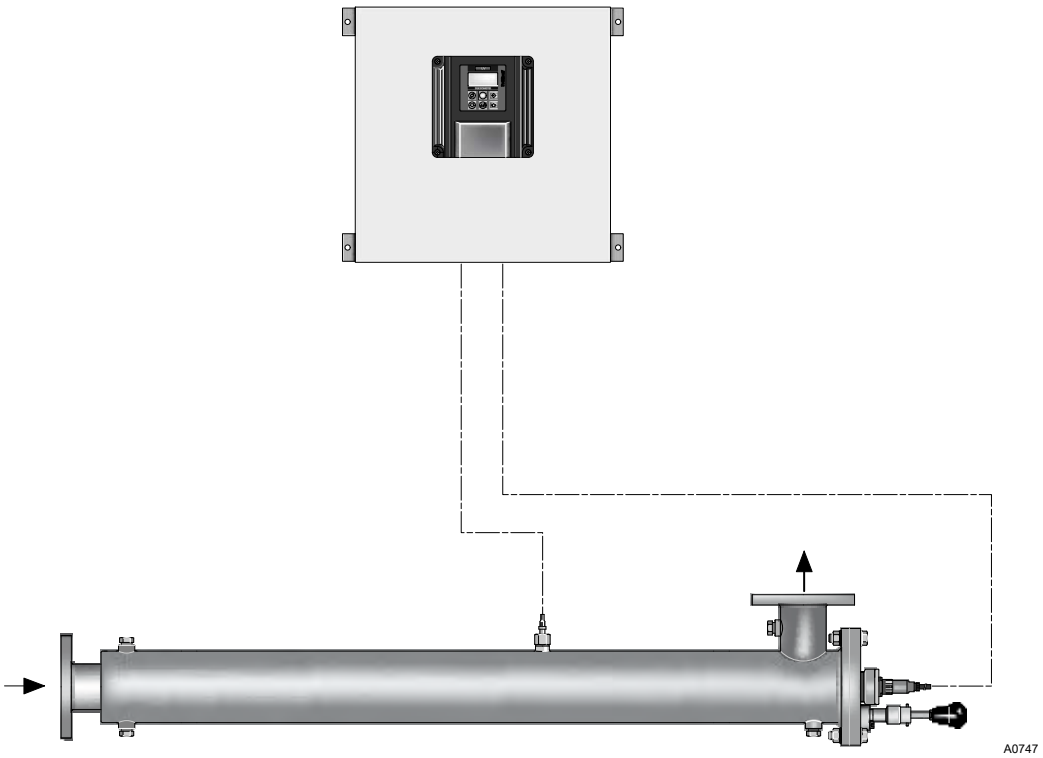
Assembly and operating instructions

Dulcodes R
UV System



Please stick the nameplate here

Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!
Technical changes reserved.

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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

Read the following supplementary information in its entirety!

The following are highlighted separately in the document:

- Enumerated lists

→ Instructions

⇨ Results of the instructions

Information

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

Safety information

Safety information are provided with detailed descriptions of the endangering situation, see ↳ *Chapter 2.1 'Explanation of the safety information' on page 7*

Table of contents

1 About this system

Application

The Dulcodes R UV systems are used for the photochemical treatment and/or disinfection of:

- Drinking water
- Process water
- Swimming pool water

This UV radiation results in rapid and reliable killing of germs, which would be difficult to combat using chlorine alone. In the treatment of swimming pool water, chloramines arising from the chlorination are moreover effectively reduced by UV radiation.

The Dulcodes UV systems are supplied ready for connection. They are available in different versions, which are defined by their identity code. The performance data can be found in the data sheet enclosed with the Dulcodes UV system.

Scope of supply

- Radiation chamber
- Lamp with lamp protection tube
- UV sensor
- Control cabinet with control
- Wiper
- Documentation

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 chapter

2.1 Explanation of the safety information

Introduction

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

The safety 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

Danger!

– Denotes an immediate threatening danger. If this 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

Warning!

– Denotes a possibly hazardous situation. If this 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

Caution!

– Denotes a possibly hazardous situation. If this 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

Note!

– Denotes a possibly damaging situation. If this 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

Information!

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

2.2 Users' qualifications

WARNING!

Danger of injury with inadequately qualified personnel!

The operator of the plant / device 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

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/her 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 ProMinent or another authorised distribution partner.
Trained qualified personnel	A 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/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.

Training	Definition
Electrician	Electricians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which the are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent to work on the system.

Note for the system operator

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

2.3 Dulcodes safety information

WARNING!

UV rays

Possible consequence: Serious injuries

UV radiation is harmful to the eyes and skin

- Only operate the UV lamp when it is fully fitted and 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: The device must be disconnected from the power supply before it is opened
- Disconnect damaged, defective or manipulated devices from the power supply

WARNING!

Insufficient water treatment

Possible consequence: Illness

Please read the technical data sheet for your UV system. Calibrate the UV systems correctly.

Ensure that:

- the maximum permissible water flow rate is not exceeded and
- UV transmission does not drop below the permissible level,
  - as otherwise adequate treatment cannot be guaranteed.

WARNING!

Drinking water disinfection

Cause: Already contaminated pipes.

Possible consequence: Illness.

Measure: For applications with high disinfection requirements (e.g. drinking water disinfection) disinfect the downstream pipework, e.g. by superchlorination, before commissioning.

CAUTION!

Depot effect in pool water

Cause: Pool water disinfected with UV radiation has no protection against contamination.

Possible consequence: Illness

Measure: When treating pool water with UV radiation, disinfection with a depot effect e.g. chlorine is necessary.

CAUTION!

Overheating of lamp and treatment chamber

Possible consequence: material damage

- Ensure that, with the exception of when the lamp is warming up, the radiation chamber has a sufficient flow of water through it so that the radiation chamber cannot overheat
- Only switch on the UV system after the radiation chamber has been filled with water
- Switch the UV system off if the flow of water is interrupted

CAUTION!
Unauthorised operating parameter
Possible consequence: material damage

Ensure that:

- the installation location is dry and frost-free
- the protection of the UV system from chemicals, dyes and vapours is guaranteed
- the ambient temperature and the radiation temperature in the direct vicinity of the system may not exceed 40 °C
- the maximum permissible operating pressure is not exceeded and
- 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 radiation chamber

ATTENTION: Hazardous ultraviolet radiation

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

ATTENTION: Danger

Disconnect the system from the mains power supply or switch off the main switch prior to commencing maintenance work on the system. Depressurise the radiation chamber prior to commencing maintenance work.

Labels on Control cabinet

Disconnect the system from the mains power supply or switch off the main switch prior to opening the cabinet.

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 Function

Shut-off valves and flushing valves do not form part of the scope of supply

The shut-off valves and flushing valves do not form part of the scope of supply of the UV system and are made available by the site operator.

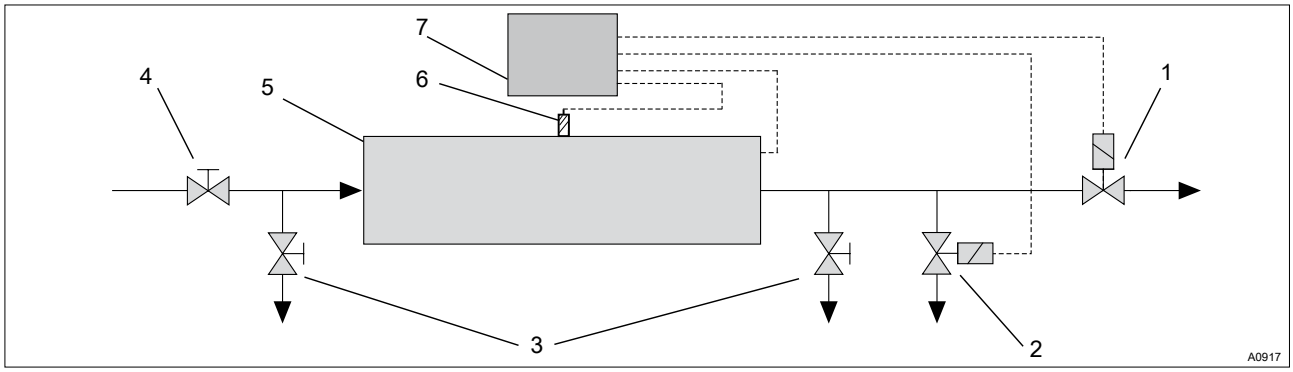


Fig. 1: Typical installation schematic of a UV system

1 Shut-off valve (site-supplied)
2 Flushing valve (site-supplied)
3 Sampling tap (site-supplied), fireproof
4 Shut-off valve (site-supplied)
5 Stainless steel radiation chamber
6 UV sensor
7 Control

The water to be treated flows through the stainless steel radiation chamber and past the UV lamps. The UV radiation kills the germs and reduces substances, such as chloramines, in the swimming pool water.

The low pressure UV lamps generate a very high output level of UV radiation, which is particularly effective for purposes of disinfection at a wavelength of 254 nm. The UV lamps are located in lamp protection tubes made of high-grade quartz with a high level of UV transparency. The compact design of the radiation chamber and the optimum flow of radiation as well as the integrated turbulators result in evenly-distributed irradiation of the entire flow of water.

A control monitors the UV system along with a UV sensor.

3.1 Commissioning

Once the Dulcodes UV-system has been switched on, the UV lamps are ignited. For UV systems on a data bus to ballasts, the bus is first activated prior to ignition. This can take several seconds, depending on the size of the UV system. Following ignition, the UV lamps need several minutes until they reach operating temperature.

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

If the minimum irradiance is not exceeded within the maximum permissible warm-up time, then the rinse valve will open regardless. However, If the minimum irradiance is also not exceeded within the maximum rinse duration, then the controller 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.

3.2 Normal mode

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

If the UV output falls below the warning threshold: a warning is emitted.

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

3.3 Automatic wiper

During the wiper process, the warning and safety thresholds are not monitored, consequently the shadowing caused by the wiper does not trigger a false alarm.

Manually triggering a wiper cycle

The function of the wiper can be checked by the switching on and off of the UV system. A wiper cycle is triggered by the switching on and off of the UV system.

Regular wiping

If you have activated regular wiping, then a wiping cycle occurs automatically after the set interval has elapsed.

3.4 Auto rinse interval

If auto rinse is active, the rinse valve opens for the auto rinse process after the maximum off-time has been reached.

3.5 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.

4 Control

NOTICE!
With the exception of sensor calibration lamp current calibration, modifications to the settings should only be undertaken when the UV system is switched off.

Version

As the electronics and software are always subject to improvements, the version number is used as a means of identification. This should be stated with complaints. It can be called up on the display.

Default settings

The Dulcodes UV systems' controllers are factory-preset. For many applications it is therefore not necessary to change the settings.

4.1 Display

The system is provided with a graphical LCD display.

NOTICE!
START/STOP button
Hold down the STOP key for at least 2 seconds.
The display returns to the normal display for the respective operating mode 5 minutes after the key has been pressed for the last time.

In operating mode

- Display of the operating mode
- Warnings are indicated by flashing arrows and displays
- Faults are displayed by a flashing fault alert

In programming mode

- Flashing display of the numerical values and inputs that can be changed.

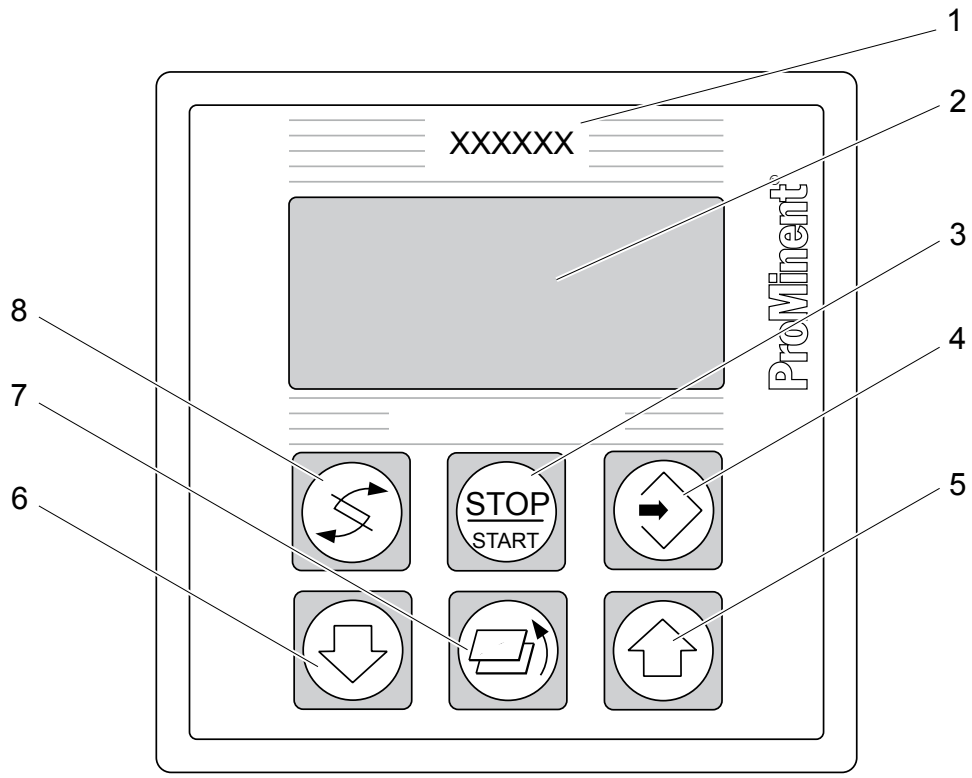


Fig. 2: Display and operating unit

Position number	Key	Function
1		Housing
2		LCD display
5		UP key In programming mode: Raises the displayed numerical value or changes an input
7		BACK key Moves back one level in the menu
6		DOWN key In programming mode: Lowers the displayed numerical value or changes an input
8		CHANGE key In operating mode: Changes the display window In programming mode: Changes adjustable parameters
3		START/STOP button Switches on and off the UV-system
4		ENTER key In operating mode: Changes to programming mode or acknowledges a fault In programming mode: Applies a set value or mode

4.2 Operating status display and parameter settings

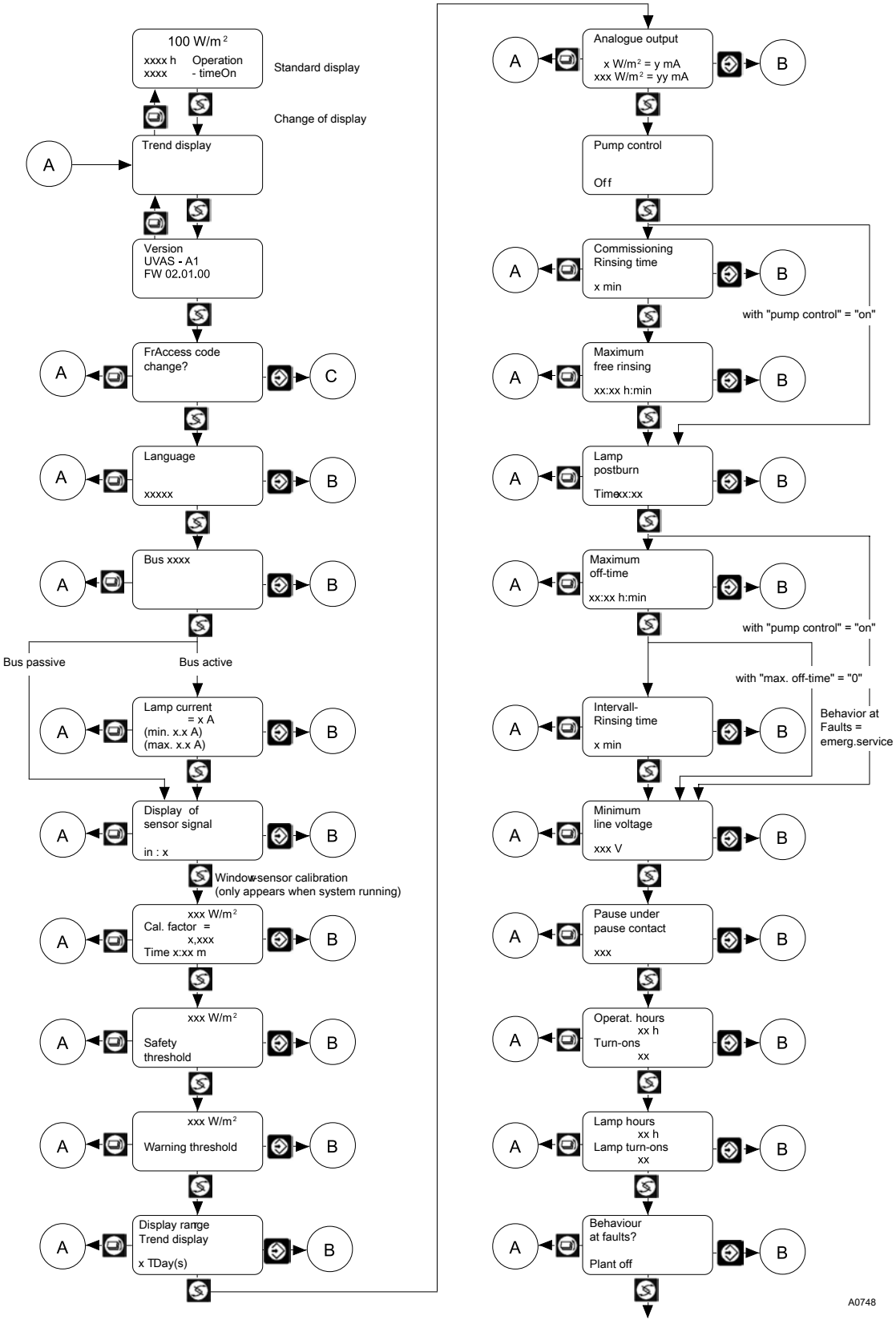


Fig. 3: Operating status display (with the UV system running)

A + Back to Trend display
B = Change to Programming mode
C = Change to "Change Access Code" mode

Programming manual

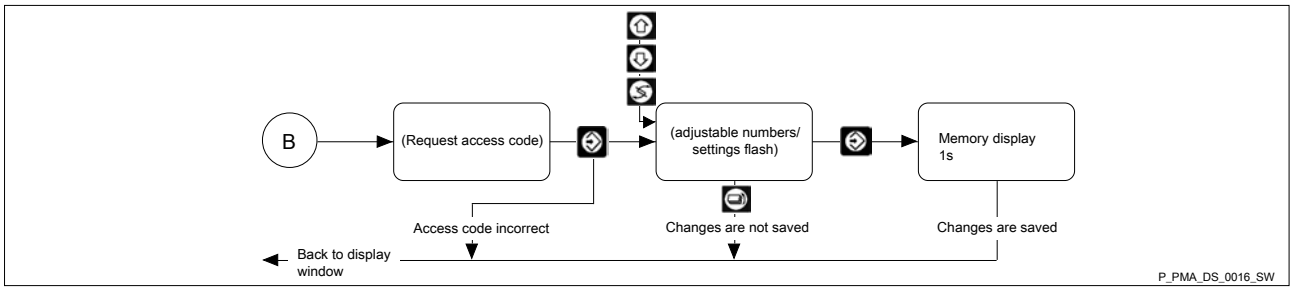


Fig. 4: Programming manual

NOTICE!

