.
3. ➤ Should an error message appear, evaluate the error message, taking into account chapter 9 *'Troubleshooting (faults and warnings)'* on page 49 in this regard.
4. ➤ Enter the required control type.
5. ➤ Enter the safety threshold and the warning threshold in the control.
 - ⇒ The UV system is now ready for operation.

7.4 Adjustable functions and parameters

Menu	Property
Display unit	The display unit can only be changed in <i>'Off'</i> status.
Transfer pump control	The transfer pump control can only be changed in <i>'Off'</i> status.
Minimum radiation intensity	This menu only appears with UV systems for which no control has been provided.
Warning threshold	This menu only appears with UV systems for which no control has been provided.
Maximum rinsing time	The maximum rinsing time can only be changed in <i>'Off'</i> status.
Maximum free rinse time	The maximum rinse-free time can only be changed in <i>'Off'</i> status.
Lamp post-burn time	The lamp post-burn time can only be changed in <i>'Off'</i> status.
Set date	The date and time can only be changed in <i>'Off'</i> status. The European display format is used for both parameters.
Set time	
Measured value recording	The measured value recording shows the time intervals at which the measured values are entered into the log book.

Menu	Property
Control	Only with UV systems that support the control function ■ No control ■ Manual control ■ External control
Analogue output XA1	The analogue output is used for issuing the radiation intensity. The analogue output shows the display value as a current signal.
Analogue input XE2	The analogue input XE2 is permanently related to the flow. The analogue input XE2 can be used to control the radiation intensity. The measured value is displayed in the secondary display and in the log book, and is also archived on the SD card.
Analogue input XE3	Various measured values can be assigned to the analogue input XE3. The measured value is displayed in the secondary display and in the log book, and is also archived on the SD card.
Temperature input XE4	The operating temperature is used to monitor the water temperature in the reactor. The setting value is limited by the maximum water temperature, which can only be adjusted in the configuration menu. The measured value is displayed in the secondary display and in the log book, and is also archived on the SD card.

8 Maintenance

8.1 General Information

- **User qualification:** trained user, see  Chapter 2.2 'User qualification' on page 8



WARNING!

UV-C radiation

Possible consequence: Serious injuries.

UV-C radiation is harmful to the eyes and skin.

- Only operate the UV lamp  when it is fully fitted and installed.
- Install the UV lamp in the UV system in accordance with the regulations prior to commissioning.



WARNING!

Live parts!

Possible consequence: Fatal or very serious injuries

- Measure: Disconnect the device from the power supply before opening it.
- Disconnect damaged and defective devices or devices that have been tampered with from the power supply.



CAUTION!

General precautionary measures

Ensure that the reactor is at atmospheric pressure before carrying out any maintenance work.



NOTICE!

Maximum permissible service life

Replace the UV lamps at the latest after their maximum permissible service life. Otherwise, the operating safety of the UV system can no longer be guaranteed.

The maximum permissible service life is 14,000 operating hours, unless otherwise stated in the accompanying data sheet.



NOTICE!

Cleaning the UV lamp protection tube

Clean the tube when the UV sensor signal falls below the warning threshold, without this being based on other causes, such as ageing of the UV lamp or significant worsening of the UV transmission.



Phosphoric acid-based cleaning agent

Internal chemical cleaning of the UV system: we recommend using a phosphoric acid-based cleaning agent. A cleaning solution with a concentration of 20 ... 30% of cleaning agent is recommended for the internal cleaning of the UV system by filling the reactor.

Manual chemical cleaning of the UV system: we recommend using a phosphoric acid-based cleaning agent. A cleaning solution with a concentration of 1 ... 3 % of cleaning agent is recommended for the manual chemical cleaning of the UV system.

Maintenance of the UV system is limited to cleaning the UV sensor/UV sensor window and replacing the UV lamp at the end of its maximum permissible service life.

An operating log must be maintained to document any maintenance work carried out; a form is included in the Appendix.

