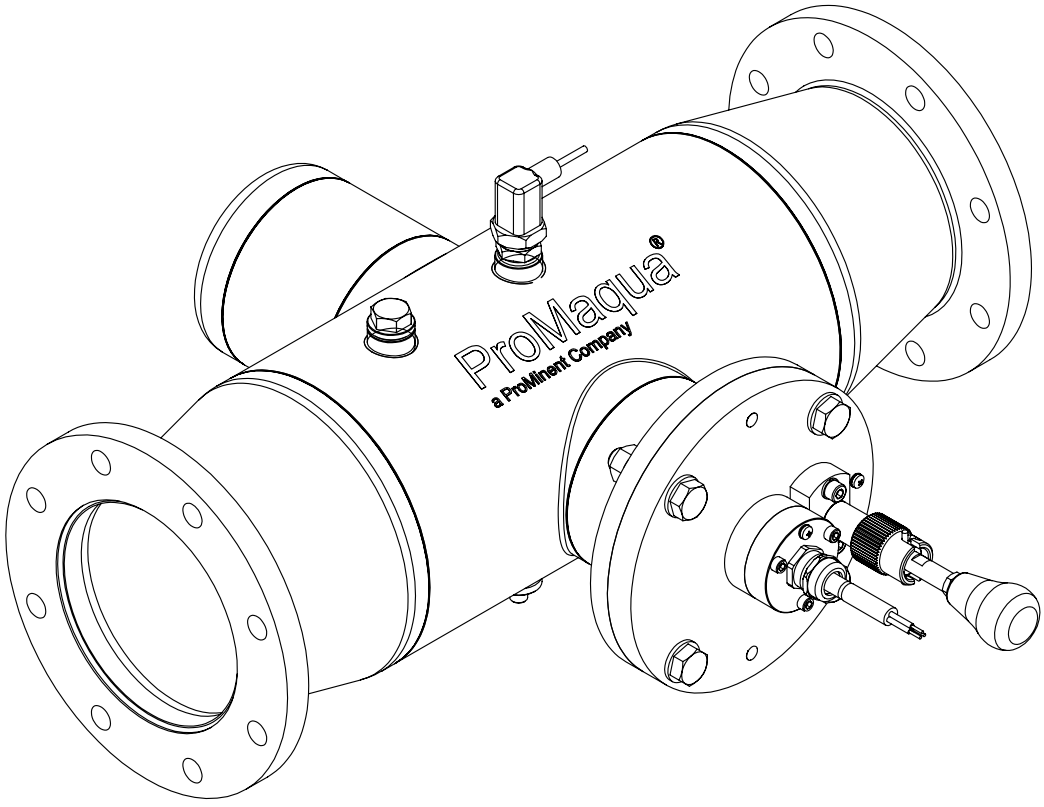
Assembly and operating instructions

Dulcodes S UV System



A0103

Please stick the specification plate 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.

ProMaqua GmbH
Maaßstraße 32/1
69123 Heidelberg

email: info@promaqua.com
Internet: www.promaqua.com

986330, 2, en_GB

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 9*

Table of contents

1 About this system

Application

The Dulcodes S UV systems are used for photochemical treatment and to support the disinfection of:

- Process water
- Swimming pool water

In the treatment of swimming pool water, harmful substances, such as chloramines, can be effectively reduced by UV radiation and also germs, which are difficult to inactivate with chlorine, can be safely killed.

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

Scope of delivery

- Radiation chamber
- Lamp with lamp protection tube
- UV-C sensor
- Temperature switch
- Controll cabinet with controller
- Mounting materials
- Documentation

Dependent on the system type, the system is equipped with no wiper, a manual wiper or an automatic wiper. Retrofitting with a manual or automatic wiper is easily possible.

Allocation of wiper versions to the device types

Device type	Without wiper	Manual wiper (Manual wiper)	Automatic Wiper (Automatic wiper)
0.65 kW	X	----	----
1.00 kW	X	O	O
2.00 kW	X	O	O
3.00 kW	X	O	O
2x2.00 kW	----	X	O
3x2.00 kW	----	X	O
3x3.00 kW	----	X	O
X = standard; O = optional; ---- = not available			

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.

Training	Definition
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.
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 S Safety Information

WARNING!

UV-C radiation

Possible consequence: Serious injuries

UV-C radiation is harmful to the eyes and skin

- Only operate the UV lamp when it is 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 system

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!