Access code

Once the access code has been correctly entered once, it is not necessary to re-enter the code for further programming processes; the flashing numbers or settings will appear directly as soon as the -key is pressed. The access code is automatically cancelled 5 minutes after a key was last pressed or after a return to the Trend or Standard display.

4.2.1 Trend display

NOTICE!

Display calibration

- Each calibration of the UV sensor is documented by a vertical continuous line in the trend display
- The content of the trend display is deleted when the display range changes and when the operating hour counter is reset

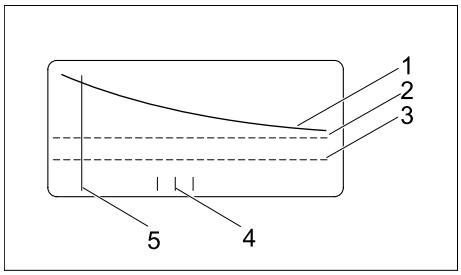


Fig. 5: Trend display

1 UV sensor signal
2 Warning threshold
3 Safety threshold
4 Switch on's/off's
5 Calibration

The trend display is used to monitor the ageing of the UV-lamps, the formation of a film coating on the lamp protection tubes or changes to the water quality.

The progress of the UV sensor signal is shown in a time frame. Horizontal lines show the safety threshold and the warning threshold respectively. The short vertical lines show when the UV system is switched on. The display range of the UV sensor signal lies between 0 W/m^2 (or 0%) and the value which has been assigned to the analogue output value of 20 mA. The time frame can be adjusted and guarantees an ongoing display: Once the selected time has expired, the oldest value is deleted and the new value is displayed.

Default setting

- Time frame: 100 days
- Maximum value of the UV sensor signal: 400 W/m^2

4.2.2 Change Access Code

CAUTION!
Change access code
Default setting "5000"

- Note down the access code!
  - Parameters can only be set once the correct access code has been entered
- The default access code does not guarantee any protection from unauthorised changes

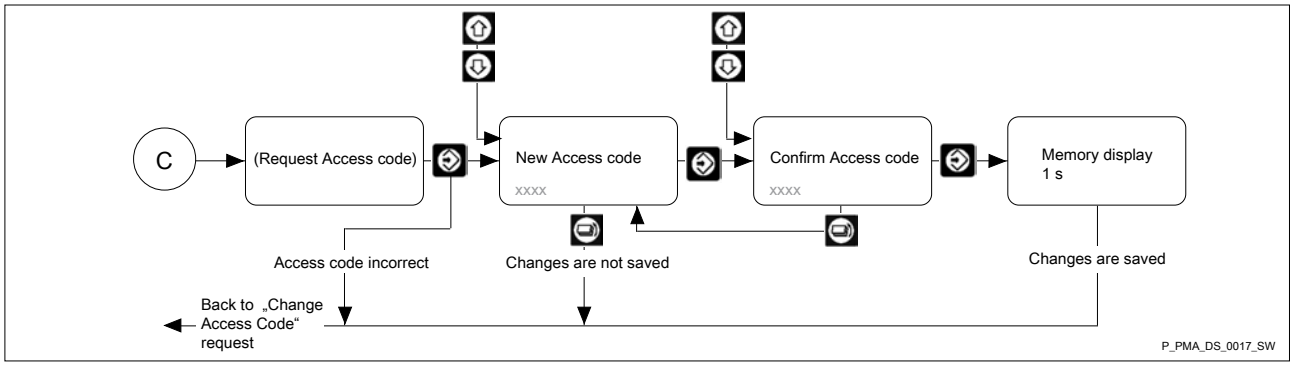
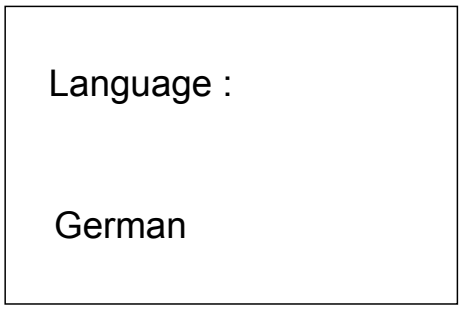


Fig. 6: Change Access Code

To protect against unauthorised changes of the settings, the system controller has an access code for the programming mode. It can be freely selected by the operator. The programming mode is still disabled after a change of the access code. It is only enabled when the new access code is entered.

4.2.3 Setting the Language



It is possible to select between different languages.

Fig. 7: Setting the Language

4.2.4 Ballast bus activate / deactivate

For UV systems equipped with ballasts via a bus interface, switch the bus to 'active'. The UV lamps cannot be ignited if the bus is passive.

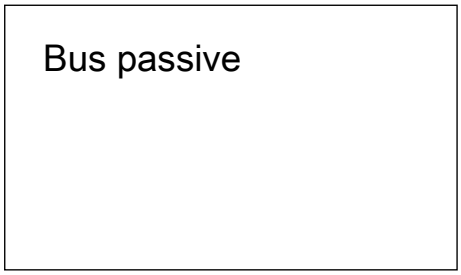


Fig. 8: Bus is passive

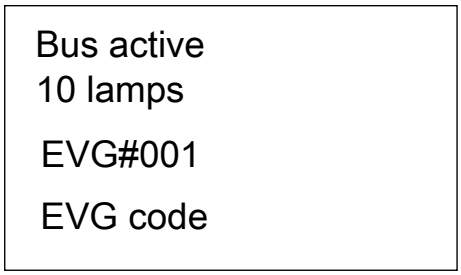


Fig. 9: Bus is active

The ballasts for the UV lamps are equipped with a bus interface. This bus interface enables the UV lamps to be ignited and switched off. In addition, they are monitored for optimal operation. Moreover, the lamp current can be configured. When the bus is active and once the UV system is switched on, the number of ballasts is shown. Keys *[UP]* and *[DOWN]* can be used to call up the serial numbers of the individual ballasts.

Default setting active

4.2.5 Setting the lamp current

CAUTION!
Deterioration of UV output / premature wear
Cause: Incorrectly configured lamp current.

Consequence: Poor disinfection performance of the UV system. Any operation of the UV lamp with currents outside of the permissible range can cause the UV system to fail prematurely. Excessive lamp current causes the UV lamps to overheat, causing the UV output to deteriorate. Insufficient lamp current leads to a significant reduction in the UV output.

Measure: Set the lamp current to approx. 3.5 A. Please refer to the enclosed data sheet for the permissible range for lamp current and rated current.

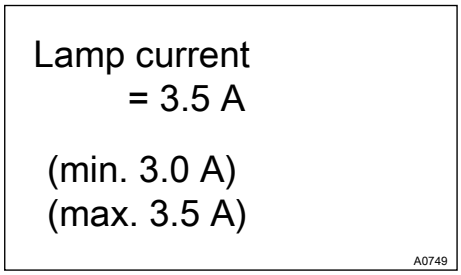


Fig. 10: Setting the lamp current

The lamp current can be freely selected within a certain range for ballasts which are equipped with a bus interface. This means that the UV lamps can be adapted to specific operational conditions. The lamp current can also be adjusted in operating mode and rinse mode. The permissible ranges for the lamp current are not monitored when the UV system is switched off. If a lamp current is configured outside of the permissible ranges, then the *'Lamp current'* fault indication is shown once the UV system is switched on and the bus has initialised.

Water temperatures < 8 °C

In the event that the UV-lamps indicate a slight reduction in UV output for water temperatures < 8 °C, then the lamp current can be increased slightly by 0.1 to 0.3 A above the rated current for UV output.

End of service life

The lamp current can be increased by 0.2 to 0.4 A above the rated current for UV output towards the end of the lamp service life in order to increase the UV output slightly.

Default setting:

3.5 ampere

4.2.6 Sensor signal display

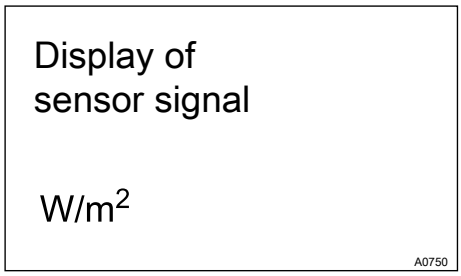


Fig. 11: Sensor signal display

The UV sensor monitors the UV lamps.

Reduction in the sensor signal can be caused by the following:

- Coating formed on the lamp protection tubes
- Significant deterioration of the UV transmission in the water
- Reduction of the UV output of the UV lamps due to lamp ageing.

It is possible to select between an absolute value in W/m² and a relative display of the sensor signal in *'%'*.

Default setting

W/m²

4.2.7 Calibrating the sensor

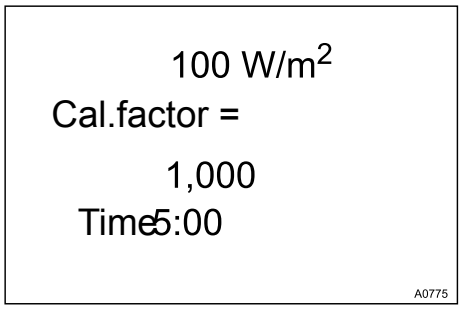


Fig. 12: Calibrating the sensor

The UV sensor is pre-calibrated at the factory and does not have to be calibrated again.

4.2.8 Adjusting the display range of the trend display

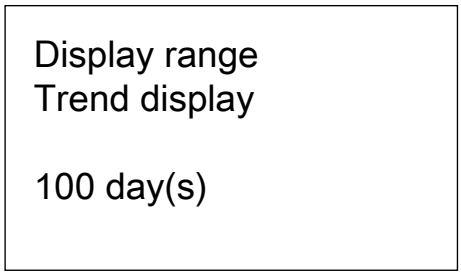


Fig. 13: Adjusting the display range of the trend display

The recording time of the sensor signal for the trend display can be adjusted. The value (in days) is interpreted as the time frame and thus guarantees a continuous display: Once the selected time has expired, the oldest value is deleted and the new value is displayed.

Default setting:

100 days

4.2.9 Setting the safety threshold

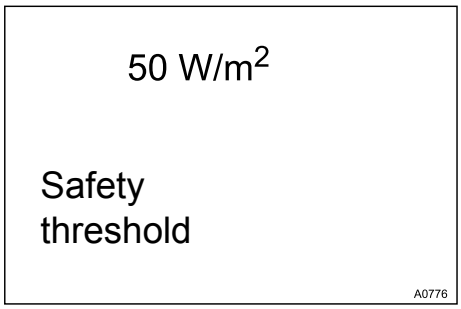


Fig. 14: Setting the safety threshold

WARNING!
UV lamp replacement
Possible consequence: Illness

– Check and possibly reset the safety and warning threshold when the UV lamp is replaced!
  – Only a correctly set safety threshold will guarantee adequate UV radiation

Reliable and safe water treatment can no longer be guaranteed if the UV output falls so low that the UV sensor signal falls below the safety threshold. In this case a shut-off valve, should one be fitted, will close. When the signal falls below the safety threshold on the display, this is shown by two flashing arrows.

A signal device can be connected to the *[SAFETY THRESHOLD]* signal relay of the control. The relay is closed when the signal falls below the safety threshold.

Setting the safety threshold

NOTICE!
The safety threshold must be below the warning threshold. It is not possible to set it above the warning threshold.

1. Switch on the UV system with the STOP/START button
2. Wait until the UV lamp has reached its full capacity, i.e. until the UV sensor signal is stable
3. Read the UV intensity displayed and note it down
4. Switch off the UV system with the STOP/START button
5. Set the safety threshold to 50 %

Example: Measured UV intensity: 100 W/m² therefore follows:

safety threshold = 100 W/m² · 0.50 = 50.0 W/m²

6. Now set the warning threshold

4.2.10 Setting the warning threshold

WARNING!
Poor disinfection
Cause: Insufficient UV system radiation power.

Consequence: Poor disinfection performance of the UV system.

Check and possibly reset the safety and warning thresholds when lamps are replaced.

The warning threshold must be above the safety threshold.

It is not possible to set it below the safety threshold.

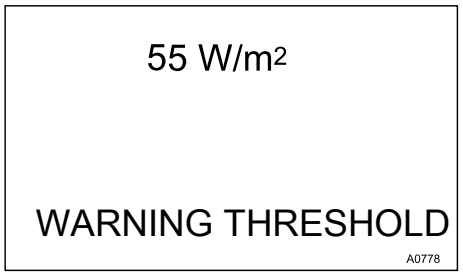


Fig. 15: Setting the warning threshold

The system issues a warning should the UV output drop so far that the sensor signal falls below the warning threshold. To prevent the signal falling below the safety threshold, the UV lamp protection tubes should be cleaned, the UV lamps should be replaced or the water quality should be improved by means of appropriate water treatment. When the signal falls below the warning threshold, this is indicated on the display by a flashing arrow.

A signal device can be connected to the *[WARNING THRESHOLD]* signal relay of the control. The relay is closed when the signal falls below the warning threshold.

Requirements:

- Stable UV intensity for the UV lamps has been noted
- The safety threshold has been set

→ Set the warning threshold to 110 % of the configured safety threshold

Example: Configured safety threshold: 50 W/m² therefore follows:

warning threshold = 50 W/m² · 1.10 = 55.0 W/m²

⇨ The safety and warning thresholds have been set, the UV system is now ready for operation. Switch on the UV system with the STOP/START button.

4.2.11 Analog output sensor signal: assigning the standard signal

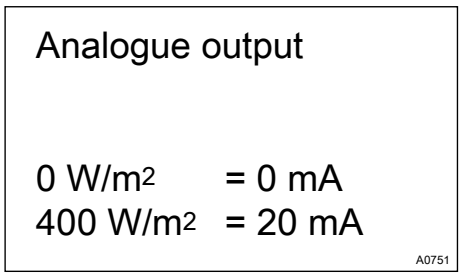


Fig. 16: Analog output sensor signal

The sensor signal assigned to the 20 mA is simultaneously the maximum value of the trend display. Adjust this sensor signal value to 125 % of the maximum value so that the trend display can never 'overflow'.

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.

It is possible to choose from a 0 to 20 mA and 4 to 20 mA standard signal:

- 0 or 4 mA corresponds to the sensor signal 0 W/m²
- 20 mA can be assigned to any value

Default setting

0 W/m² = 0 mA

400 W/m² = 20 mA (dependent on the settings)

4.2.12 Activating the pump control

CAUTION!

Damage to the UV lamps and radiation chamber

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

Measure: It must therefore be ensured that the radiation chamber cannot run empty when the pump is switched off.

As the feed pump generally has a certain post-rinse duration, the lamp postburning duration should be set to at least one minute. This ensures that water conveyed during the post-rinse period is disinfected.

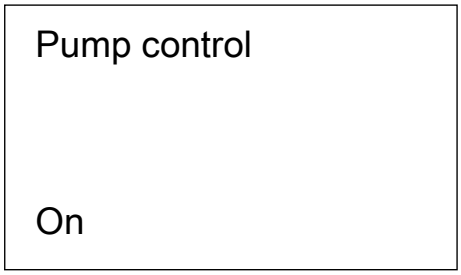


Fig. 17: Activating the pump control

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 warning 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 irradiance is undershot during operation or a UV lamp fails, then the pump relay releases and the UV system switches over to fault mode.

Default setting: Off

4.2.13 Setting the start rinse duration

In most cases, a start rinse duration of '1 min' is sufficient. If there is no start rinse duration specified, then the start rinse duration will be set to '0 min'.

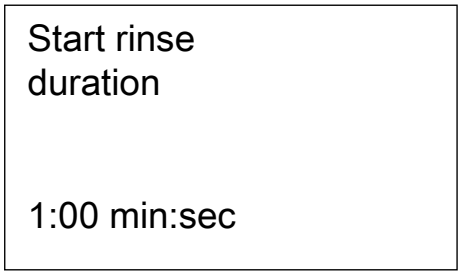


Fig. 18: Setting the start rinse duration

The start rinse duration 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 sensor signal has exceeded the minimum irradiance level, the automatic rinse valve opens (if fitted) for the start rinse process. Only then does the shut-off valve open.

Default setting: 1 min

4.2.14 Set maximum free rinse duration

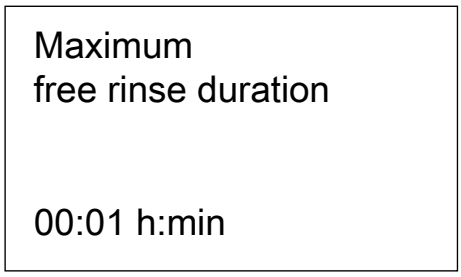


Fig. 19: Set maximum free rinse duration

The free rinsing process is primarily used for the disinfection of drinking water. In doing so, a maximum free rinse duration of over 10 hours is often used. After periods of heavy rainfall it is possible that the UV transmission will decrease, for example, if the water has poor natural filtering characteristics. The sensor signal undershoots the minimum irradiance value. The shut-off valve closes and the rinse valve opens.

Once the water quality has improved, the UV system switches back over to normal mode. However, If the sensor signal fails to exceed the minimum irradiance threshold within the maximum free rinse duration, then the UV system switches over to fault mode.

Default setting: 1 min

4.2.15 Setting the lamp postburning duration

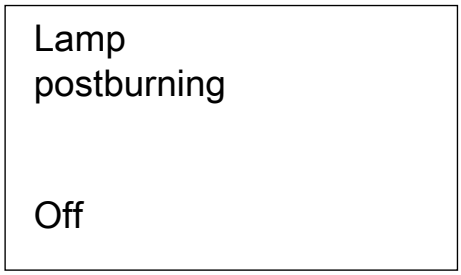


Fig. 20: Setting the lamp postburning duration

In large-scale UV systems for drinking water disinfection, it can 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 this case, the lamp postburning system prevents insufficiently disinfected water from reaching the consumer while the UV system is being shut down. In most cases, a start lamp postburning duration of 1 minute is sufficient.

Default setting: Off

4.2.16 Adjustment of off-time and auto rinse interval

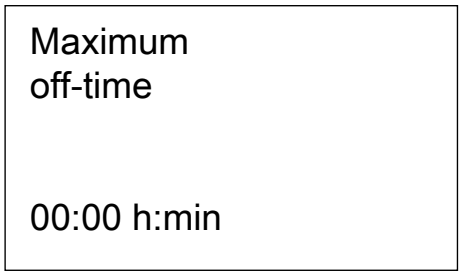


Fig. 21: Setting the off-time

The off-time rinsing system is used primarily for internal drinking water supply systems. One must always assume that there will be prolonged periods without water removal in UV systems with internal drinking water supplies. In such cases, it is advantageous to make use of the off-time rinsing system in order to avoid impermissible warming and irradiance of the water.