8.2 Cleaning with Cleaning Solution by Filling the UV System



NOTICE!

Handling the cleaning solution

- It is also recommended with reactors, which are regularly cleaned by filling them with a cleaning solution, that the water drain connector and the vent screw are replaced by appropriate valves.
- With larger reactors, it is recommended that they are filled through the water drain opening using an appropriate acid-resistant pump.
- If the reactor is filled with a pump, it is also useful to circulate the cleaning solution through the vent opening.
 - This shortens the cleaning time and achieves a better result.
- If the cleaning solution is collected and stored in a suitable storage tank, it can be reused several times.

Cleaning the lamp protection tubes by filling the reactor with a cleaning solution:

1. ➤ Switch off the UV system.
2. ➤ Switch off the master switch or disconnect it from the mains power supply.
3. ➤ Close the shut-off valves upstream and downstream of the radiation chamber.
4. ➤ Drain the reactor.
5. ➤ Screw in the water drain screw again and tighten using minimal force.
6. ➤ Fill the reactor with the cleaning solution through the vent opening.
 - ⇒ Allow the cleaning solution to work for at least 20 minutes.
7. ➤ Open and remove the water drain screw.

8. ➤ Empty the reactor and dispose of the cleaning solution in accordance with the applicable regulations.
9. ➤ Flush the reactor thoroughly with clean water until all residue of cleaning solution has been removed.
10. ➤ Screw in the water drain screw and tighten using minimal force.
11. ➤ Slowly open the shut-off valve upstream of the reactor.
12. ➤ Fill the reactor until water emerges from the vent screw.
13. ➤ Close the air vent screw and tighten it using minimal force.
14. ➤ Open the shut-off valve downstream of the reactor, which is only necessary with a manual shut-off valve.
 - ⇒ Check the reactor for leaks.
15. ➤ Switch on the master switch or connect to the mains power supply.
 - ⇒ The UV system is ready for operation again.

8.3 Dismantling and cleaning the UV lamp protection tube/sensor window

**WARNING!****UV-C radiation**

Possible consequence: Serious injuries.

UV-C radiation is harmful to the eyes and skin.

- Only start up the UV lamp  when it is properly installed.
- Install the UV lamp into the UV system in accordance with the regulations prior to commissioning.

**WARNING!****Live parts!**

Possible consequence: Fatal or very serious injuries.

- Measure: Disconnect the unit from the power supply before opening it.
- Disconnect damaged and defective units or units that have been tampered with from the mains power supply.



CAUTION!

Fingerprints on the UV lamp

Possible consequence: Premature failure of the UV lamp.

- Only touch the glass of the UV lamp when wearing cotton gloves.
- Fingerprints or impurities burn into the glass and can result in premature failure.
- For this reason, always clean the lamp thoroughly with a cloth moistened with alcohol before installing it.
- Then wipe the UV lamp with a soft, dry cloth.



Cleaning the UV sensor window

Clean the UV sensor window every time you clean the UV lamp protection tube.

Cleaning after dismantling the UV lamp protection tube

1. ➤ Switch off the UV system.
2. ➤ Close the shut-off valves upstream and downstream of the reactor.
3. ➤ Switch off the main switch or disconnect the system from the mains power supply.
4. ➤ Empty the reactor.



WARNING!

Hot UV lamp

Possible consequence: Burns to the skin.

Measure: Switch off the UV system 5 minutes before carrying out installation work.