Overheating of lamp and treatment chamber

Possible consequence: material damage

- Ensure that, with the exception of when the UV 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 system after the radiation chamber has been filled with water
- Switch the 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 a suitable filter prior to 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

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

The medium pressure UV lamp generates a very high level of UV-C radiation, which is particularly effective for the treatment of water. The UV lamp is located in a lamp protection tube 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 results in evenly-distributed irradiation of the entire flow of water.

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

3.1 Commissioning

Once the Dulcodes UV-system has been switched on, the UV lamp is ignited. Following ignition, the UV lamp needs approx 1 - 3 minutes until it has reached its operating temperature.

The UV-C sensor monitors the UV lamp: As soon as the UV-C output has exceeded the warning threshold, the UV system switches to normal operation mode.

If the safety threshold is not exceeded within the maximum permissible warm-up time, the controller switches the UV-system off and goes into fault 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 safety threshold: the controller switches the UV-system off and goes into fault mode.

3.3 Automatic wiper

Manually triggering a wiper cycle

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.

If you press the Enter key in the *"Wiper"* display, a wiping process is triggered. This is independent of whether the system is set to *"ON"* or *"OFF"* .

If you start the wiping process in warming up mode, the warming up process is stopped and once the wiping process is ended, the warm-up time is restarted.

Regular wiping

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.

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

3.4 Temperature Monitoring

The water temperature in the radiation chamber is monitored throughout the entire time the UV lamp is operating.

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

3.5 Switching off

When the OFF switch on the UV controller is pressed, the UV lamp is switched off immediately.

3.6 Cool down

As the UV lamp can only be re-ignited after it has cooled down sufficiently after the UV system has been switched off, the UV system goes into cooling down mode.

After pressing the STOP button has been pressed during cool down, the UV system only starts up again automatically after the remaining cooling-down time is elapsed. The UV system also only restarts after completion of the cool-down time, even after cancellation of Pause mode during cool-down.

Only with service work

A test ignition can be triggered during the cool-down period by pressing the key .

4 Control

NOTICE!

With the exception of sensor calibration, modifications to the settings can 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. It is therefore not necessary to change the settings with many applications.

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.