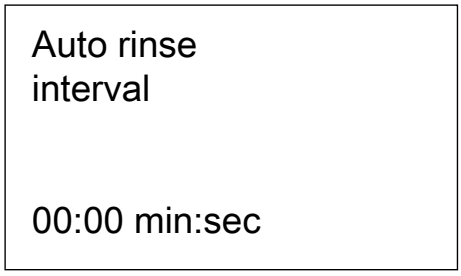


Fig. 22: Setting the auto rinse interval

If the *[FLOW]* switch input on the controller has a flow detector connected to it with a contact which closes in the event that a minimum flow rate is exceeded, then the rinse valve is opened for the rinse interval, insofar as no water has been removed within the maximum off-time.

However, if the *[FLOW]* switch input on the controller does not have a flow detector connected to it, in other words, the switch input is open, then the rinse valve opens after the maximum off-time for the auto rinse interval (periodic rinsing).

In most cases, the maximum off-time is set to 5 hours. An auto rinse interval of 1 minute is generally sufficient.

If the maximum off-time is set to 00:00, then no auto rinse process is undertaken.

Default setting: 00:00 min

1 min

4.2.17 Set minimum mains voltage

Modifications to the minimum line voltage may only be carried out in agreement with the manufacturer.

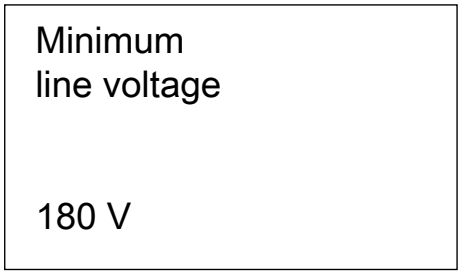


Fig. 23: Set minimum mains voltage

Monitoring the line voltage prevents uncontrolled failure of the UV system and the UV lamps due to insufficient line voltage.

If the line voltage drops to the minimum value, then the controller switches over to undervoltage mode and the UV system is shut down.

When the line voltage exceeds the permissible minimum value again, then the UV system starts up again automatically.

Default setting: 180 V

4.2.18 Pause function

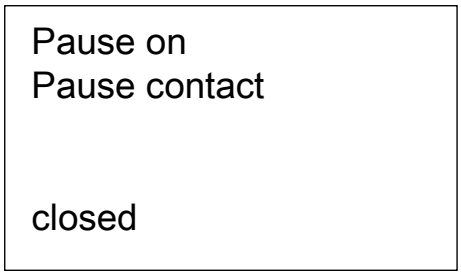


Fig. 24: Pause function

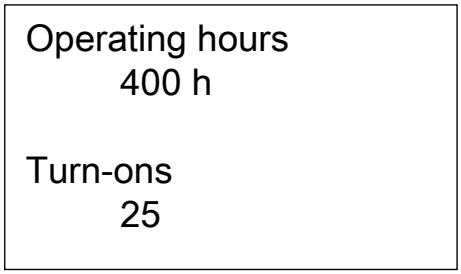
The UV-system can be switched on and off by opening and shutting an external contact that is connected to the Pause input of the controller.

It is possible to select whether the UV system starts up with an open or closed Pause contact.

Default setting: Pause with pause contact closed.

(UV-system starts up when the pause contact is open).

4.2.19 Displaying/Resetting the counter



The *[OPERATING HOURS]* and *[SWITCH ONS]* counters cannot be reset.

Fig. 25: OPERATING HOURS / SWITCH ONS

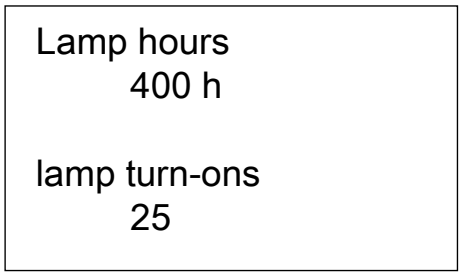


Fig. 26: LAMP HOURS / LAMP SWITCH ONS

The *[LAMP HOURS]* and *[LAMP SWITCH ONS]* can be reset.

4.2.20 Behaviour of the system in the event of a fault

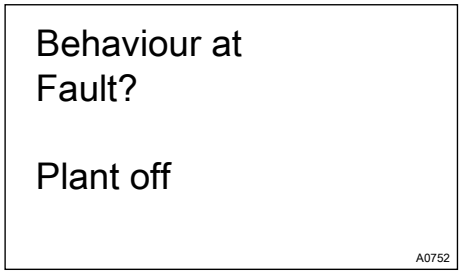


Fig. 27: Behaviour of the system in the event of a fault

Normally the UV system is switched off in the event of a fault. However, for certain applications it can be a good idea to continue operating the system at reduced capacity (emerg.service).

CAUTION!
Reduced disinfection efficiency

- The disinfection efficiency of the UV system is severely reduced in emerg.service mode
- Emerg.service mode is not permissible for applications where high demands are made of the disinfection efficiency, for example, drinking water disinfection or similar applications
- A significantly reduced system output must be expected for applications where emerg.service mode is permissible for the UV system
- In emerg.service mode, a possibly equipped shut-off valve opens immediately once the STOP button has been pressed, and not after the safety threshold has been exceeded.
  The system does not monitor whether the UV lamps are warmed up or whether sufficient UV output is available. It may be necessary to manually interrupt the water flow for 5 to 10 minutes once emerg.service mode has been activated (manual shut-off valve, manual deactivation of the feed pump, etc.)
- The operator must check prior to enabling the emerg.service mode in the programming menu that no risk is posed to personnel and property as a result of the significantly reduced system efficiency
- ProMaqua provides no warranty and accepts no liability or claims for damages resulting from operation of the UV system in emerg.service mode.

A special code is required for reprogramming the system's fault behaviour which can only be obtained on request from ProMaqua. Once the special access code has been entered, it is possible to select emerg.service mode for the system's behaviour in the event of a fault.

If emerg.service mode has been selected for fault events, then the system switches over to fault mode as previously in the event of lamp failure or if the safety threshold is undershot after completion of the UV system's free rinse duration. Pressing the button causes the UV system to switch over to emerg.service mode. In other words, the fault is not to be acknowledged with the button.

Emerg.service mode can also be triggered by means of closing gate input *'flow/temperature'*. Bridging the input causes automatic switch-over into emerg.service mode.

The UV lamps are ignited in emerg.service mode, the shut-off valve is opened and the pump relay is activated. However, the fault indicating relay will remain dropped and lamp failure and sensor signals are no longer monitored. The signal relay *[WARNING AND SAFETY THRESHOLD]* undershot remains dropped

No auto rinse interval is possible for UV systems where emerg.service mode is enabled. The programming windows [max. off-time] as well as [Auto rinse interval] are permanently hidden.

Due to the fact that in emerg.service mode the pump relay is still activated with pump control *[Off]*, the pump relay can be used to indicate emerg.service mode on UV systems with the pump control specification *[Off]*. For UV systems with the specification pump control *[On]*, emerg.service mode can be detected by the fact that the pump relay continues to be activated despite a dropped fault indicating relay.

4.2.21 Alarm Signal Relay

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

4.2.22 Fault switch input

CAUTION!
remove bridge
Possibility of faulty operation

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

NOTICE!
remove bridge
Possibility of faulty operation

The *[FAULT]* switch input is bridged when the system is delivered. If the jumper is removed, without connecting up a fault signalling device, then the control will go into fault mode and the UV system can then no longer be operated.

An external fault signalling device, such as a flow rate monitor, can be connected to the *[FAULT]* switch input.

5 Mounting and installation

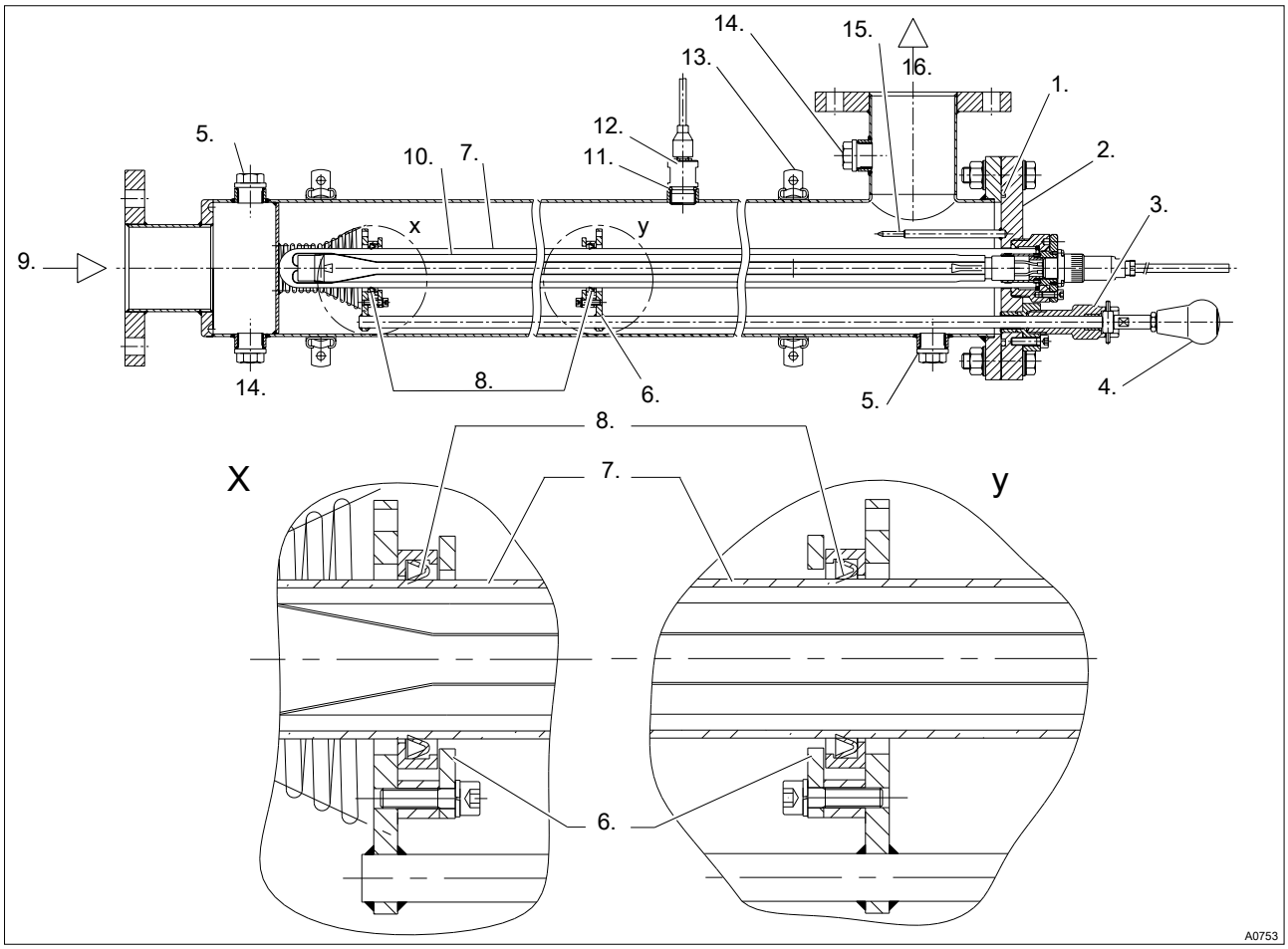


Fig. 28: Construction of the radiation chamber with detail X and Y for the example of a Dulcodes 1x300 R with manual wiper

x Detail X
y Detail Y
1. O-ring
2. Chamber cover
3. Clamping screw
4. Mushroom knob
5. Flushing connector
6. Bracket with wiper rod
7. Lamp protection tube
8. Wiper elements
9. Inlet flange
10. UV lamp
11. O-ring
12. UV sensor
13. Retaining element
14. Bleed valve / drain (depending on fitting position)
15. Centring bolt
16. Outlet flange

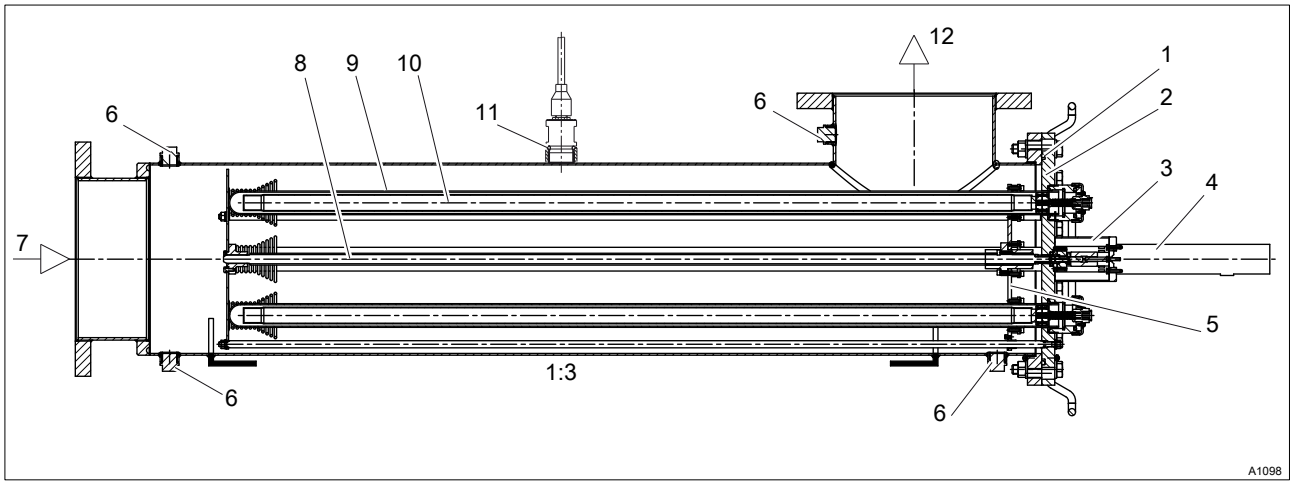


Fig. 29: Construction of the radiation chamber for the example of the Dulcodes 4x300 R with automatic wiper

1. O-ring
2. Chamber cover
3. Protective cover
4. Wiper motor
5. Wiper rod
6. Bleed valve / drain (depending on fitting position)
7. Inlet flange
8. Wiper spindle
9. Lamp protection tube
10. UV lamp
11. UV sensor
12. Outlet flange

Please note the following safety information before installing the system:

WARNING!

Insufficient water treatment

Possible consequence: Illness

Please read the technical data sheet for your UV system. Calibrate the UV systems correctly.

Ensure that:

- the maximum permissible water flow rate is not exceeded and
- UV transmission does not drop below the permissible level
  - as otherwise adequate treatment cannot be guaranteed.

CAUTION!
Unauthorised operating parameter
Possible consequence: material damage

Ensure that:

- the installation place is dry and frost-free
- the protection of the UV system from chemicals, dyes and vapours is guaranteed
- the ambient temperature and the radiation temperature in the direct vicinity of the system may not exceed 40 °C
- the maximum permissible operating pressure is not exceeded and
- 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.

In spite of the use of modern ballasts, with lamp-preserving ignition, the UV system should be operated so that frequent switching on and off of the UV lamp is avoided.

5.1 Radiation chamber

The design of the radiation chamber can be found in the
↳ *Chapter 9 'Technical data' on page 70*

Attach the warning label

The supplied self-adhesive warning label should be attached to the radiation chamber so that it is clearly visible.

5.1.1 Assembly

The outlet flange must be aligned vertically upwards or vertically downwards.

Otherwise the radiation chamber cannot be fully bled via the designated connectors.

Leave adequate room for maintenance work. The required room can be found on the enclosed data sheet.

Horizontal installation

→ Fasten the radiation chamber horizontally to the wall or appropriate frame with suitable mounting fixtures.

5.1.2 Fitting the mushroom knob (with manual wiper)

Some system types are supplied with the mushroom knob unassembled. In this case, it must be assembled now.

1. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
2. Pull the wiper rod all the way out
3. Screw the mushroom knob (with fixing bushing) with an SW 11 wrench to the wiper rod
4. Push the wiper rod completely into the radiation chamber
5. Lock the fixing bushing in the clamping screw
6. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)

5.1.3 Connections, hydraulic

WARNING!

Automatic shut-off valve

If the water flow is not interrupted in the event of a system fault by means of automatic deactivation of the feed pump, then an automatic shut-off valve is to be fitted downstream of the radiation chamber. This is to be connected to the *'shut-off valve'* output of the controller. The shut-off valve must close autonomously, in order that the water flow is interrupted in the event of power failure.

CAUTION!

Overheating of lamp and treatment chamber

Possible consequence: material damage

- Ensure that, with the exception of when the lamp is warming up, the radiation chamber has a sufficient flow of water through it so that the radiation chamber cannot overheat
- Only switch on the UV system after the radiation chamber has been filled with water
- Switch the UV system off if the flow of water is interrupted

NOTICE!

Execute the hydraulic connections on the radiation chamber in compliance with the applicable general guidelines and local installation regulations.

Use UV-resistant materials for the hydraulic connector. If PVC is used, it is highly likely that the PVC will discolour in the area of the connection. In unfavourable circumstances the material may become brittle and crack.

Provide valves upstream and downstream of the radiation chamber to shut off the radiation chamber for maintenance work.

Provide suitable fireproof valves upstream and downstream of the radiation chamber to allow for microbiological sampling.

Cleaning solution

It is also recommended with radiation chambers, which are regularly cleaned by filling them with a cleaning solution, that the discharge screw and the vent screw are replaced by appropriate valves.

With larger radiation chambers, it is recommended that they are filled through the water drain opening using an appropriate acid-resistant pump.

If the radiation chamber is filled with a pump, it is also useful to circulate the cleaning solution through the air vent opening. This shortens the cleaning time and achieves a better result.

5.2 Control cabinet and control system

5.2.1 Assembly

The connecting cable for the lamp and the sensor cable may not be lengthened.

→ The switch cabinet or the mounting panel with controller and power supply unit should be fitted to the wall or a suitable frame in such a way that the UV lamps and the UV sensors can be connected to the cables provided.

5.2.2 Connections, electric

WARNING!

Mains voltage on protective low voltage

Possible consequence: Fatal or very serious injuries.

Measure: If connecting the protective low voltage (SELV) to one of the X4 terminals, the X4 terminals must not be connected to mains voltage.

NOTICE!

General notes on the electrical installation

- The electrical installation must be carried out by an authorised electrical engineer
- Ensure a continuous power supply by means of a suitable fault current protection switch
- Connect a protective earth conductor to both the radiation chamber and the cover of the chamber

The connecting cable for the lamp and the sensor cable may not be lengthened.

5.3 Fitting the lamp protection tubes

5.3.1 Fitting the UV lamp protection tubes with manual wiper

CAUTION!

Unsecured wiper rod

Possible material damage and slight bodily injury

- An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  - Therefore always lock the wiper rod in place with the fixing bushing

CAUTION!