5. ➤ Use an Allen key to loosen the fixing bolts of the UV lamp cover and remove the UV lamp cover and the UV lamp.
6. ➤ Place the UV lamp cover and the UV lamp fully to one side.
7. ➤ Loosen the UV lamp protection tube with a face spanner and remove it, placing the tool on the holes, not on the threads.
8. ➤ Carefully remove the UV lamp protection tube fully from the reactor and place on a suitable clean surface.
9. ➤ Remove the O-ring from the UV lamp protection tube.
10. ➤ Wash the UV lamp protection tube with cleaning solution or immerse it in cleaning solution until the film has been removed without leaving a trace.
11. ➤ Rinse the UV lamp protection tube with clean water and dry thoroughly with a soft cloth.
12. ➤ Dismantle the UV sensor from the UV sensor window.
13. ➤ Twist the UV sensor window out of the reactor.
14. ➤ Clean the quartz window with a cloth that has been saturated with cleaning solution until the coating has been removed without leaving a trace.
15. ➤ Rinse the quartz window with clean water and dry with a soft cloth.

UV sensor window

Fitting the UV lamp protection tube

16. ➤ Fit a new O-ring.
17. ➤ Screw in the UV sensor window again and tighten using minimal force.
18. ➤ Connect the sensor connection cable to the UV sensor.
19. ➤ Carefully push the UV lamp protection tube until it reaches its stop position in the reactor.

20. ➤

**CAUTION!**

Check the UV lamp protection tube for damage before fitting

- Never re-fit a damaged UV lamp protection tube.
- Ensure that the lamp protection tube is sitting correctly.

Push a new O-ring onto the end of the UV lamp protection tube.

**Condition of the O-ring**

Check whether the O-ring on the UV lamp protection tube bracket is seated in the groove provided. Ensure that the sealing surfaces on which the O-ring sits are completely smooth and clean.

21. ➤ Screw the UV lamp protection tube into the reactor cover.

**Leak test**

Following this, check the leak-tightness of the UV system.

22. ➤ Attach the connector plug with lamp cover to the UV lamp.
23. ➤ Fully insert the UV lamp into the lamp protection tube
24. ➤ Place the UV lamp cover onto the UV lamp protection tube.
Use an Allen key to screw in the fixing bolts provided and tighten.
25. ➤ Attach the pin plug with the lamp connection cable to the socket on the cover of the lamp and fix in place with the knurled nut.
26. ➤ Connect the cable plug to the temperature monitor.
27. ➤ Switch on the main switch or connect the system to the mains power supply.
28. ➤ Slowly open the shut-off valve upstream of the reactor.
29. ➤ Open the shut-off valve downstream of the reactor, which is only necessary with a manual shut-off valve.
30. ➤ Switch on the UV system.

8.4 Replacing the lamp



WARNING!

Live parts!

Possible consequence: Fatal or very serious injuries.

- Measure: Disconnect the device from the power supply before opening it.
- Disconnect damaged and defective devices or devices that have been tampered with from the mains power supply.



WARNING!

UV-C radiation

Possible consequence: Serious injuries.

UV-C radiation is harmful to the eyes and skin.

- Only start up the UV lamp  when it is properly installed.
- Install the UV lamp into the UV system in accordance with the regulations prior to commissioning.



WARNING!

Insufficient treatment efficiency

Possible consequence: Illness.

Please read the Technical Data Sheet accompanying your UV system.

- Replace the UV lamps with new lamps at the very latest when:
 - The UV sensor signal approaches the minimum radiation intensity without this being due to other causes, such as the formation of a coating on the UV lamp protection tubes or a serious deterioration of the UV-transmission.
 - The operating life of the UV lamp is approaching the maximum service life of the lamp or has exceeded it.



CAUTION!

Fingerprints on the UV lamp

Possible consequence: Premature failure of the UV lamp.

- Only touch the glass of the UV lamp when wearing cotton gloves.
- Fingerprints or impurities burn into the glass and can result in premature failure.
- For this reason always clean the lamp thoroughly with a cloth moistened with alcohol before installing it.
- Then wipe the UV lamp with a soft, dry cloth.

**NOTICE!**

Clean the lamp protection tubes each time a lamp is replaced.

Dispose of used lamps in accordance with the applicable guidelines and directives. Usually they can be disposed of together with used fluorescent tubes.