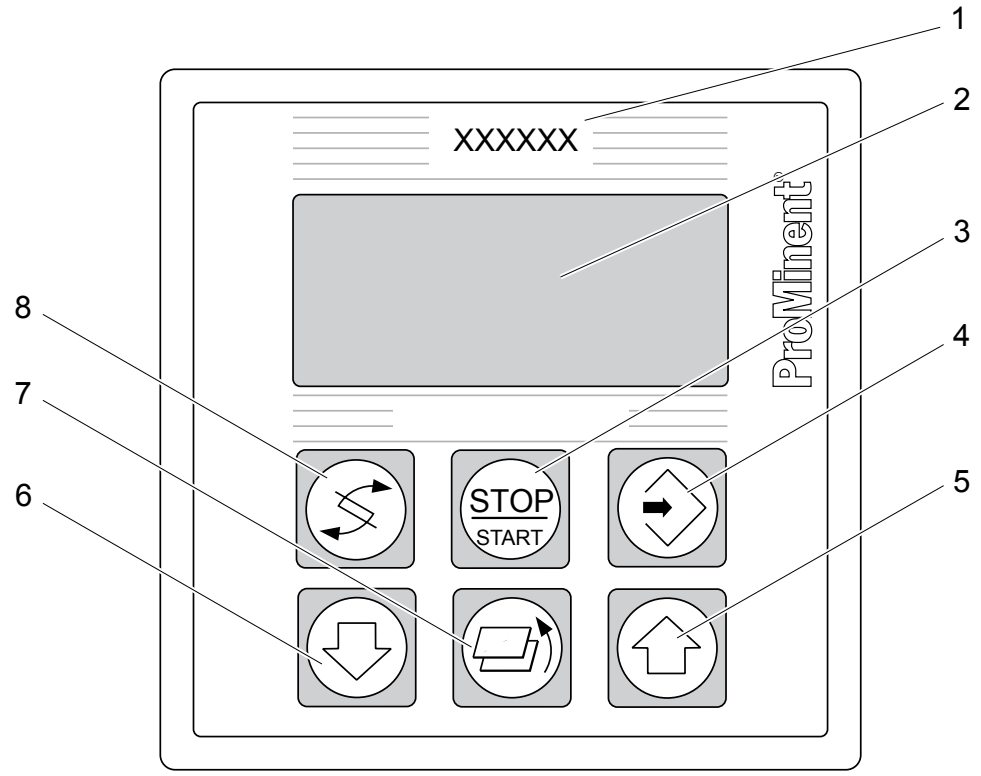


Fig. 1: Display and operating unit

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

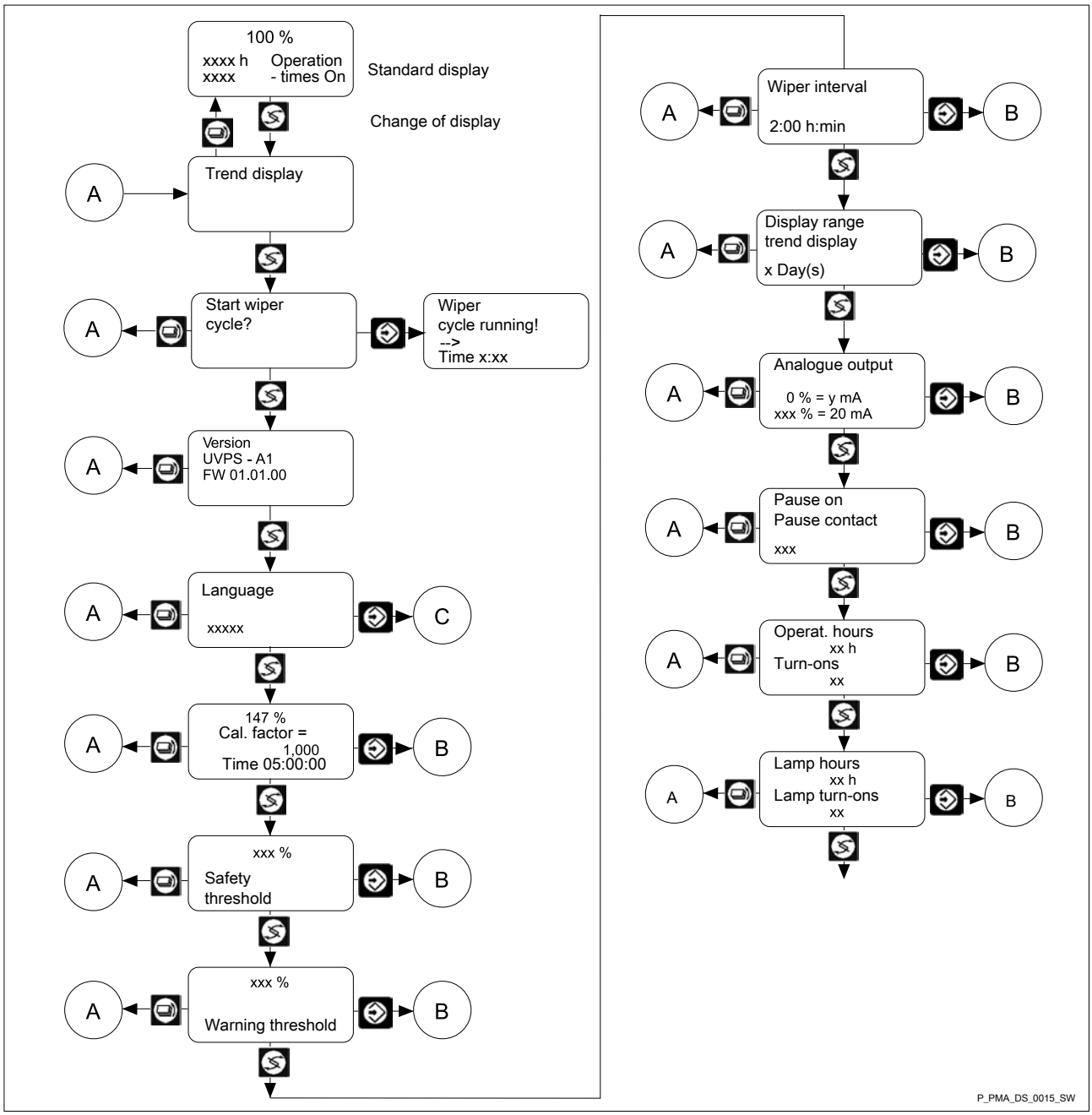


Fig. 2: Operating status display (with the system running)