Wiper rod with manual wiper

Possible material damage

Take care when working on UV systems with a manual wiper, that the projecting rod of the wiper does not become bent!

NOTICE!

The outlet flange must be aligned vertically upwards or vertically downwards. Otherwise the radiation chamber cannot be fully bled via the designated connectors.

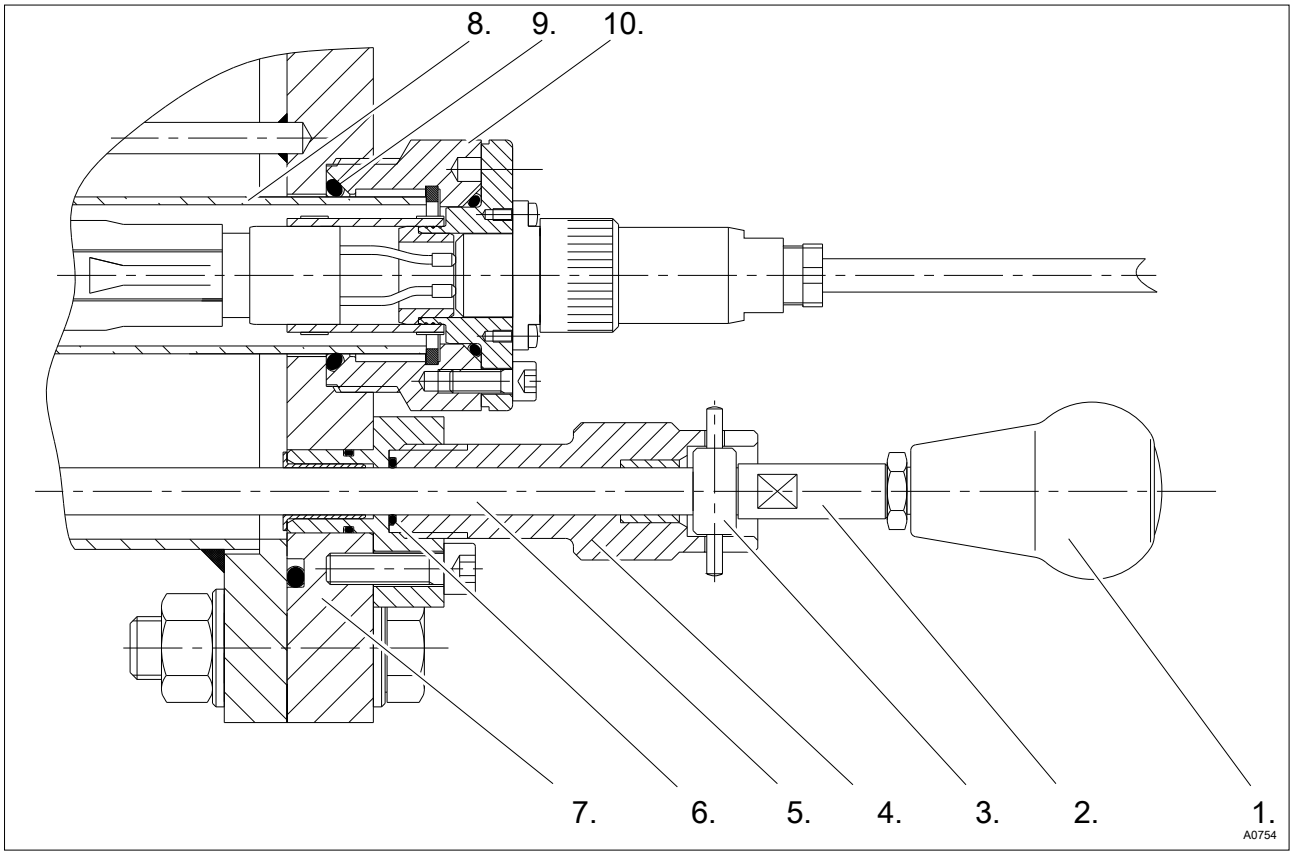


Fig. 30: Components of the manual wiper on the chamber cover and parts of the UV lamp

1. Mushroom knob
2. Guide bolt
3. Fixing bushing
4. Clamping screw
5. Wiper rod
6. O-ring
7. Chamber cover
8. Lamp protection tube
9. O-ring
10. UV lamp protection tube holder

1. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
2. Loosen the fixing bushing from the locking of the clamping screw
3. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again!
4. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
5. Loosen the lamp protection tube bracket with a face spanner and remove it (place on the holes - not on the threads)
6. Carefully pull the transport protection (grey plastic pipe) completely out of the radiation chamber
7. Carefully push the lamp protection tube into the radiation chamber until it reaches its stop position
8. Push a new O-ring onto the end of the UV lamp protection tube

9. CAUTION!
   - Check the UV lamp protection tube for damage before fitting.
     - A damaged UV lamp protection tube may not be refitted.
   - Ensure that the UV lamp protection tube is sitting correctly.
     - The UV lamp protection tube may not project out more than 40 mm and may not be offset at an angle.

   Screw the lamp protection tube bracket into the cover of the chamber and tighten with a face spanner (place on the drill holes - not on the threads)

10. CAUTION!
    - The wiper rod should only be pushed into the radiation chamber if it has a clean surface. Otherwise the O-ring could be damaged.

    Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)

11. Push the wiper rod completely into the radiation chamber
12. Lock the fixing bushing in the clamping screw
13. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)

5.3.2 Fitting the UV lamp protection tube with automatic wiper

1. Loosen the lamp protection tube bracket with a face pin spanner and remove it (place on the holes - not on the threads!)
2. Carefully push the UV lamp protection tube into the radiation chamber until it reaches its stop position
3. Push a new O-ring onto the end of the UV lamp protection tube
4. CAUTION!
   - Check the UV lamp protection tube for damage before fitting
     - A damaged UV lamp protection tube may not be refitted
   - Ensure that the UV lamp protection tube is sitting correctly

   Ensure that the UV lamp protection tube is sitting correctly. The UV lamp protection tube may not project by more than 13 mm and must not be offset at an angle
5. Insert the UV lamp with the cable clamp fully into the UV lamp protection tube
6. Place the UV lamp cover onto the UV lamp protection tube bracket and, using the fixing screws provided, screw in and tighten with an Allen key.

7. Push the protection cover in the longitudinal direction over the motor up to the end position

5.4 Assembly and connection of the UV lamp

WARNING!

Electrical installation

Cause: Danger from electrical voltage.

Possible consequence: Fatal or very serious injuries.

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

WARNING!

UV-C radiation

Cause: Danger due to UV radiation.

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

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

NOTICE!

Premature UV lamp failure

Never touch the glass of the UV lamp with bare hands.

Fingerprints burn into the glass and can result in early failure. Clean off fingerprints from the lamp with a cloth moistened with alcohol before installing.

The UV system should be installed in accordance with all pertinent regulations prior to commissioning the lamps.

Do not modify the fitted lamp connection cable without authorisation.

Do not modify the gap between the plug and the lamp cover. Otherwise, it can not be guaranteed that the UV lamp lies against the closed end of the UV lamp protection tube. This is a prerequisite for safe disinfection.

1. Lay the O-ring into the UV lamp protection tube holder groove provided.

NOTICE!
Turn the UV lamps so that the internally aligned cables both point away from the UV sensors. Otherwise a reduced lamp output will be measured.

For free-standing UV systems, the connecting plug with UV lamp cover is to be inserted onto the UV lamp before the UV lamp is fed into the UV lamp protective tube.

2. Insert the UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm
3. Insert the connector plug with lamp cover onto the UV lamp.
4. Insert the UV lamp fully into the UV lamp protection tube
5. Place the UV lamp cover onto the UV lamp protection tube bracket.

   Screw in the associated attachment screws with the Allen key provided and tighten evenly
6. Attach the round plug with the lamp connection cable to the socket on the cover of the lamp and fix in place with the knurled nut

5.5 Assembly and connection of the UV sensor

WARNING!

UV rays

Cause: Danger due to UV radiation.

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

Measure: Only operate the UV system if the UV sensors are properly installed.

If the UV sensor is removed, harmful UV radiation will be emitted from the system when the lamps are burning.

1. Carefully push the O-ring over the thread onto the undercut of the UV sensor
2. Insert the UV sensor fully into the sleeve and fix in place; very little effort is required for this
3. Attach the sensor cable to the sensor plug and fasten in place with the knurled nut

6 Commissioning

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

WARNING!
Contaminated pipework / tubing
Cause: The following pipework / tubing, etc. could be contaminated.

Possible consequence: Serious illnesses.

Measure: The pipework / tubing requires disinfection after the commissioning process (e.g. by superchlorination).

6.1 Leak testing and ventilation of the radiation chamber

Use the clamping screw of the manual wiper as the vent screw for vertical wall-mounted systems.

1. Open the air vent on the radiation chamber
2. Slowly open the shut-off valve upstream of the radiation chamber
3. Fill the radiation chamber until water emerges from the bleed valve
4. 

   Tighten the clamping screw on the wiper rod by hand only to the extent that no water comes out under operating pressure.

   Close the bleed valve
5. Check that the radiation chamber is not leaking
6. Open the shut-off valve downstream from the radiation chamber (only necessary with a manual shut-off valve)

6.2 Switching on the UV system

NOTICE!
Only switch on the UV system after the radiation chamber has been filled with water.

1. Switch on the main switch or connect to the mains power supply
2. Check the parameters in programming mode and change if necessary

NOTICE!
Ensure that the UV lamps are operated at the rated current.

3. Switch on the UV system using the *[START/STOP]* key. In order to do so, the *[START/STOP]* key must be held down for at least 2 seconds
4. Should the controller go into *[PAUSE]* mode, activate the Pause contact
   ⇨ Once the UV lamp has ignited, it will take several minutes until the full UV output has been reached.

6.3 Calibrating the UV sensor

All new UV lamps need a burn-in time of 100 to 200 hours. For this reason, the safety threshold and warning threshold should be checked approx. 200 operating hours after commissioning.

The UV sensor is pre-calibrated at the factory and does not have to be calibrated again.

6.4 Adjusting the automatic wiper

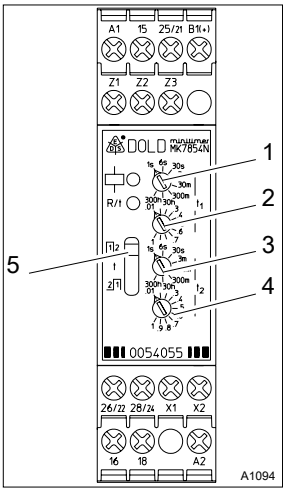


Fig. 31: Pacing relay MK7854N

1 Time range switch pulse time t_1
2 Adjustment pulse time t_1
3 Time range switch pause time t_2
4 Adjustment pause time t_2
5 Slider switch S1

For systems equipped with an automatic wiper, the wiper interval can be adjusted. The interval set in the factory is 2 hours. The setting / adjustment of the interval is undertaken in the control cabinet on the pacing relay MK7854N. The adjustable parameters are as follows: Time range switch pause time t_2 (3) and adjustment pause time t_2 (4).

As supplied, the wiper is on the cover side of the UV-system. If the UV-system is connected to the voltage, the wiper moves from the cover side of the UV system to the start position. The wiper remains in the start position until the pacing relay outputs a voltage signal. The function of the UV-system can be checked by switching it off and on. The slider switch S1 (5) must be upright.

1. Adjust the interval at the time range switch pause time t_2 (3).
   ⇨ Adjustment range: 1 second to 300 hours.
2. Adjust the multiplier at the adjuster pause time t_2 (4).
   ⇨ Example: Time range switch pause time t_2 (3) set to 30 hours and the adjustment pause time t_2 set to 5 results in a wiper interval every 150 operating hours.

The time range switch pulse time t_1 (1) and adjustment pulse time t_1 (2) are preset in the factory and should not be changed as otherwise the possibility exists that the wiper will not return to its park position.

7 Maintenance

WARNING!

Background information about maintenance

- The UV lamps should be replaced no later than after their maximum permissible service life. Otherwise, the operating safety of the UV system cannot be guaranteed
- The maximum permissible service life is 14,000 operating hours, unless otherwise stated in the enclosed data sheet
- Before any maintenance work, disconnect the system from the mains power supply or switch off the main switch
- Depressurise the radiation chamber before commencing any maintenance work
- UV radiation is harmful to the eyes and skin
- Only operate the UV lamp when it is correctly fitted
- The UV system should be installed in accordance with all pertinent regulations prior to commissioning the UV lamps
- Dirty filter mats on the fan and air outlet filter can lead to the control cabinet overheating and becoming damaged

Carry out the following maintenance work at regular intervals:

- Replace the UV lamp at the end of its useful service life
- Clean and check the lamp protection tube (normally only necessary when replacing the lamp)
- Clean the sensor window (normally only necessary when replacing the lamps)
- Replace the wearing parts of the wiper mechanism (normally every 1-2 years)
- Replace the filter mats on the fan and the air outlet filter on the control cabinet (normally annually)

An operating log should be kept as a record. A form is enclosed in the appendix for this purpose.

7.1 Cleaning the UV lamp protection tube

Deposits of, for example iron, manganese or limescale, can form on the lamp protection tubes during operation. As these deposits absorb UV radiation, they should be removed at regular intervals.

Clean the tube at the very latest when the sensor signal falls below the warning threshold, without this being based on other causes, such as ageing of the lamp or serious deterioration of the UV transmission.

The UV lamp protection tubes can be cleaned when fully assembled using the manual wiper, manually when dismantled or can be cleaned by filling the radiation chamber with a cleaning solution. Acids, such as diluted phosphoric acid, acetic acid or diluted nitric acid, are particularly suitable for cleaning.

For Dulcodes R systems with an automatic wiper, cleaning of the lamp protection tubes in the fitted state is carried out according to the set wiper interval (factory setting 2 hours).

WARNING!

Safety data sheet for the cleaning agent selected

Cause: Danger due to cleaning agent.

Possible consequence: Damage to the health. Property damage.

Measures: Observe the safety data sheet for the cleaning agent selected. Wear protective clothing when cleaning (protective eye wear, protective gloves).

Do not use corrosive acids or acids that could cause stress cracks, such as hydrochloric acid. Ensure that no cleaning solution penetrates the lamp protection tube. Ensure, when cleaning UV systems that no cleaning solution enters the pipework.

Dispose of the waste cleaning solution in accordance with the pertinent guidelines and regulations.

7.1.1 Cleaning with a Manual Wiper

CAUTION!

Wiper rod, manual rod

Possible material damage and slight bodily injury.

Take care when working on UV systems with manual wipers, that the projecting rod of the wiper does not become bent!

– An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  – Therefore always lock the wiper rod in place with the fixing bushing

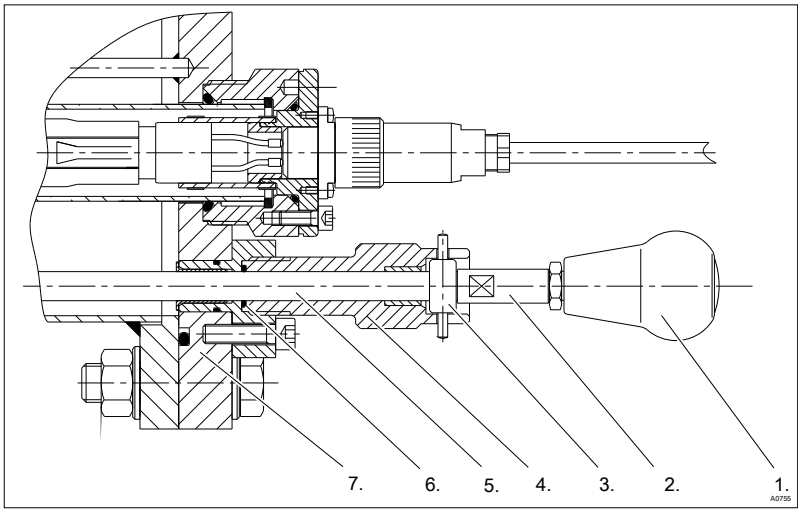


Fig. 32: Components of the manual wiper on the chamber cover

1. Mushroom knob
2. Guide bolt
3. Fixing bushing
4. Clamping screw
5. Wiper rod
6. O-ring
7. Chamber cover

Cleaning with a Manual Wiper

1. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
2. Secure the handle from thrusting backwards
3. Loosen the fixing bushing from the locking of the clamping screw
4. Pull or slide the wiper rod out of the radiation chamber until it reaches its stop position
5.

CAUTION!

The seal on the wiper rod can become damaged

Possible consequence: Leakages.

Only push the wiper rod with a clean surface into the radiation chamber.

Push the wiper rod completely into the radiation chamber

6. Repeat the wiping process as often as is necessary until the display of the UV intensity on the controller indicates a sufficiently high value
7. Push the wiper rod completely into the radiation chamber
8. Lock the fixing bushing in the clamping screw
9. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
10. Flush the dissolved dirt and impurities out of the radiation chamber with clean water (flushing connections)
11. Connect the radiation chamber hydraulically to the complete system (shut-off valves)

7.1.2 Cleaning After Dismantling the UV Lamp Protection Tube

WARNING!

UV rays

Possible consequence: Serious injuries.

UV radiation is harmful to the eyes and skin

- Only operate the UV lamps when they are 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: The device must be disconnected from the power supply before it is opened
- Disconnect damaged, defective or manipulated devices from the power supply

CAUTION!

Wiper rod, manual rod

Possible material damage

Take care when working on systems with manual wipers, that the projecting rod of the wiper does not become bent!

- An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  - Therefore always lock the wiper rod in place with the fixing bushing

CAUTION!