1. ➤ Deactivate the UV system.
2. ➤ Switch off the master switch or disconnect it from the mains power supply.
3. ➤ Close the shut-off valves upstream and downstream of the reactor.
4. ➤ Loosen the fixing bolts of the lamp cover using an Allen key, remove the lamp cover and pull out the lamp by approximately 100 mm.
5. ➤ Loosen the UV lamp at the cable clamp with the aid of a slotted head screw driver.
6. ➤ Fully remove the UV lamp and place it to one side.
7. ➤ Check whether the O-ring on the UV lamp protection tube bracket is in the groove provided – ensure that the sealing surfaces of the O-rings are completely smooth and clean.
8. ➤ Fix the UV lamp to the cable clamp with the aid of a slotted head screw driver.
9. ➤ Insert the UV lamp fully into the UV lamp protection tube.
10. ➤ Place the UV lamp cover onto the UV lamp protection tube bracket and, using the fixing bolts provided, screw in and tighten with an Allen key.
11. ➤ Switch on the main switch or connect up to the mains power supply.
12. ➤ Switch on the UV system.
13. ➤ Slowly open the shut-off valve upstream of the reactor.
14. ➤ Open the shut-off valve downstream of the reactor (only necessary with a manual shut-off valve).
15. ➤ Delete the lamp data in the controller.

**WARNING!****Insufficient treatment efficiency**

Possible consequence: Death or illness.

Check minimum radiation intensity and warning threshold.

Check and, if necessary, reset the minimum radiation intensity and warning threshold when the UV lamp is replaced.

Only a correctly adjusted minimum radiation intensity will guarantee adequate treatment.

8.5 Calibrating the UV Sensor

Calibrate the UV sensor according to the instructions in Chapter .

9 Troubleshooting (faults and warnings)

The display can be in W/m^2 or J/m^2 depending on the setting.

9.1 The display in *[Fault]* status

The display in *[Fault]* status

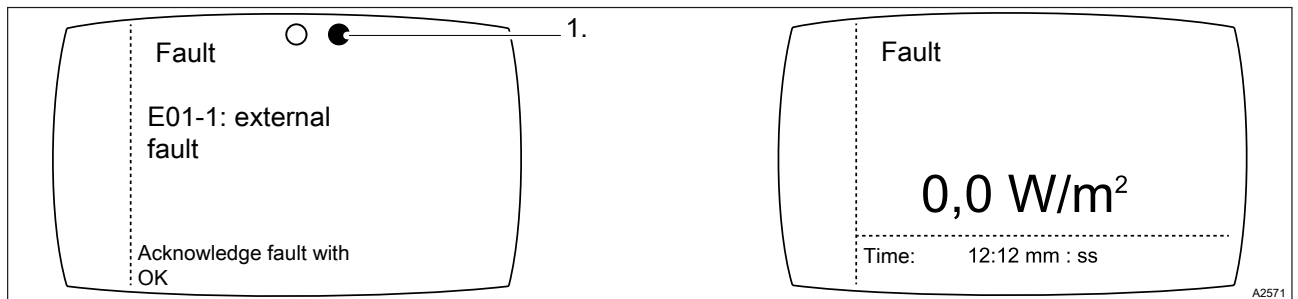


Fig. 7: Fault → Acknowledge [OK] → UV system [Off] ($0.0 W/m^2$) / Lamp cool-down period countdown

- 1 The two dots indicate that there is a second display for this fault and that you can move to it with the *[i]* key.