A + Back to Trend display

B = Change to Programming mode

C = Change to "Change Access Code" mode

Programming manual

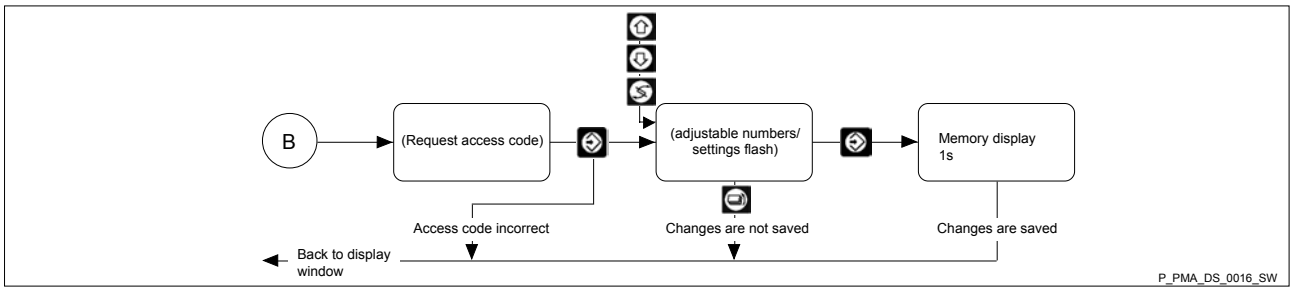


Fig. 3: Programming manual

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 has been 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

- Every 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

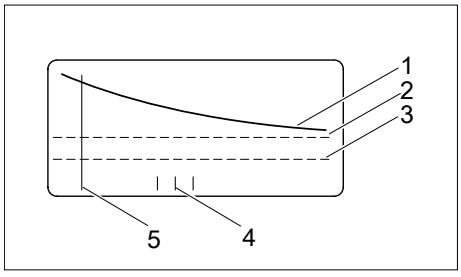


Fig. 4: Trend display

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 lamp, the formation of a film coating on the UV lamp protection tube 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. he short vertical lines show when the UV system is switched on. The display range of the UV sensor signal lies between 0 % and the value that 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: 120%

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

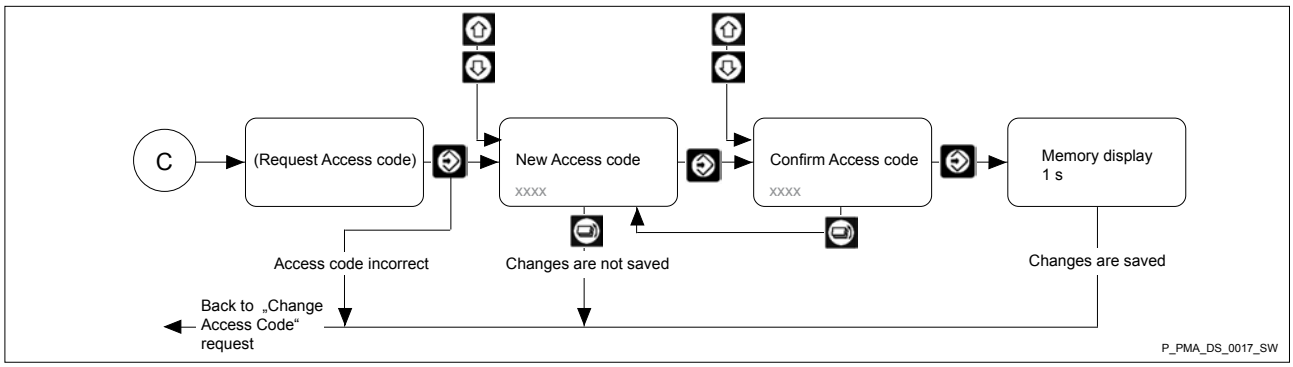


Fig. 5: Change Access Code

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

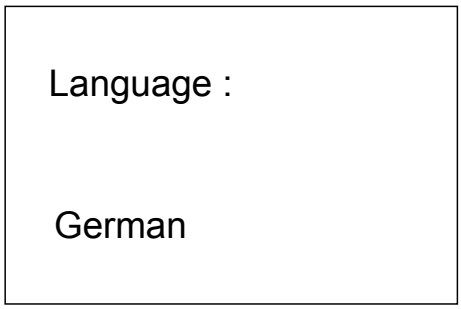


Fig. 6: Setting the Language

It is possible to select between different languages.