Fingerprints on the UV lamp

Possible consequence: Early failure of the UV lamp

- Only touch the glass of the UV lamp with cotton gloves
- Fingerprints or impurities burn into the glass and can result in early 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 cloth

Cleaning the UV Sensor

Every time you clean the UV lamp protection tube, also clean the UV sensor

Cleaning After Dismantling the UV Lamp Protection Tube

1. Close the shut-off valves upstream and downstream of the radiation chamber
2. Switch off the UV system with the STOP button
3. Switch off the main switch or disconnect from the mains power supply
4. Empty the radiation chamber
5. Release the round plug (7) from the UV lamp cover by turning the knurled nut and pulling it off

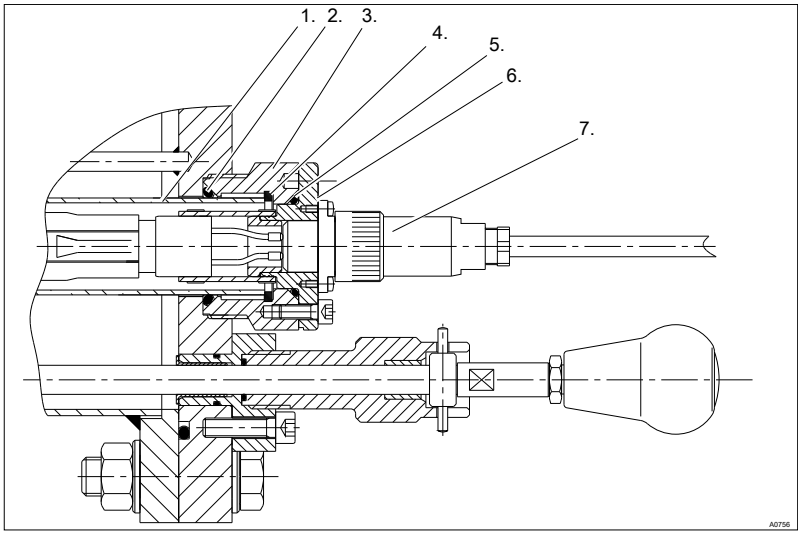


Fig. 33: Cross-section of the lamp connection

1. Lamp protection tube
2. O-ring
3. UV lamp protection tube bracket
4. Teflon ring
5. O-ring
6. Lamp cover
7. Round plug

6. Loosen the fixing screws of the lamp cover using an Allen key and pull out the lamp cover and the UV lamp by approx. 100 mm
7. Pull off the connector plug with lamp cover from the UV lamp
8. Fully remove the UV lamp and lay it to one side
9. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
10. Loosen the fixing bushing from the locking of the clamping screw
11. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again
12. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
13. Loosen the lamp protection tube bracket with a face spanner and remove it (place on the holes - not on the threads)
14. Carefully remove the lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
15. Remove the O-ring from the lamp protection tube
16. Wash the lamp protection tube with cleaning solution or immerse it in cleaning solution until the film has been removed without leaving a trace

17. Rinse the lamp protection tube with clean water and dry thoroughly with a soft cloth

18. Carefully push the lamp protection tube into the radiation chamber until it reaches its stop position

19. Push a new O-ring onto the end of the lamp protection tube - the sealing surfaces of the O-ring must be smooth and clean

20. 

CAUTION!

Check the lamp protection tube for damage before fitting

- A damaged lamp protection tube may not be refitted
- Ensure that the lamp protection tube is sitting correctly
  - The lamp protection tube may not project out more than 40 mm and may not be offset at an angle

Screw the UV lamp protection tube bracket into the cover of the chamber and tighten firmly (place on the drill holes - not on the threads)

21. 

CAUTION!

The seal on the wiper rod can become damaged

Only push the wiper rod with a clean surface into the radiation chamber.

Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)

22. Push the wiper rod completely into the radiation chamber

23. Lock the fixing bushing in the clamping screw

24. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)

25. 

CAUTION!

Wiper rod, manual rod

Possible material damage

Take care when working on systems with manual wipers, that the projecting rod of the wiper does not become bent!

- An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  - Therefore always lock the wiper rod in place with the fixing bushing

Check whether the O-ring on the UV lamp protection tube bracket is in the groove provided - the sealing surfaces of the O-ring must be completely smooth and clean

26. **NOTICE!**
Turn the UV lamps so that the internally aligned cables both point away from the UV sensors. Otherwise a reduced lamp output will be measured.

For free-standing UV systems, the connecting plug with UV lamp cover is to be inserted onto the UV lamp before the UV lamp is fed into the UV lamp protective tube.

Insert the UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm

27. Insert the connector plug with lamp cover onto the UV lamp
28. Insert the UV lamp fully into the UV lamp protection tube.
29. Place the UV lamp cover onto the UV lamp protection tube bracket and, using the attachment screws provided, screw in and tighten with the Allen key.
30. 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.
31. Switch on the main switch or connect up the mains power supply
32. Switch on the UV system with the STOP button
33. Slowly open the shut-off valve upstream of the radiation chamber
34. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off valve)

7.1.3 Cleaning with a Cleaning Solution

NOTICE!

Handling the cleaning solution

- It is also recommended in case of radiation chambers regularly cleaned by filling with a cleaning solution that the water drain connector and the air vent plug be replaced by appropriate valves
- With larger radiation chambers, it is recommended that they are filled through the water drain opening using an appropriate acid-resistant pump
- If the radiation chamber is filled with a pump, it is also useful to circulate the cleaning solution through the air vent opening
  - This shortens the cleaning time and achieves a better result
- If the cleaning solution is collected in a suitable container and stored, it can be reused several times

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

1. Switch off the UV system using the STOP key
2. Switch off the main switch or disconnect from the mains power supply
3. Close the shut-off valves upstream and downstream of the radiation chamber
4. Empty the radiation chamber
5. Screw in the water drain screw again and tighten; very little effort is needed for this
6. Fill the radiation chamber 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 radiation chamber and dispose of the cleaning solution in accordance with the pertinent regulations
9. Flush the radiation chamber thoroughly with clean water until all the remains of cleaning solution have been removed
10. Screw in the water drain screw and tighten; very little effort is needed for this
11. Slowly open the shut-off valve upstream of the radiation chamber
12. Fill the radiation chamber until water emerges from the vent plug
13. Close the air vent plug and tighten; very little effort is needed for this
14. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off valve)
    ⇨ Check that the radiation chamber is not leaking
15. Switch on the main switch or connect to the mains power supply
    ⇨ The UV-system is again ready for operation.

7.1.4 Cleaning the UV Sensor

1. Loosen the sensor connection cable from the UV sensor
2. Turn the UV sensor out of the radiation chamber
3. Clean the quartz window with a cloth that has been saturated with cleaning solution until the coating has been removed without leaving a trace
4. Rinse the quartz window with clean water and dry with a soft cloth
5. Examine the O-ring for damage and replace any damaged seals
6. Screw in the UV sensor again and tighten; very little effort is needed for this
7. Connect the sensor connection cable to the UV sensor
8. Slowly open the shut-off valve upstream of the radiation chamber

Use the clamping screw of the manual wiper for vertical wall-mounted systems.

9. Fill the radiation chamber until water emerges from the vent plug
10. Close the air vent plug and tighten; very little effort is needed for this
11. Open the shut-off valve downstream from the radiation chamber (only necessary with a manual shut-off valve)
    ⇨ Check that the radiation chamber is not leaking
12. Switch on the main switch or connect to the mains power supply
    ⇨ The UV-system is again ready for operation.

7.2 Replacement of the wiper elements (UV-systems with a manual wiper)

Maintenance interval: 1 ... 2 years

WARNING!
UV rays
Possible consequence: Serious injuries.

UV radiation is harmful to the eyes and skin

– Only start up the UV lamps when they are 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: The device must be disconnected from the power supply before it is opened
– Disconnect damaged, defective or manipulated devices from the power supply

CAUTION!
Wiper rod, manual rod
Possible material damage

Take care when working on systems with manual wipers, that the projecting rod of the wiper does not become bent!

– An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  – Therefore always lock the wiper rod in place with the fixing bushing

CAUTION!

Fingerprints on the UV lamp

Possible consequence: Early failure of the UV lamp

- Only touch the glass of the UV lamp with cotton gloves
- Fingerprints or impurities burn into the glass and can result in early 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 cloth

1. Close the shut-off valves upstream and downstream of the radiation chamber
2. Switch off the UV system with the STOP/START button
3. Switch off the main switch or disconnect from the mains power supply
4. Drain the radiation chamber
5. Release the round plug (7) from the UV lamp cover by turning the knurled nut and pulling it off

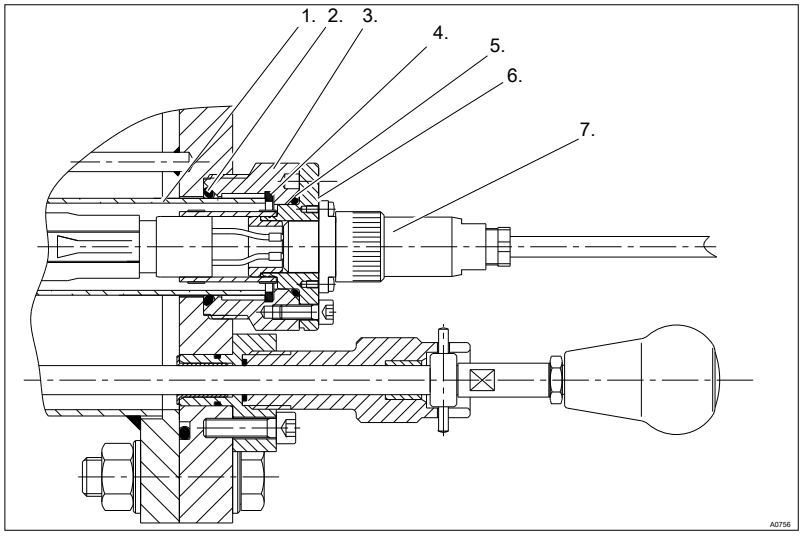


Fig. 34: Cross-section of the lamp connection

1. Lamp protection tube
2. O-ring
3. UV lamp protection tube holder
4. Teflon ring
5. O-ring
6. Lamp cover
7. Round plug

6. Loosen the attachment screws of the lamp cover using an Allen key and pull out the lamp cover and the UV lamp by approx. 100 mm
7. Pull off the connector plug with lamp cover from the UV lamp
8. Fully remove the UV lamp and lay it to one side

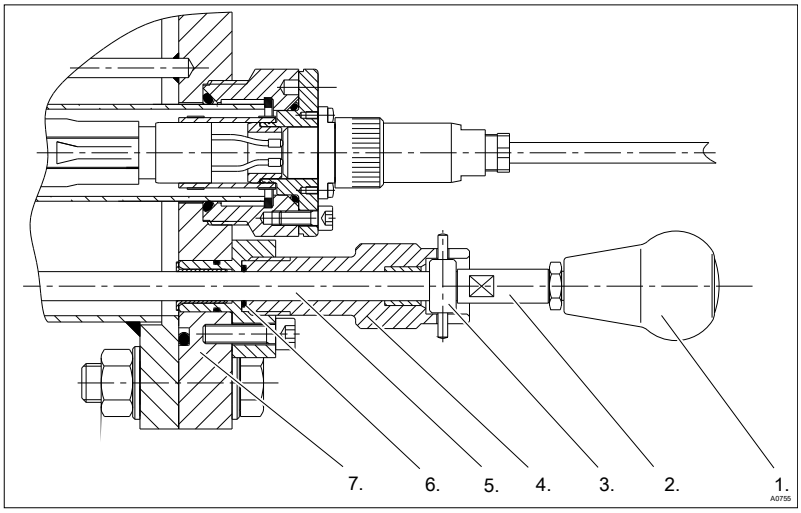


Fig. 35: Components of the manual wiper on the chamber cover

1. Mushroom knob
2. Guide bolt
3. Fixing bushing
4. Clamping screw
5. Wiper rod
6. O-ring
7. Chamber cover

9. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
10. Loosen the fixing bushing from the locking of the clamping screw
11. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again
12. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
13. Loosen the lamp protection tube bracket with a face spanner and remove it (place on the holes - not on the threads)
14. Carefully remove the lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
15. Remove the O-ring from the lamp protection tube
16. Wash the lamp protection tube with cleaning solution or immerse it in cleaning solution until the film has been removed without leaving a trace
17. Rinse the lamp protection tube with clean water and dry thoroughly with a soft cloth
18. Remove the screws of the cover of the radiation chamber
19. Carefully lay the radiation chamber cover and the fully removed wiper rod in a suitable, clean place
20. Remove one hexagonal screw on a wiper
21. Remove the old wiper element to one side
22. Insert the new wiper element from the side - the wiping lip must point away from the radiation chamber
23. Insert the Allen screw with the bushing into the wiper and tighten

The wiper element must sit loosely in the wiper even when the Allen screw is tightened.

If it does not do this, then eliminate the cause or use another wiper element.

24. Replace the other wiper elements as described
25. Fit a new O-ring to the cover of the radiation chamber
26. Carefully insert the radiation chamber cover with the wiper rod still fully pulled out into the radiation chamber - the wiper rod must sit in its fixing on the radiation chamber cover and remain there until the lamp protection tube is fitted
27. Screw the cover of the radiation chamber onto the radiation chamber so that it is moisture-proof
28. Carefully push the lamp protection tube into the radiation chamber until it reaches its stop position
29. Push a new O-ring onto the end of the lamp protection tube - the sealing surfaces of the O-ring must be smooth and clean
30. **CAUTION!**
    Check the lamp protection tube for damage before fitting
    - A damaged lamp protection tube may not be refitted
    - Ensure that the lamp protection tube is sitting correctly
      - The lamp protection tube may not project out more than 40 mm and may not be offset at an angle

    Screw the UV lamp protection tube bracket into the cover of the chamber and tighten firmly (place on the drill holes - not on the threads)
31. **CAUTION!**
    The seal on the wiper rod can become damaged
    Only push the wiper rod with a clean surface into the radiation chamber.

    Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
32. Push the wiper rod completely into the radiation chamber
33. Lock the fixing bushing in the clamping screw
34. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)

35. 

CAUTION!

Wiper rod, manual rod

Possible material damage

Take care when working on systems with manual wipers, that the projecting rod of the wiper does not become bent!

- An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  - Therefore always lock the wiper rod in place with the fixing bushing

Check whether the O-ring on the UV lamp protection tube bracket is in the groove provided - the sealing surfaces of the O-ring must be completely smooth and clean

36. 

NOTICE!

Turn the UV lamps so that the internally aligned cables both point away from the UV sensors. Otherwise a reduced lamp output will be measured.

For free-standing UV systems, the connecting plug with UV lamp cover is to be inserted onto the UV lamp before the UV lamp is fed into the UV lamp protective tube.

Insert the UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm

37. Insert the connector plug with lamp cover onto the UV lamp

38. Insert the UV lamp fully into the UV lamp protection tube.

39. Place the UV lamp cover onto the UV lamp protection tube bracket and, using the attachment screws provided, screw in and tighten with the Allen key.

40. 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.

41. Switch on the main switch or connect up the mains power supply

42. Switch on the UV system with the  button

43. Slowly open the shut-off valve upstream of the radiation chamber

44. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off valve)

7.3 Replacing the O-ring on the clamping screw

Maintenance interval: 1 year

CAUTION!
Wiper rod, manual rod
Possible material damage

Take care when working on systems with manual wipers, that the projecting rod of the wiper does not become bent!

– An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone
  – Depressurise the radiation chamber

1. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
2. Loosen the fixing bushing from the locking of the clamping screw
3. Fully remove the wiper rod
4. Unscrew the handle from the wiper rod using an SW 11 wrench
5. Push the wiper rod approx. 150 mm into the radiation chamber
6. Remove the clamping screw
7. Pull the wiper rod again fully out - it will pull out the O-ring at the same time
8. Clean the wiper rod if required
9. Replace the O-ring
10. Fit the clamping screw but do not tighten firmly
11. Screw the mushroom knob (with fixing bushing) on to the wiper rod using an open-ended 11 mm spanner

The seal on the wiper rod can become damaged.

Only push the wiper rod with a clean surface into the radiation chamber.

12. Push the wiper rod completely into the radiation chamber
13. Lock the fixing bushing in the clamping screw

Tighten the clamping screw on the wiper rod by hand only to the extent that no water comes out under operating pressure.

14. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)

An unsecured wiper rod can shoot out of the radiation chamber under operating pressure and injure someone. Therefore always lock the wiper rod in place with the fixing bushing.

7.4 Maintenance of the automatic wiper

Maintenance interval: 1 year

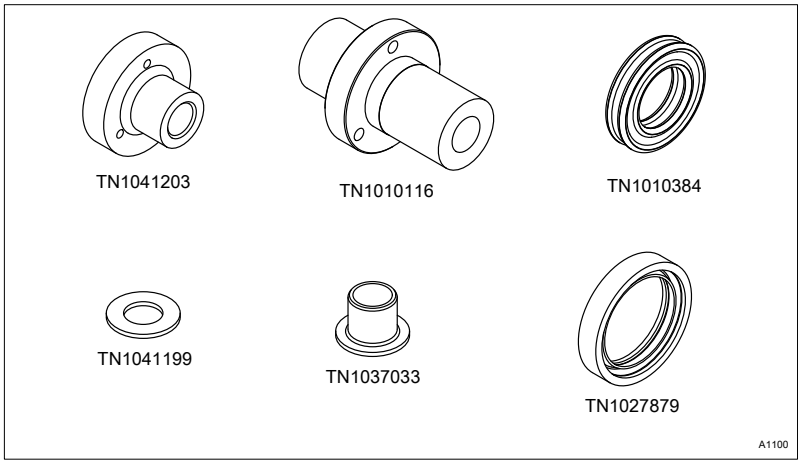


Fig. 36: You must replace the components after an operating period of one year

7.4.1 Replacing the wiper elements (systems with automatic wiper)

Maintenance interval: 1 year

WARNING!
UV-C radiation
Possible consequence: Serious injuries.

UV-C radiation is harmful to the eyes and skin

- Only operate the UV lamps when they are 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: The device must be disconnected from the power supply before it is opened
- Disconnect damaged, defective or manipulated devices from the power supply

CAUTION!
Fingerprints on the UV lamp
Possible consequence: Early failure of the UV lamp

- Only touch the glass of the UV lamp with cotton gloves
- Fingerprints or impurities burn into the glass and can result in early 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 cloth
- Also thoroughly clean the glass of the UV lamp return cable

Replacing the Wiper Elements

1. Switch off the UV system using the STOP key
2. Switch off the main switch or disconnect from the mains power supply
3. Close the shut-off valves upstream and downstream of the radiation chamber
4. Empty the radiation chamber
5. Loosen the fixing screws of the UV lamp cover using the enclosed Allen key and remove the lamp cover and the UV lamp
6. Lay the UV lamp cover and the UV lamp completely to one side
7. Pull off the protection cover over the motor in the longitudinal direction
8. Loosen the lamp protection tube bracket with a face pin spanner and remove it (place on the holes, not on the threads)
9. Carefully remove the UV lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
10. Remove the O-Ring from the lamp protection tube
11. 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
12. Rinse the UV lamp protection tube with clean water and dry thoroughly with a soft cloth
13. Remove the screws of the cover of the radiation chamber
14. Carefully lay the radiation chamber cover and the wiper unit in a suitable, clean place
15. Remove one hexagonal screw on a wiper

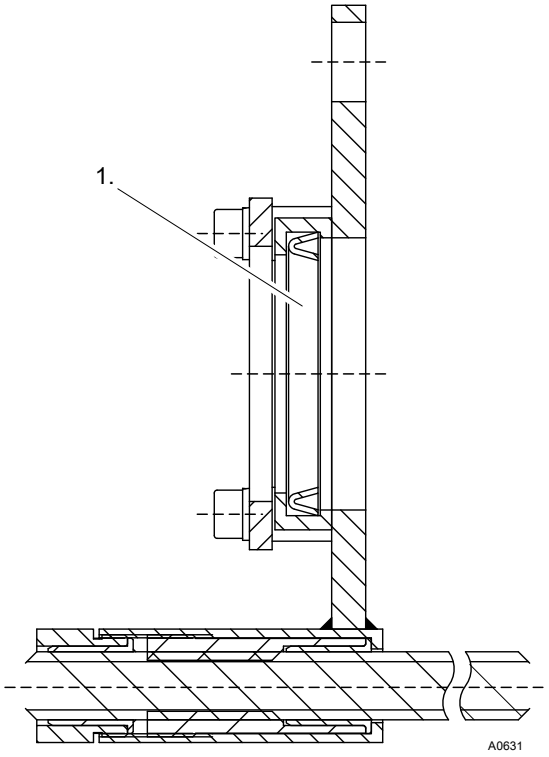


Fig. 37: Wiper element

16. Remove the old wiper element (1) to one side
17. Insert the new wiper element (1) from the side - the wiping lip must point away from the radiation chamber
18. Insert the Allen head screw with its nut into the wiper and tighten
19.