LED	Function
Red LED	The system is in fault mode
Yellow LED	The system has warning messages
Green LED	The system is in operation

9.2 Warning Messages

Tab. 3: Warning messages

Warning message	Possible cause	Remedy
Temperature sensor missing.	No temperature sensor connected.	Connect temperature sensor.
	Temperature sensor defective.	Replace temperature sensor.
	Temperature sensor cable connection defective.	Check and repair cable connection.
Undervoltage threshold undershot.	Power supply unstable.	Check and repair power supply.
		Dimension power supply adequately.
Mains voltage too low.	Power supply unstable. Mains voltage below the minimum required voltage.	Check and repair power supply.
		Dimension power supply adequately.
SD card not inserted.	SD card not in slot.	Insert SD card into slot.
	SD card defective.	Replace SD card.
SD card is locked.	The slider on the SD card is set to "LOCK".	Unlock SD card.
	SD card defective.	Replace SD card.
SD card is full.	SD card memory is full.	Back up data externally and clear the SD card memory.
	SD card defective.	Replace SD card.
The operating time of UV lamp X has expired.	The maximum permissible usage period of UV lamp X has been reached.	Replace UV lamp.
Warning threshold not reached ↓	The sensor signal is below the warning threshold:	
	Lamp output too low	Increase lamp output. With UV systems with manual step control, increase the output with the rotary dial.
	Deposit formation on the lamp protection tube and/or UV sensor	Trigger wiper cycle; clean lamp protection tube and/or UV sensor if necessary
	Deterioration of the UV transmission of the water to be treated	Improve water quality by suitable pretreatment
	UV lamp at the end of its service life	Replace UV lamp
	UV sensor not calibrated	Check UV sensor and if necessary, calibrate or replace UV sensor
XE2: Current < 4 mA	The current at the signal input is below 3.6 mA.	Check and repair cable connection.
XE3: Current < 4 mA		Check and repair connected measuring devices.
Temperature too high	The maximum set operating temperature is exceeded.	Water temperature is above the maximum set temperature. A flushing process is triggered. If the temperature does not decrease within the water cooling time of 5 min., the UV system switches to Fault status.

9.3 Fault messages



Acknowledging a fault message

The UV system is immediately switched off in the event of a fault. You can acknowledge this fault with the [OK] button.

Once you have acknowledged a fault, the UV system switches from the [Fault] mode to [Off] mode. Before starting up the UV system, check whether any troubleshooting measures implemented have been successful. A restart makes sense only if all fault-related errors have been rectified.

Tab. 4: Fault messages

Fault messages	Possible cause	Remedy
E01-1: External fault	The "External fault" digital input responds.	Eliminate cause of external fault.
	No external fault indicating device connected.	Bridge contacts at fault input.
E02-1: Excessive temperature	The maximum permissible water temperature of 65°C has been exceeded.	Lower water temperature of the process.
E03-1: Water cooling-down time has been exceeded	The maximum set operating temperature continues to be exceeded after automatic flushing process.	Lower water temperature of the process.
E04-1: Radiation intensity too low ↓↓	The sensor signal is below the minimum radiation intensity:	
	Lamp output too low.	Increase lamp output.
	Deposit formation on the lamp protection tube and/or the UV sensor/sensor window.	Trigger wiper cycle; clean lamp protection tube and/or UV sensor/sensor window.
	Deterioration of the UV transmission of the water to be treated.	Improve water quality by suitable pretreatment.
	UV lamp at the end of its service life.	Replace UV lamp.
	UV sensor not calibrated.	Check UV sensor and if necessary, calibrate or replace UV sensor.
	Faulty setting of the warning threshold or minimum radiation intensity.	Check warning threshold or minimum radiation intensity and adjust if necessary.
	Electronic ballast defective.	Replace electronic ballast.
	Electrical contact problems.	Check terminals in the control cabinet, lamp connection terminals and lamp cable and repair if necessary.

*X = Number of components, e. g. UV lamp number 5.