> **NOTICE!**
> The wiper element must sit loosely in the wiper even when the Allen screw is tightened!
>
> If it does not do this, then eliminate the cause or use another wiper element!

Fit a new O-ring to the cover of the radiation chamber

20. Carefully insert the radiation chamber cover with the wiper unit into the radiation chamber
21. Screw the cover of the radiation chamber onto the radiation chamber so that it is moisture-proof
22. Carefully push the UV lamp protection tube into the radiation chamber until it reaches its stop position
23. Push a new O-ring onto the end of the UV lamp protection tube - the sealing surfaces of the O-ring must be completely smooth and clean!

24. 

CAUTION!

Check the UV lamp protection tube for damage before fitting

- A damaged UV lamp protection tube may not be refitted
- Ensure that the lamp protection tube is sitting correctly
  - The UV lamp protection tube may not project by more than 13 mm and must not be offset at an angle

Screw the UV lamp protection tube bracket into the cover of the chamber and tighten firmly (place on the drill holes - not on the threads!)

25. Insert the UV lamp with the cable clamp fully into the UV lamp protection tube

26. Place the UV lamp cover onto the UV lamp protection tube bracket and, using the fixing screws provided, screw in and tighten with an Allen key.

27. Push the protection cover in the longitudinal direction over the motor up to the end position

28. Switch on the main switch or connect up the mains power supply

29. Switch on the UV system using the  key

30. Slowly open the shut-off valve upstream of the radiation chamber

31. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off valve)

7.5 Replacing the lamp

WARNING!

Electrical installation

Cause: Danger from electrical voltage.

Possible consequence: Fatal or very serious injuries.

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

WARNING!

UV-C radiation

Cause: Danger due to  UV radiation.

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

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

NOTICE!

The UV lamps should be replaced by new lamps at the very latest:

When the sensor signal approaches the minimum safety threshold without this being due to other causes, such as the formation of a coating on the lamp protection tubes or a serious deterioration of the UV-transmission;

When the operating life of the lamp is approaching the maximum service life of the lamp or has exceeded it.

NOTICE!

Premature UV lamp failure

Never touch the glass of the UV lamp with bare hands.

Fingerprints burn into the glass and can result in early failure. Clean off fingerprints from the lamp with a cloth moistened with alcohol before installing.

The UV system should be installed in accordance with all pertinent regulations prior to commissioning the lamps.

Do not modify the fitted lamp connection cable without authorisation.

Do not modify the gap between the plug and the lamp cover. Otherwise, it can not be guaranteed that the UV lamp lies against the closed end of the UV lamp protection tube. This is a prerequisite for safe disinfection.

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

Disposal

Dispose of the old UV lamp in accordance with the pertinent guidelines and regulations.

Note regarding multiple UV lamp systems:

- *When UV lamps are being exchanged at the end of the maximum lamp service life, all of the UV lamps should be exchanged for new ones.*
- *When UV lamps are being exchanged due to lamp wear, all of the UV lamps should be exchanged for new ones.*
- *When exchanging faulty UV lamps, only new UV lamps may be used.*
- *In the event that only the faulty UV lamp is being replaced, then the new UV lamp should always be installed in the UV lamp protective tube which is the furthest away from the UV sensor measuring position.*
- *In the event of lamp failure towards the end of the maximum lamp service life, all of the UV lamps should be exchanged for new ones.*

1. Close the shut-off valves upstream and downstream of the radiation chamber
2. Switch off the UV system with the STOP button
3. Switch off the main switch or disconnect from the mains power supply
4. Empty the radiation chamber
5. Release the round plug (7) from the UV lamp cover by turning the knurled nut and pulling it off

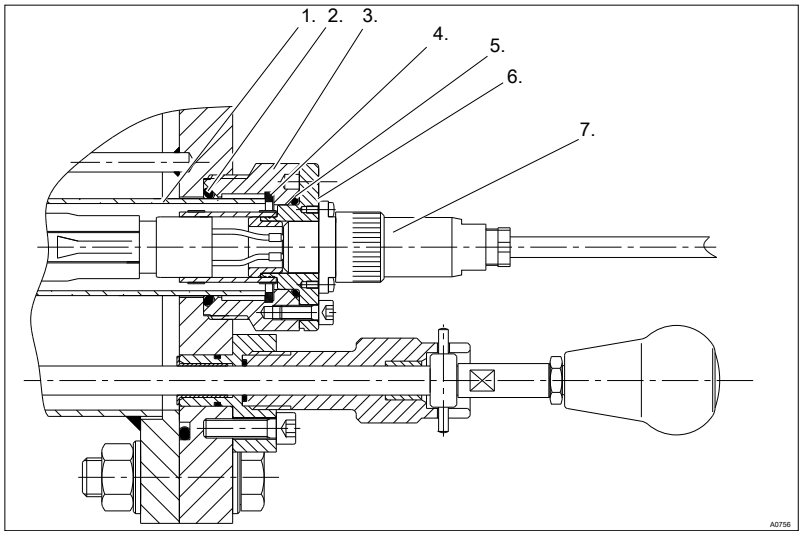


Fig. 38: Cross-section of the lamp connection

1. Lamp protection tube
2. O-ring
3. UV lamp protection tube bracket
4. Teflon ring
5. O-ring
6. Lamp cover
7. Round plug

6. Loosen the fixing screws of the lamp cover using an Allen key and pull out the lamp cover and the UV lamp by approx. 100 mm
7. Pull off the connector plug with lamp cover from the UV lamp
8. Fully remove the UV lamp and lay it to one side

9. Check whether the O-ring on the UV lamp protection tube bracket is in the groove provided - the sealing surfaces of the O-ring must be completely smooth and clean.

NOTICE!
Turn the UV lamps so that the internally aligned cables both point away from the UV sensors. Otherwise a reduced lamp output will be measured.

For free-standing UV systems, the connecting plug with UV lamp cover is to be inserted onto the UV lamp before the UV lamp is fed into the UV lamp protective tube.

10. Insert the UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm
11. Insert the connector plug with lamp cover onto the UV lamp
12. Insert the UV lamp fully into the UV lamp protection tube
13. Place the UV lamp cover onto the UV lamp protection tube bracket.

    Screw in the associated attachment screws with the Allen key provided and tighten evenly
14. Attach the round plug with the lamp connection cable to the socket on the cover of the lamp and fix in place with the knurled nut
15. Switch on the main switch or connect up the mains power supply
16. Switch on the UV system with the button
17. Slowly open the shut-off valve upstream of the radiation chamber
18. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off valve)

WARNING!
Insufficient treatment efficiency
Possible consequence: Death or illness

Check safety and warning threshold.

Check and possibly reset the safety and warning threshold when the UV lamp is replaced.

Only a correctly adjusted safety threshold will guarantee adequate treatment.

Reset UV lamp hours and UV lamp turn ons

1. With the system switched off, use the *[CHANGE]* key to display the lamp hours and lamp turn-ons
2. Confirm with the *[ENTER]* key - *[Request Access Code]* will appear on the display
3. Enter the access code and confirm with the ENTER key - *[Reset]* will appear in the display
4. Confirm with the *[ENTER]* key - the display will now be reset

7.6 Calibrating the UV sensor

All new UV lamps need a burn-in time of 100 to 200 hours. For this reason, the safety threshold and warning threshold should be checked approx. 200 operating hours after exchanging the lamp.

The UV sensor is pre-calibrated at the factory and does not have to be calibrated again.

7.7 Replacement of the filter mats on the fan and the air outlet filter

CAUTION!

Soiled filter mats

Cause: Dirty filter mats on the fan and air outlet filter can lead to the control cabinet overheating and becoming damaged

Possible consequence: Material damage.

Measure: Replace the filter mats on the fan and the air outlet filter at least once per year. The filter mats should be replaced at shorter intervals in unfavourable ambient conditions.

1. Switch off the UV system using the *[START/STOP]* key
2. Switch off the main switch
3. Remove the cover of the fan. To do so, insert your fingers into the recesses on the bottom of the cover and remove the cover
4. Remove the dirty filter mat and insert a new filter mat with the white side facing inwards (control cabinet side)
5. Replace the filter mat on the air outlet filter as described above
6. Switch on the main switch

   ⇨ Switch on the UV system.

8 Troubleshooting

- **User qualification, troubleshooting:** trained user, see
  ↳ *Chapter 2.2 'Users' qualifications' on page 8*

NOTICE!
Troubleshooting on the open switch cabinet and the replacement of components may only be done by an authorised electrical engineer.

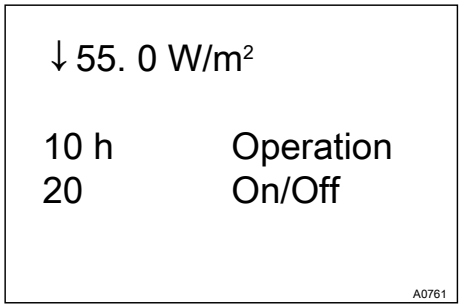


Fig. 39: Warning threshold transgressed

Message: Flashing downward arrow

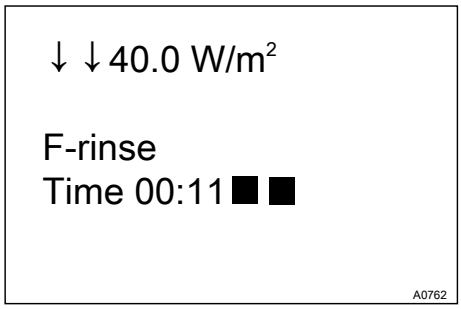


Fig. 40: Safety threshold transgressed

Message: Flashing upward arrow The remaining free rinsing duration is displayed (instead of seconds, 2 squares flash).

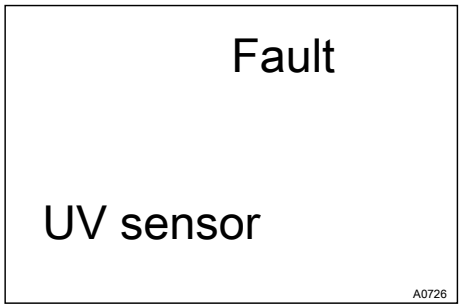


Fig. 41: Fault

Fault Minimum irradiance level undershot (after maximum free rinse duration has expired)
Fault alert: UV sensor

→ Acknowledge fault alert with the *[ENTER]* key

→ Transition to emerg.service mode with display *[CHANGE]* key

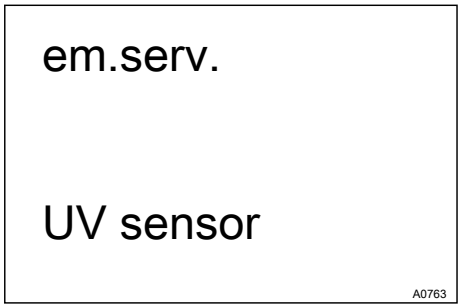


Fig. 42: Emerg.service

Emerg.service: Safety threshold transgressed

→ System continues to run in emerg.service mode

→ Acknowledge fault alert with the *[ENTER]* key.

Fault description	Cause	Remedy
Warning threshold undershot / safety threshold undershot	Coating formed on the lamp protection tubes	Clean the lamp protection tube
	Insufficient UV-transmission in the water to be treated	Improve water quality
	UV lamp at the end of its UV emission service life	Replace with new UV lamps
	Incorrect lamp current	Operate with rated current
	UV sensor not correctly calibrated	Recalibrate the UV sensor

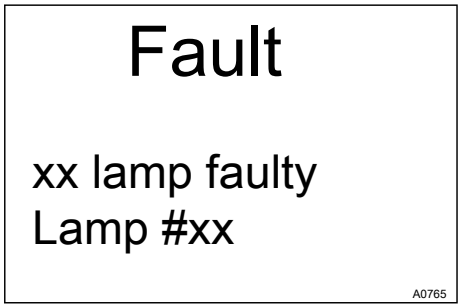


Fig. 43: Fault: Lamp failure

Fault indication: xx lamp faulty

1. → Acknowledge fault alert with the *[ENTER]* key
2. → Transition to emerg.service mode with display *[CHANGE]* key

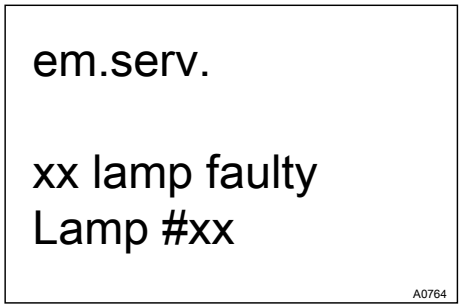


Fig. 44: Emerg.service: Lamp failure

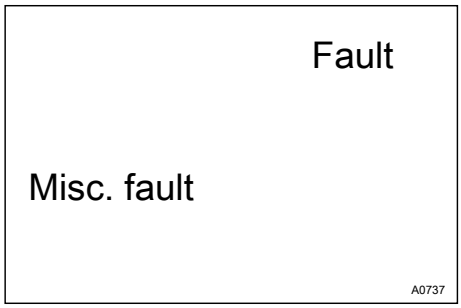
→ System continues to run in emerg.service mode

The number of failed UV lamps is indicated.

In the event that more than one UV lamp has failed, the failed UV lamp can be called up using the [Up] and [Down]-keys.

→ Acknowledge fault alert with the *[ENTER]* key.

Fault description	Cause	Remedy
Fault: Lamp failure	UV lamp xx defective	Replace with new UV lamps
	Incorrect lamp current	Operate with rated current
	Ballast faulty	Replace ballast

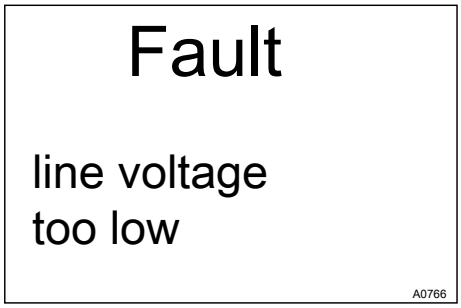


Fault alert: Other fault

Fig. 45: Other faults

→ Acknowledge fault alert with the *[ENTER]* key.

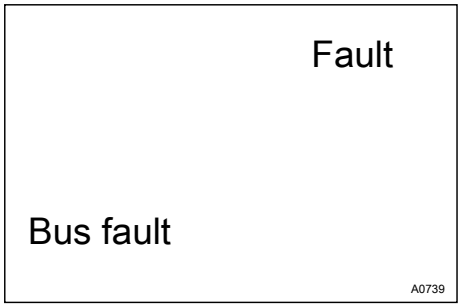
Fault description	Cause	Remedy
Other faults	External fault signal device triggered	Eliminate cause of external fault
	No external fault signal device connected and the contacts at the fault input are not bridged.	Jumper contacts at fault input



Fault alert: Voltage supply too low

Fig. 46: Line voltage too low

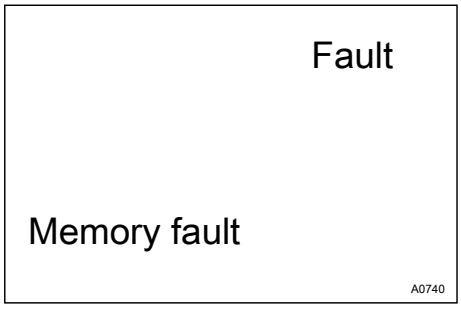
Fault description	Cause	Remedy
Voltage supply too low	The supply voltage is or was lower than the minimum permissible supply voltage	Check supply voltage



Fault alert: Bus fault

Fig. 47: Bus fault

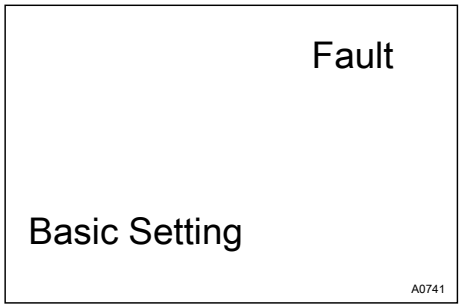
Fault description	Cause	Remedy
Bus fault	Bus connection interrupted	Restore bus connection
	Insufficient supply voltage to one or more ballasts	Check the supply voltage and micro fuse in the ballast (only an electrician is authorised to do so)
	Ballast faulty	Replace the ballast (only an electrician is authorised to do so)



Fault alert: Memory error

Fig. 48: Memory error

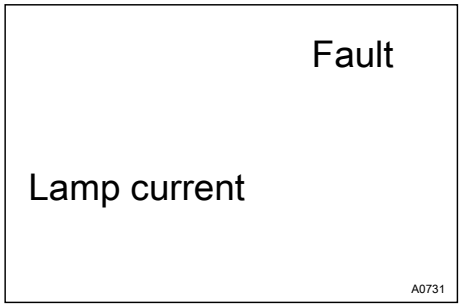
Fault description	Cause	Remedy
Memory error	During self-testing, the control has detected an error in the memory	Replace the control (only an electrician is authorised to do so)



Fault alert: Default setting

Fig. 49: Default setting

Fault description	Cause	Remedy
Default setting	During self-testing, the control has detected an error in the memory	Replace the control (only an electrician is authorised to do so)



Message: Lamp current

Fig. 50: Lamp current fault

Fault description	Cause	Remedy
Lamp current fault	Lamp current configured outside of permissible range	Configure the lamp current within permissible range (see datasheet)

Function and fault indications on ballasts

- **User qualification, bus fault:** Qualified electrician, see ↳ *Chapter 2.2 'Users' qualifications' on page 8*

Bus with ring topology

As the data bus is configured in a ring topology, defective ballasts or an interrupted data connection mean that the subsequent ballasts can no longer communicate.

Function and fault indications on ballasts

The three red LEDs on the ballasts serve for checking functionality and fault finding. When the supply voltage is applied, all three LEDs light up for approx. 1 second.