**EB = Electronic ballast.

Fault messages	Possible cause	Remedy
E08-1: UV sensor < 10 mV	Sensor voltage less than the minimum permissible sensor voltage:	
	UV sensor defective.	Replace UV sensor.
	Electrical contact problems.	Check terminals in the control cabinet and sensor cables and repair if necessary.
E06-1: XE2: Flow < 4 mA	Signal input activated as controller variable.	No device connected to signal input. Cable break.
	The current at the signal input is below 3.6 mA.	External device or UV controller mA input incorrectly configured.
E07-1: XE2: Setpoint < 4 mA	Signal input activated as controller variable.	No device connected to signal input. Cable break.
	The current at the signal input is below 3.6 mA.	External device or UV controller mA input incorrectly configured.
E01-2: Fault in EB** X*	Supply voltage at EB** X* outside the permissible range.	Check supply voltage and stabilise if necessary.
		Check cabling and repair if necessary.
E02-2: Fault in EB** X*	Fault in UV lamp X*.	Check cabling and repair if necessary.
		Replace UV lamp.
		Replace EB**.
E03-2: Earth leakage at EB** X*	Earth leakage at EB** X*.	Check cabling and repair if necessary.
		Replace EB**.
E04-2: Temperature at EB** X*	Maximum permissible temperature at EB** exceeded.	Check fan for EB** X* cooling and repair if necessary.
		Check fan fuse and repair if necessary.
E05-2: Time out at EB** X*	No communication between UV system controller module and EB** X*.	Check cabling between controller module and EB** X* and repair if necessary.
		Replace EB** X*.
		Replace controller module.

*X = Number of components, e. g. UV lamp number 5.

**EB = Electronic ballast.

10 Technical data

Performance data



NOTICE! Data sheet

This technical data supplements the enclosed data sheet. If in doubt, the information on the data sheet applies.

Type	Number of lamps	Lamp power	Connected power
230W230	1	260 W	310 W
350W350	1	370 W	430 W
700W350	2	2x370 W	835 W
690W230	3	3x260 W	825 W
1050W350	3	3x370 W	1240 W
1400W350	4	4x370 W	1645 W
2100W350	6	6x370 W	2455 W

Type	Minimum clearance for maintenance work	Empty weight / Operating weight Reactor	Volume in litres Gross Net
230W230	1065 mm	19 kg / 32 kg	14.8 - 13.5
350W350	1465 mm	30 kg / 60 kg	30.8 - 29.0
700W350	1465 mm	56 kg / 128 kg	72.4 - 68.8
690W230	1065 mm	65 kg / 139 kg	82.6 - 78.8
1050W350	1570 mm	84 kg / 219 kg	135.9 - 130.4
1400W350	1570 mm	96 kg / 259 kg	164.3 - 156.7
2100W350	1570 mm	137 kg / 347 kg	213.4 - 201.9

Permissible operating temperatures:

- Water temperature:
 - Temperature during operation: 2 ... 70 °C
 - Temperature in dimmed mode: 2 ... 40 °C
- Ambient temperature: 5 ... 40 °C

Requirements for the water to be treated:

- Maximum operating pressure: 10 or 16 bar, see nameplate on the UV system
- No corrosive or abrasive properties, chloride content < 250 ppm
- No tendency for sedimentation

10.1 Requirements for CIP Processes



NOTICE!

Chemical cleaning processes

Note the following with UV systems integrated into chemical cleaning processes (CIP):

- Do not use any corrosive cleaning chemicals, e.g. HCl (hydrochloric acid).
- The maximum temperature of the CIP process may not exceed the following values:
 - 90 °C with alkaline cleaning media.
 - 50 °C with acidic cleaning media.
- Switch off the UV system during the CIP process.

10.2 Setting Data

Refer to

10.3 Control Cabinet



Wiring diagram provided

A system-specific wiring diagram (appendix) is supplied with the UV system. In the event of any differences between the operating instructions and system-specific wiring diagram, the system-specific wiring diagram applies.

Fuses

Fuse	Current strength	Function
F6	1.6 ampere / time-delay	For internal electronics modules.
F4	3.1 ampere / time-delay	For connected relay GN.
F2	3.1 ampere / time-delay	For 3 connected outputs.