LED "supply voltage" (designation on board "Power")

- on
  - Supply voltage to ballast is sufficient
- off
  - despite the fact that the master switch is on and the mains plug is inserted
  - Check supply voltage (only electrical technician)
  - Check micro fuse

LED "lamp" (designation on board "Fault")

- flashes approx. 1 to 15 sec
  - = lamp electrodes are preheated prior to ignition
- on
  - UV lamp fails to light up. If the supply voltage is switched off and on again, the LED goes out and will only light up again after a further attempt to ignite

→ Check UV lamp

LED "Bus" (designation on board "Tx")

- lights up every 0.1 to 3 sec
  - The ballast is in communication with the controller.
- fails to light up
  - despite the UV system being switched on:
  - The bus connection to the ballast is interrupted or the ballast is faulty

9 Technical data

This technical data supplements the enclosed data sheet.

If in doubt, the information on the data sheet applies.

9.1 Performance data

Type	Number of UV lamps	UV lamp output (kW)	Connected output (kW)	Min. free space for exchanging lamps (mm)	Empty weight Operating weight (kg)	Max. flow rate (98%/cm transm., 400 J/m²) (m³/h)	Nominal width Connector
1*300R	1	0.3	0.32	1438	45 / 67	30	DN 80
2*300R	2	0.6	0.65	1438	75 / 134	95	DN 150
3*300R	3	0.9	1	1438	90 / 182	179	DN 200
4*300R	4	1.2	1.3	1438	120 / 253	274	DN 250

Permissible operating temperatures:

- Water temperature: 5 ... 40 °C
- Ambient temperature: 5 ... 40 °C

Requirements of the water to be treated:

- Maximum temperature: 40 °C
- Maximum operating pressure: 10 bar*
  - *** The permissible operating pressure is possibly lower with systems that have a non-standard design, see data sheet for the UV system**
- No corrosive or abrasive properties, chloride content < 250 ppm
- No tendency for sedimentation

9.2 Data sheet Dulcodes R with manual wiper

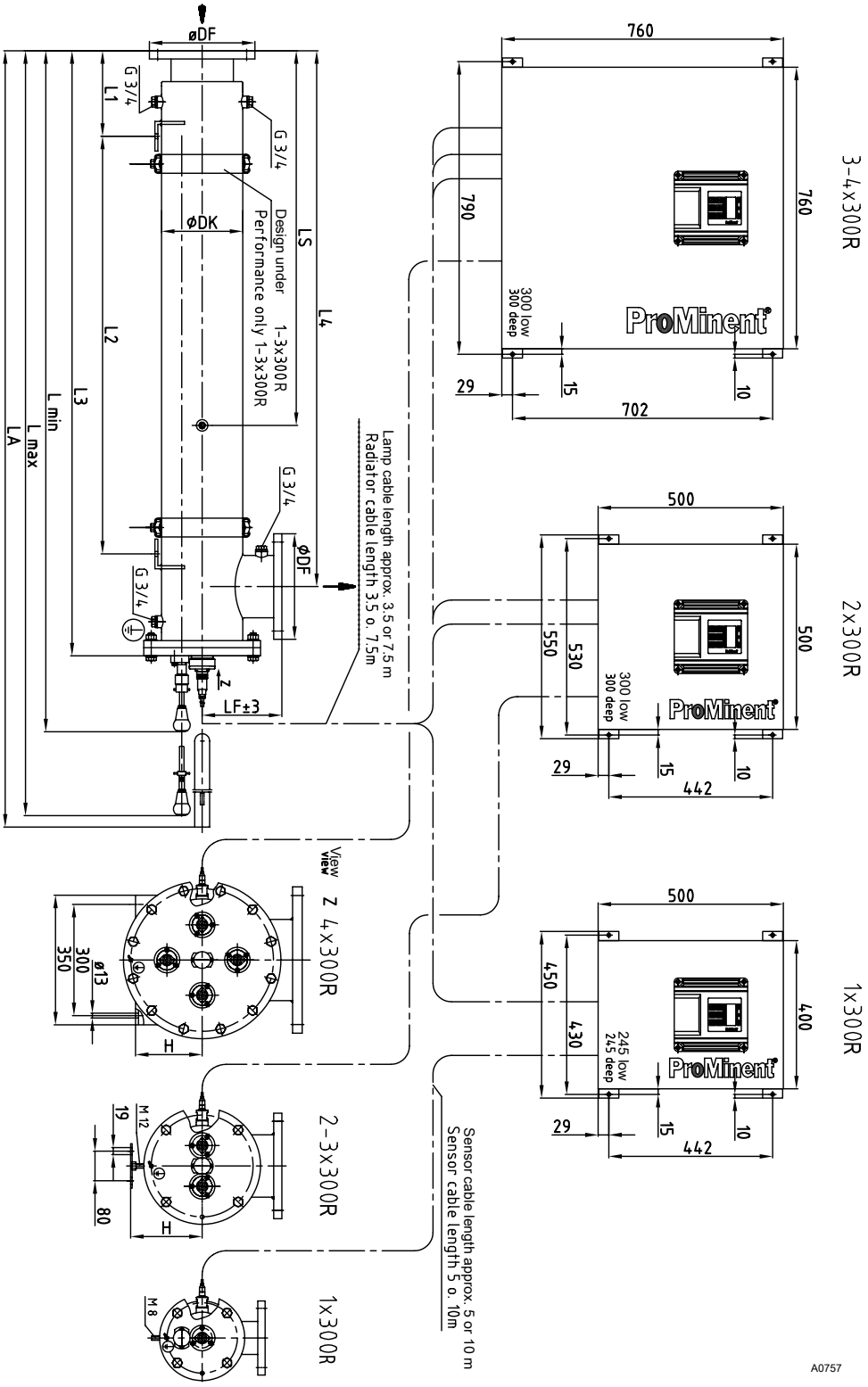


Fig. 51: Data sheet Dulcodes R with manual wiper, for data see ↬ 'Dimensions Dulcodes R (in mm) ' Table on page 72

Dimensions Dulcodes R (in mm)

Type	L1	L2	L3	L4	LS	Lmin	Lmax
1*300R	-	-	1562	1450	940	1767	2370
2*300R	-	-	1633	1446	1011	1838	2441
3*300R	-	-	1638	1431	1016	1843	2446
4*300R	261	1154	1652	1415	1030	1857	2460

Dimensions Dulcodes R (in mm)

Type	LA	LF	H	DF	DK	Flange	Volume (litre)
1*300R	3000	180	-	200	139.7	DN 80x88.9	22
2*300R	3070	215	193	285	219.1	DN 150x168,3	59
3*300R	3075	250	220	340	273	DN 200x219.1	92
4*300R	3089	280	180	395	329.9	DN 250x273	133

9.3 Data sheet Dulcodes R with automatic wiper

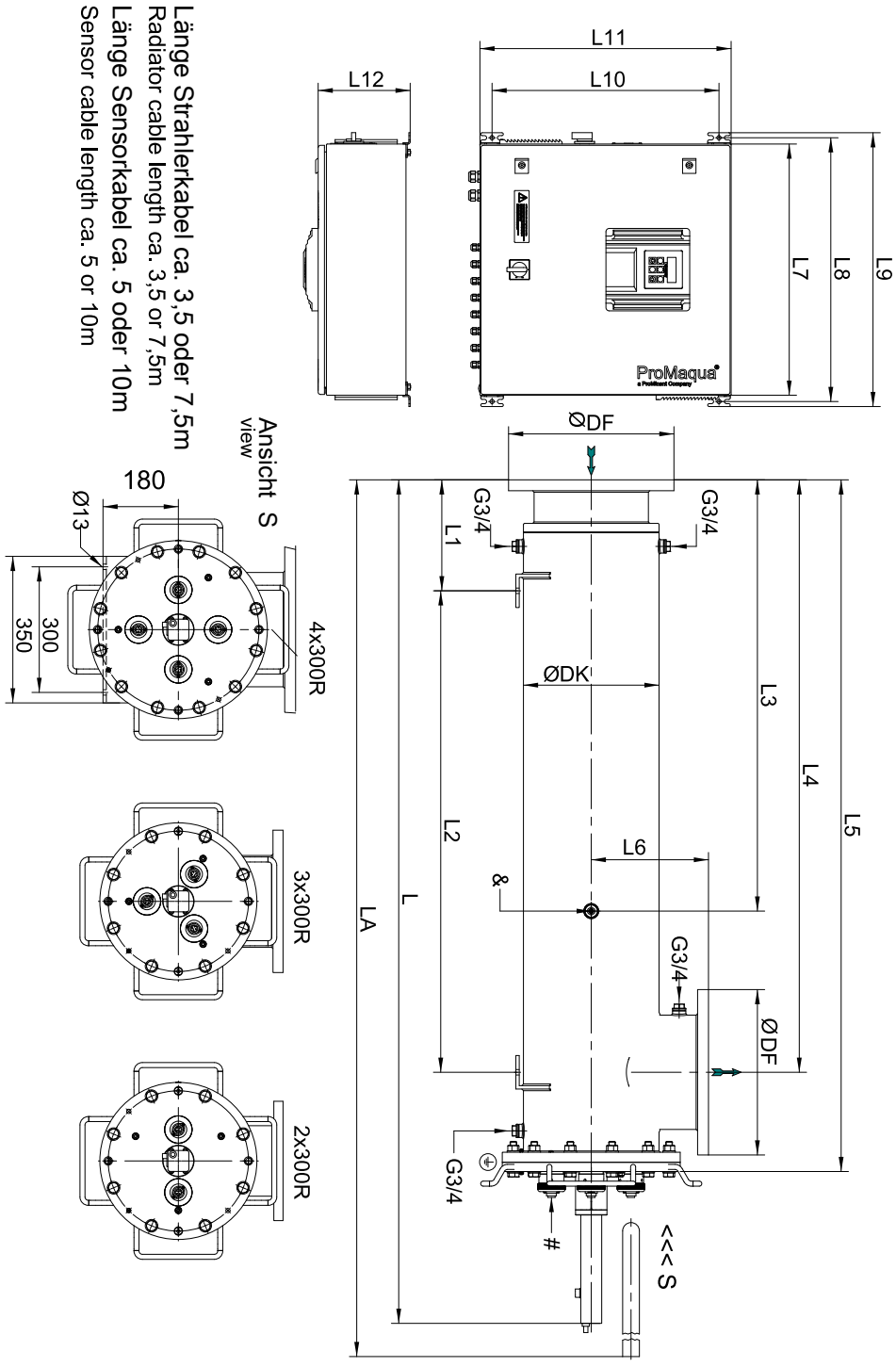


Fig. 52: Data sheet Dulcodes R with automatic wiper

Dimensions Dulcodes R (in mm)

Type	L	LA	L1	L2	L3	L4
2*300R	1995	3070	-	-	1011	1446
3*300R	2000	3075	-	-	1016	1431
4*300R	2015	3090	295	1150	1030	1415

Dimensions Dulcodes R (in mm)

Type	L5	L6	L7	L8	L9	L10
2*300R	1633	250	500	530	550	442
3*300R	1638	250	760	790	810	702
4*300R	1652	280	760	790	810	702

Dimensions Dulcodes R (in mm)

Type	L11	L12	DF	DK	Flange	Volume (litre)
2*300R	500	300	285	273	DN 150x168,3	59
3*300R	760	300	340	273	DN 200x219.1	92
4*300R	760	300	395	329.9	DN 250x273	133

9.4 Electrical data

The fuses are located in fuse boxes with a bayonet lock, on the right of the terminal box of the controller.

Radiation chamber:

Lamp type	Lamp current:
OptiFlux 300 W	normal: 3.5 A
	Maximum: 3.5 A
	Minimum: 3.0 A

Control

Fuse	Site of installation	Part no.
230 V AC, 50/60 Hz	Upper fuse (proprietary provision by controller)	712048
230 V AC, 50/60 Hz	Lower fuse (switched mains outputs XR1-XR3)	712033

Control cabinet

Contact inputs (-X3:1 ... -X3.6):

for zero volt connection contacts:

Open circuit voltage: 5V ± 0.5 V

Input resistance: 10 kOhm

Voltage outputs (-X1:1 ... -X1.10):

Type of contact: NOC

Load capacity: 250 V AC / 1 A

With inductive loads provide RC protection circuits!

Relay outputs (-X4:1 ... -X4.6):

Type of contact: NOC

Load capacity: 250 V AC / 1 A

With inductive loads provide RC protection circuits!

Alarm relay (-X4:7 ... -X4.9):

Type of contact: Change-over contact

Load capacity: 250 V AC / 1 A

With inductive loads provide RC protection circuits!

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

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

Maximum apparent ohmic resistance: 600 Ohm

10 Appendix

10.1 Spare parts drawings (with manual wiper)

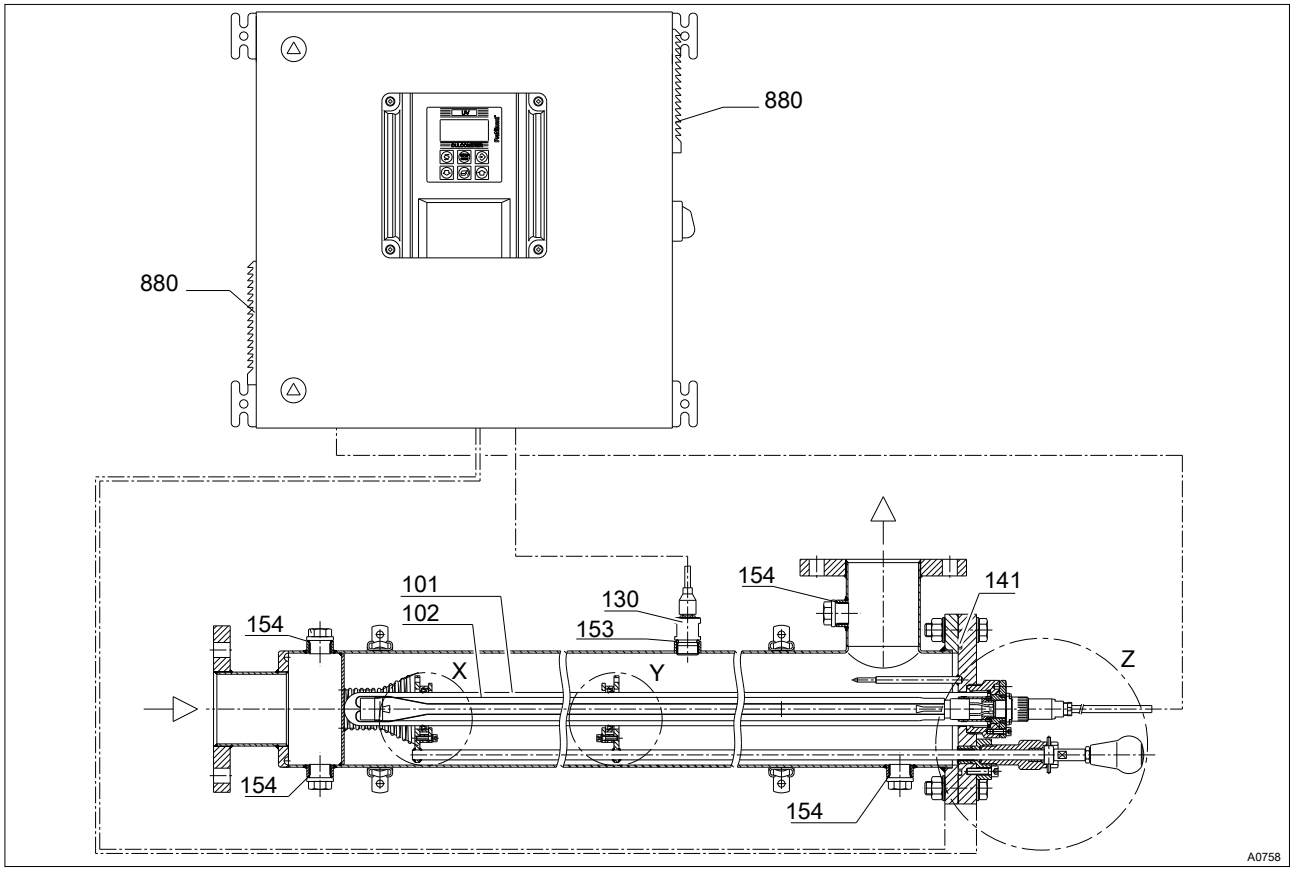


Fig. 53: Spare parts drawing Dulcodes R, spare parts list, see ↳ Chapter 10.2 ‘Spare parts list for UV-systems with manual wiper ’ on page 77

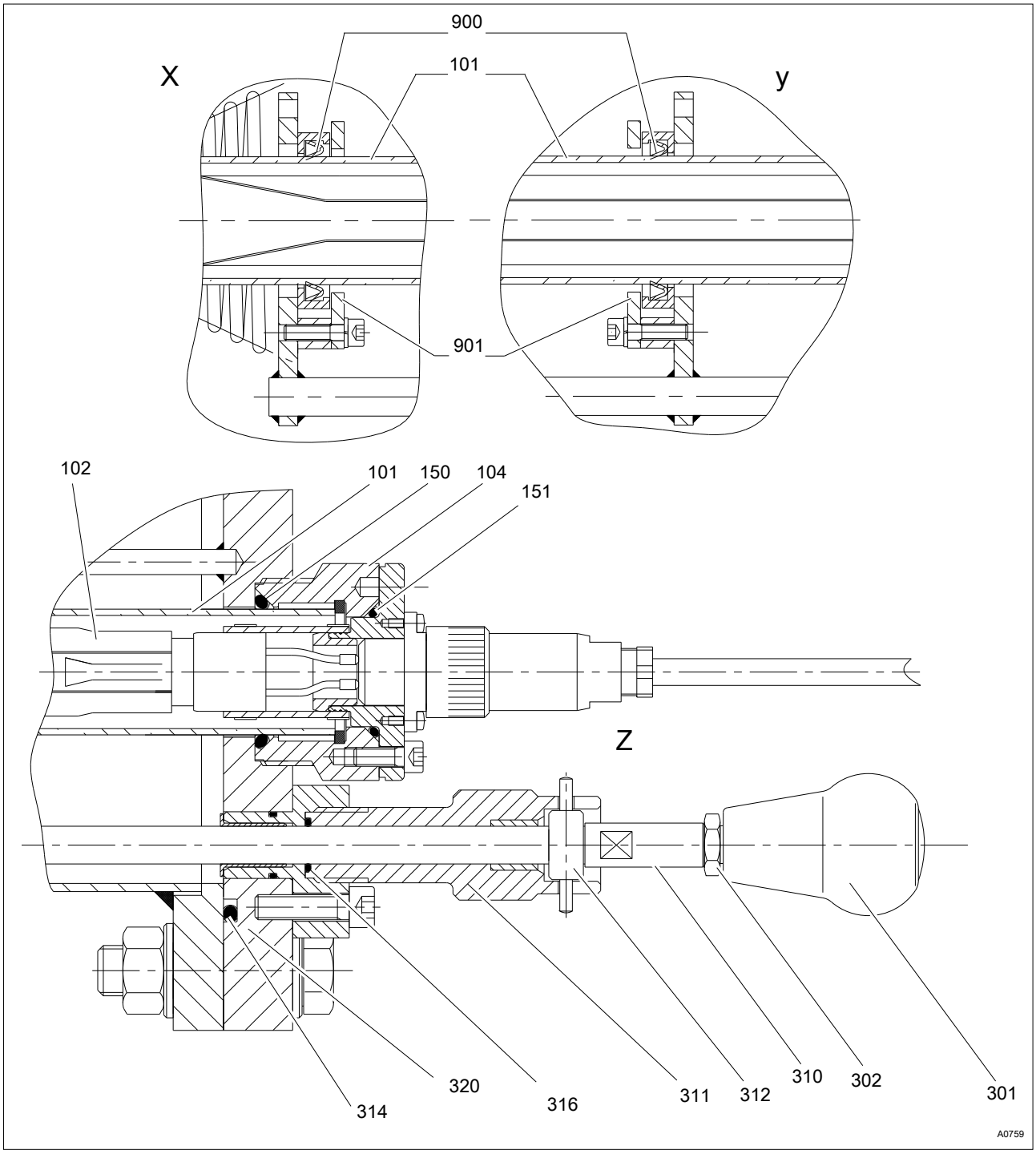


Fig. 54: Details X / Y and cross-section through the lamp connection and manual wiper, spare parts list, see Chapter 10.2 'Spare parts list for UV-systems with manual wiper ' on page 77