Control Cabinet

Tab. 5: Nominal voltage

230 V AC $\pm$ 10%

50/60 Hz

Tab. 6: Contact inputs (XK2, XK3, XK4):

for contacts or switching transistors:

Output voltage: maximum 9 V

Contact resistance open > 100 kOhm / contact resistance closed < 100 kOhm

Tab. 7: Output relay, feeding, XR3

Type of contact: N/O

Load capacity: 90 ... 253 V AC / 3 A / maximum 690 VA

Provide RC protection circuits with inductive loads!

Tab. 8: Relay outputs XR1:

Type of contact: N/O, potential-free

Load capacity: 90 ... 253 V AC / 3 A / maximum 690 VA

Load type: Ohmic and inductive loads (up to power factor (cos phi) = 0.4)

Tab. 9: Alarm relay XR2:

Type of contact: Changeover contact, potential-free

Load capacity: 90 - 253 V AC / 3 A / maximum 690 VA

Provide RC protection circuits with inductive loads!

Tab. 10: Standard signal output mA (-X3:7 ... -X3:8):

0/4...20 mA, potential-free

Maximum load: 450 Ohm at 21.5 mA

Tab. 11: Degree of protection:

Degree of protection: IP 66

10.4 Dimensional drawing

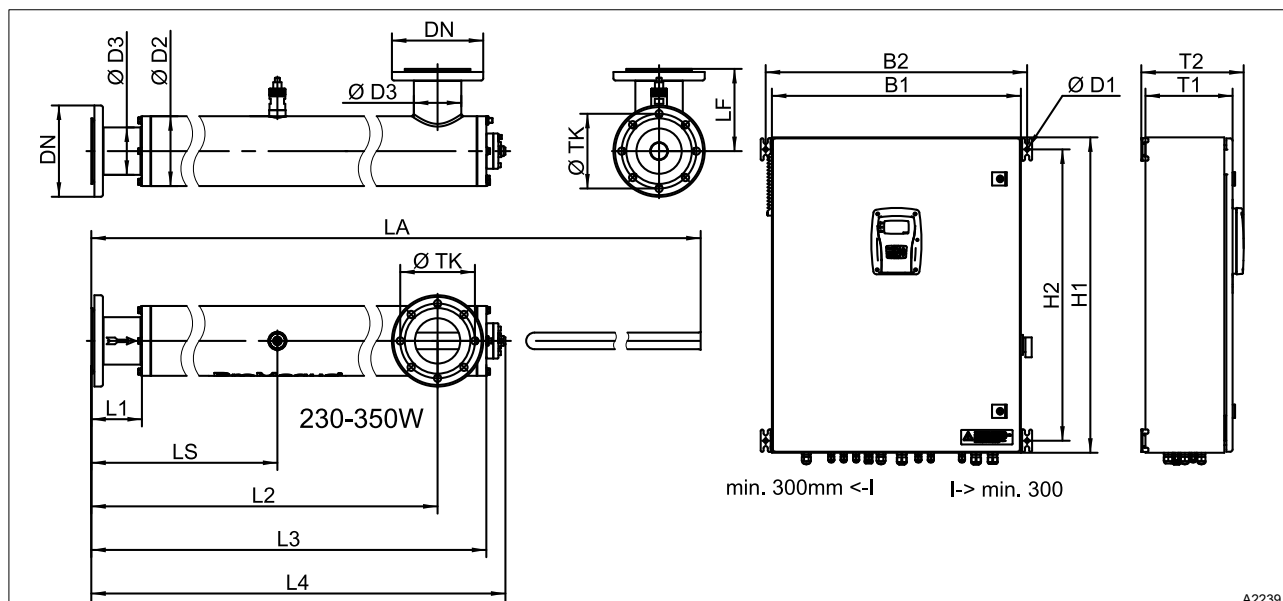


Fig. 8: Dimensional drawing of the Bewades T230W230/14N ... Bewades T2100W350/41N

10.4.1 Bewades T230W230/14N ... Bewades T2100W350/41N, PN10/DIN EN 1092-1

Tab. 12: Dimensional drawing of the Bewades T230W230/14N ... Bewades T2100W350/41N, PN10/DIN EN 1092-1