10.2 Spare parts list for UV-systems with manual wiper

No.	Description	Part no.	Replacement interval	each
101	Lamp protection tube ⌀ 40x2x1400 mm	1020845	on request	1 - 4
102	UV-lamp 300 W Opti Flux	1020929	max. 14,000 h	1 - 4
104	Bracket lamp protection tube (collector ⌀ 40 - G2 - ⌀ 69)	1026728	on request	1 - 4
130	UV sensor G 3/4	1034147	on request	1

No.	Description	Part no.	Replacement interval	each
141	O-ring 149.2 - 5.34 EPDM for 1x300 R	1027463	after every opening of the radiation chamber	1
141	O-ring 234.32 - 5.33 EPDM for 2x300 R	1009036		1
141	O-ring 291.47 - 6.99 EPDM for 3x300 R	1009037		1
141	O-ring 342.27 - 6.99 EPDM for 4x300 R	1009038		1
150	O-ring/M 40.00-5.00 EPDM/P	1023569	on request	1 - 4
151	O-ring 34.5-3.5 EPDM DN2	1009836	on request	1 - 4
153	O-ring/M 22.00 - 3.00 EPDM/P	1002175	on request	1
154	O-ring/M 16.00-3.00 EPDM/P	1004921	on request	2
301	Turning mushroom knob GN 597-45-M1	1027877	on request	1
302	Hexagon nut DIN 439 M10	1017585	on request	1
310	Guide bolts M8/M10x65 for UVR	1027931	on request	1
311	Clamping screw complete for wiper rod	1027975	on request	1
312	Fixing bushing with pins for UVR	1027930	on request	1
314	O-ring/M 18.00 - 2.00 EPDM/P	1002279	on request	1
316	O-ring 11.91 - 2.62 EPDM	790410	1 year	1
320	Bearing flange complete for wiper rod	1027944	on request	1
860	Face spanner for ⌀ 14-100	409805	Auxiliary tool	1
880	ET Filter mat SK 3322.700	1004212	1/2-1 year	2
900	Wiper elements for UVR	1027879	1 - 2 years	2 - 8
901	Holding ring ⌀ 62/45x4 for UVR PTF	1028100	on request	2 - 8
-	Lamp cover	1027541	on request	1 - 4

10.3 Spare parts drawings (with automatic wiper)

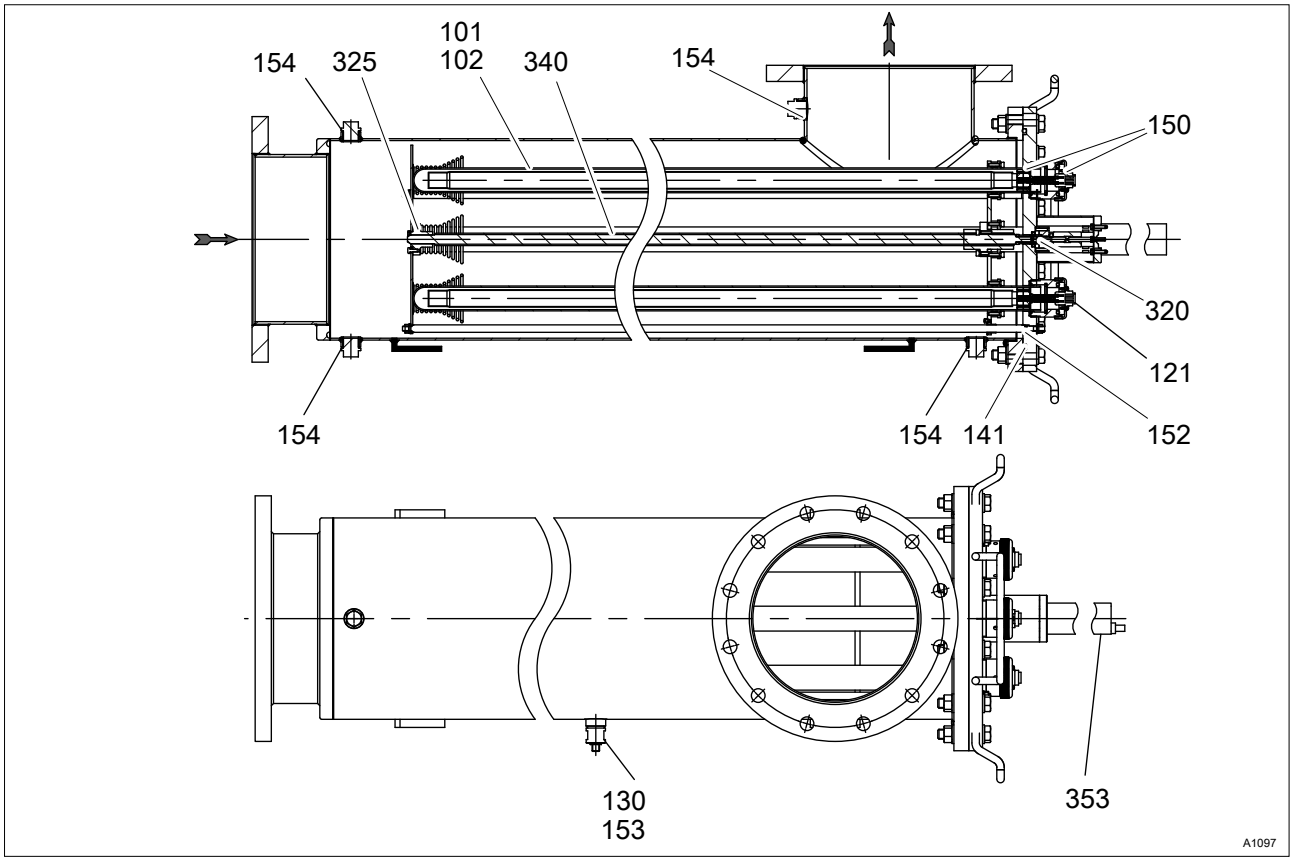


Fig. 55: Spare parts drawing Dulcodes R

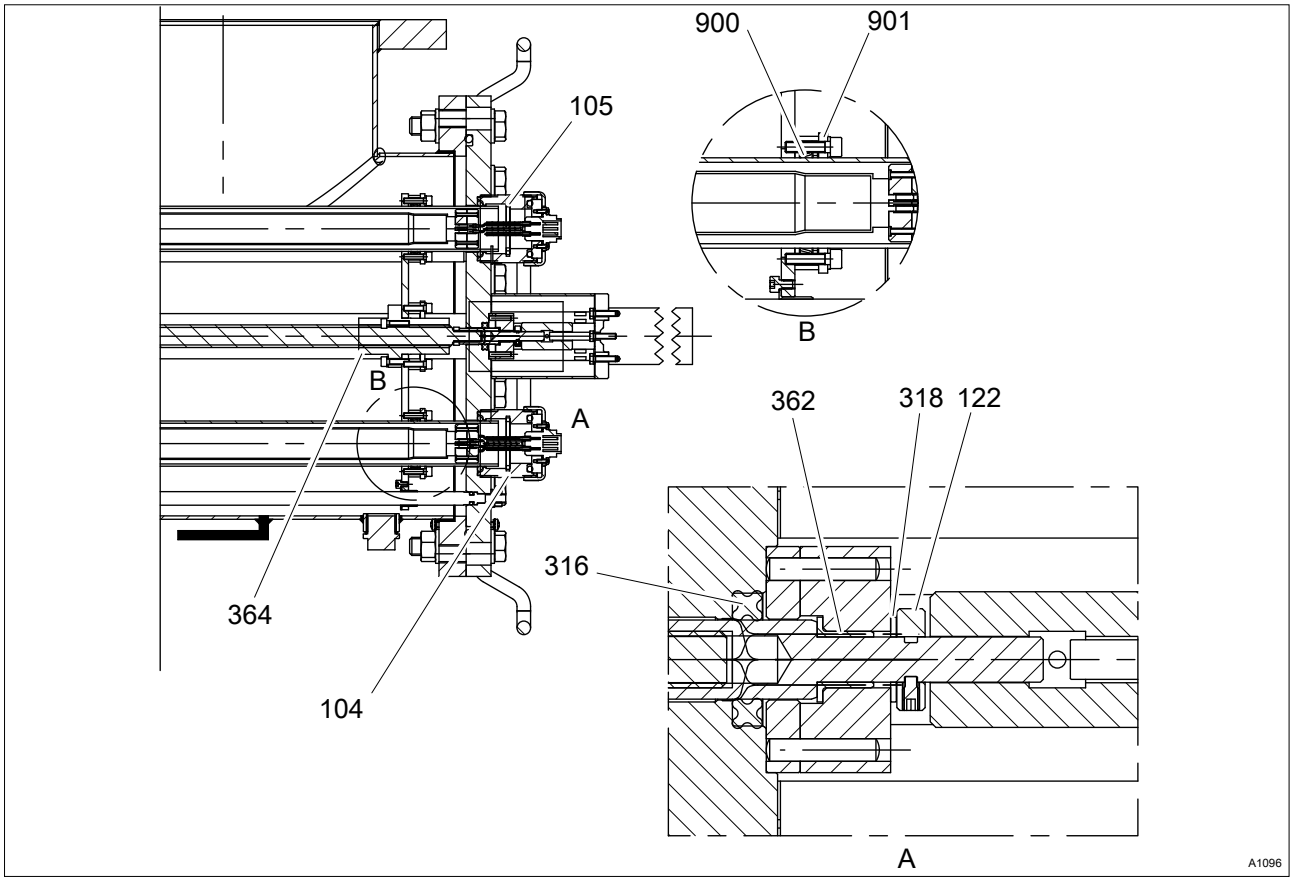


Fig. 56: Details A / B and section through the lamp connection and automatic wiper

10.4 Spare parts list for UV-systems with automatic wiper

No.	Description	Part no.	Replacement interval	each
101	Lamp protection tube ⌀ 40x2x1400 mm	1020845	on request	2 - 4
102	UV-lamp 300 W Opti Flux	1020929	max. 14,000 h	2 - 4
104	Collector ⌀ 40 - G2 - ⌀ 60	1041180	on request	2 - 4
105	Retainer	1035074	on request	
121	Lamp cover, complete	1041182	on request	
122	Bearing washer, complete	1041183	on request	
130	UV sensor G 3/4	1034147	on request	1
141	O-ring 234.32 - 5.33 EPDM for 2x300 R	1009036	after every opening of the radiation chamber	1
141	O-ring 291.47 - 6.99 EPDM for 3x300 R	1009037		1
141	O-ring 342.27 - 6.99 EPDM for 4x300 R	1009038		1
150	O-ring/M 40.00-5.00 EPDM/P	1023569	on request	2 - 8
152	O-ring	740331	on request	
153	O-ring/M 22.00 - 3.00 EPDM/P	1002175	on request	1
154	O-ring/M 16.00-3.00 EPDM/P	1004921	on request	2-4
316	X-Ring 13.75x5.3x4.75 / 70 EPDM 281	1010384	1 year	1
318	Slip washer	1041199	1 year	1
320	Bearing cover	1037028	on request	
325	Counter bearing	1041203	1 year	1
340	Wiper rod, complete, 2x300 W	1041204	on request	
340	Wiper rod, complete, 3x300 W	1041205	on request	
340	Wiper rod, complete, 4x300 W	1041206	on request	
353	Motor	1037490	on request	1
362	Slide bearing	1037033	1 year	1
364	Nut, TR 20x4	1010116	1 year	1
860	Face spanner for ⌀ 14-100	409805	Auxiliary tool	1
880	ET Filter mat SK 3322.700	1004212	1/2-1 year	2
900	Wiper elements for UVR	1027879	1 year	2 - 8
901	Holding ring ⌀ 62/45x4 for UVR PTF	1028100	on request	2 - 8
-	Lamp cover	1027541	on request	1 - 4

10.5 Terminal wiring diagram

WARNING!

Mains voltage on protective low voltage

Possible consequence: Fatal or very serious injuries.

Measure: If connecting the protective low voltage (SELV) to one of the X4 terminals, the X4 terminals must not be connected to mains voltage.

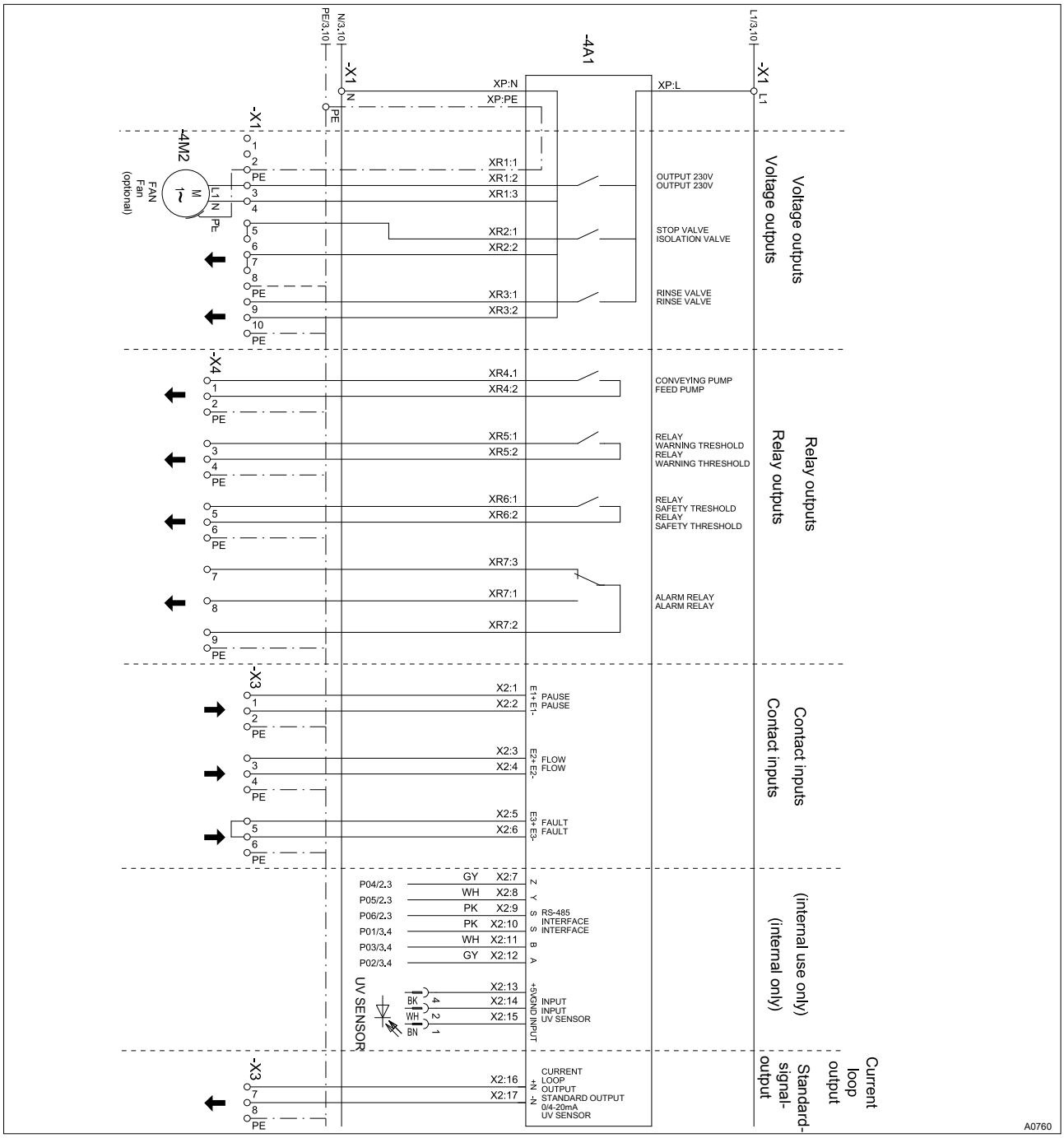


Fig. 57: Terminal Wiring Diagram

10.6 Dulcodes UV system unit operating log

Date	Turn-ons UV lamp	Operating hours UV lamp	Signal display Sensor [%] // [w/m²]	UV-transmission [%/1 cm]	Flow [m³/h]	Maintenance work	Signature

10.7 Disposal of used parts

- **Users' qualification:** instructed persons, see *Chapter 2.2 'Users' qualifications' on page 8*

NOTICE!

Regulations governing disposal of used parts

– Note the current national regulations and legal standards which apply in your country

ProMinent Dosiertechnik GmbH, Heidelberg will take back decontaminated used devices providing that they are covered by adequate postage.

11 EC Declaration of Conformity

EU Declaration of Conformity

We, hereby declare that,

ProMaqua GmbH
Maaßstraße 32/1
D - 69123 Heidelberg

on the basis of its functional concept and design and in the version marketed by us,
the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.
Any modification to the product not approved by us will invalidate this declaration.

Product description:	***UV disinfection system Dulcodes***
Product type:	***UVCa...***
Serial number:	***Please refer to the type plate on the device***
Relevant EC regulations	***EU - Low Voltage Directive (2006/95/EC)*** ***EU - EMC Directive (2004/108/EC)*** ***EU Pressure Equipment Directive (97/23/EC)***
Harmonised standards applied, in particular:	***EN 60204-1, EN 60335-1, EN 60529*** ***EN 610000-3-2, EN 610000-6-1/2/3/4***
Harmonised national standards and other technical specifications applied, in particular:	
Technical documents have been compiled by documentation specialists:	***Dr. W. Weibler*** ***Maaßstraße 32/1*** ***D - 69123 Heidelberg***
Date /manufacturer's signature:	*7.5.2010*
The undersigned:	*Ralf Kiermaier, Managing Director of ProMaqua GmbH*

Fig. 58: EC Declaration of Conformity

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