Type	230W230	350W350	700W350	690W230	1050W350	1400W350	2100W350
DN	80	100	150	150	200	200	250
B1	600	600	600	600	600	760	760
B2	630	630	630	630	630	790	790
H1	760	760	760	760	760	760	760
H2	702	702	702	702	702	702	702
T1	210	210	210	210	210	300	300
T2	247	247	247	247	247	337	337
Ø D1	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Ø D2	139.7	168.3	256	323.9	323.9	355.6	406.4
Ø D3	88.9	114.3	168.3	168.3	219.1	219.1	273
Ø TK	160	180	240	240	295	295	350
L1	67	122	122	101	130	130	130
L2	1053.5	1522.5	1495.5	1040.5	1715	1715	1688
L3	1151	1640	1640	1185	1885	1885	1885
L4	1190	1679	1679	1224	1924	1924	1924
LS	609	881	881	643	1007	1007	1007
LF	138.5	198	242	276	276	292	317
LA	2215	3105	3105	2250	3450	3450	3450

All dimensions in millimetres.

10.4.2 Bewades T230W230/14N ... Bewades T2100W350/41N, PN16/DIN EN 1092-1

Tab. 13: Dimensional drawing of the Bewades T230W230/14N ... Bewades T2100W350/41N, PN16/DIN EN 1092-1

Type	230W230	350W350	700W350	690W230	1050W350	1400W350	2100W350
DN	80	100	150	150	200	200	250
B1	600	600	600	600	600	760	760
B2	630	630	630	630	630	790	790
H1	760	760	760	760	760	760	760
H2	702	702	702	702	702	702	702
T1	210	210	210	210	210	300	300
T2	247	247	247	247	247	337	337
Ø D1	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Ø D2	139.7	168.3	256	323.9	323.9	355.6	406.4
Ø D3	88.9	114.3	168.3	168.3	219.1	219.1	273
Ø TK	160	180	240	240	295	295	355
L1	67	122	122	101	130	125	130
L2	1053.5	1522.5	1495.5	1040.5	1715	1710	1688
L3	1151	1640	1640	1185	1885	1880	1887
L4	1190	1679	1679	1224	1924	1919	1922
LS	609	881	881	643	1007	1002	1007
LF	138.5	198	242	276	276	292	333
LA	2215	3105	3105	2250	3450	3445	3452

All dimensions in millimetres.

11 UV system operating log

[illegible]

12 EC Declaration

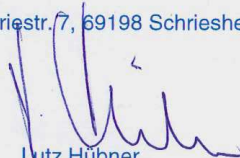
EU-Konformitäts-Erklärung Declaration of Conformity Certificat de conformité		
im Sinne der EU-Richtlinien	Niederspannung EMV	2014/35/EU 2014/30/EU
according to EU instructions	Low voltage EMC	2014/35/EU 2014/30/EU
en accord avec les instructions de la Union Européenne	Basse tension CEM	2014/35/UE 2014/30/UE
Produkt/Product/Produit:	UV Desinfektionsanlage UV disinfection unit L'appareil de désinfection UV	
Typ/Type/Type:	Bewades T	
ist entwickelt, konstruiert und gefertigt in Übereinstimmung mit den oben genannten Richtlinien, in alleiniger Verantwortung von		
is developed, designed and produced according to the above mentioned guidelines at the entire responsibility of		
est développé, conçu et fabriqué en accord avec les instructions mentionnées ci-dessus sous l'entière responsabilité de		
BWT Wassertechnik GmbH, Industriestr. 7, 69198 Schriesheim		
Schriesheim, 04 / 2018 Ort, Datum / Place, date / Lieu et date	 Lutz Hübner Unterschrift (Geschäftsleitung) Signature (Management) Signature (Direction)	
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Fig. 9: EC Declaration of Conformity

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