4.2.4 Calibrating the sensor

Default setting 1,000

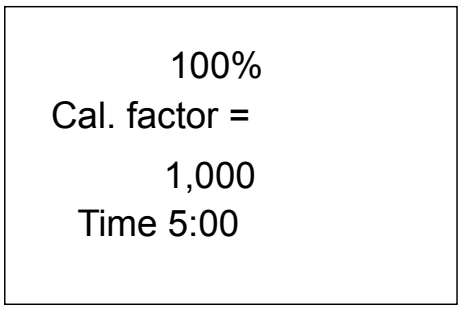


Fig. 7: Calibrating the sensor

NOTICE!

Incorrect calibration caused by dirty components

Possible consequence: insufficient irradiation due to inaccurate calibration.

Ensure before starting the calibration, that the UV lamp and UV sensors are clean, see ↳ *Chapter 7.1.4 “Cleaning the UV Sensor ” on page 58* and ↳ *Chapter 7.1 “Cleaning the UV lamp protection tube” on page 51*

The UV sensor must be calibrated when a new UV lamp is installed.

The safety threshold and warning threshold are no longer monitored during calibration. For safety reasons, calibration is automatically interrupted after 5 minutes without the changes made being saved. The time count down can be seen in the display.

The UV sensor signal must be stable before the start of calibration. A changing UV sensor signal shows that the UV lamp has not yet warmed up sufficiently (5 to 10 minutes).

4.2.5 Triggering the wiper cycle

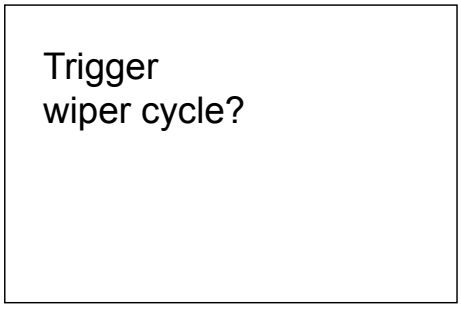


Fig. 8: Triggering the wiper cycle

If an additional cleaning requirement exists, you can trigger a wiper cycle additional to those at the programmed intervals by pressing the key.

4.2.6 Setting the safety threshold

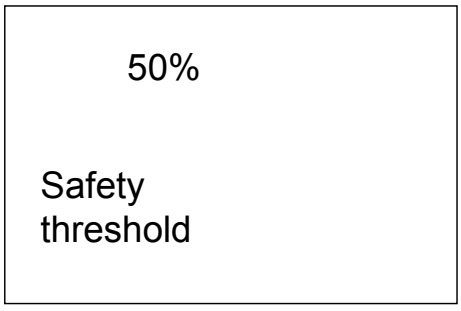


Fig. 9: Setting the safety threshold

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

Monitoring the safety threshold

During wiper operation of the automatic wiper, the wiper safety threshold is not monitored.

Reliable and safe water treatment can no longer be guaranteed if the UV-C output falls so low that the UV sensor signal falls below the safety threshold. 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 controller. 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 system using the key
2. Wait until the UV lamp has reached its full capacity, i.e. until the UV-C sensor signal is stable
3. Read the UV-C intensity displayed and note it down
4. Switch on the UV system using the key
5. Set the safety threshold to 50 %
6. Now set the warning threshold

4.2.7 Setting the warning threshold

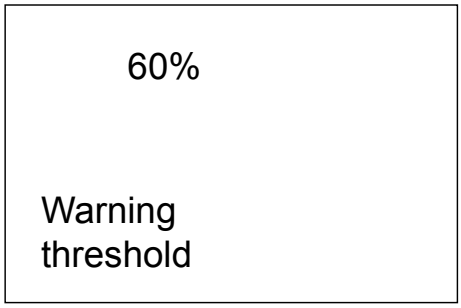


Fig. 10: Setting the warning threshold

WARNING!

UV lamp replacement

Possible consequence: Illness

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

Monitoring the warning threshold

During wiper operation of the automatic wiper, the wiper warning threshold is not monitored.

The system issues a warning should the UV-C output drop so far that the UV sensor signal falls below the warning threshold. To prevent the signal falling below the safety threshold, the UV lamp protection tube should be cleaned, the UV lamp 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 controller. The relay is closed when the signal falls below the warning threshold.

Setting the warning threshold

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

Prerequisites:

- The UV-C intensity is stable
- The safety threshold has been set

Set the warning threshold to 60 %

⇨ The safety and warning thresholds have been set, the system is now ready for operation and can be switched on with the STOP key.

4.2.8 Adjusting the wiper interval

Default setting 2 hours

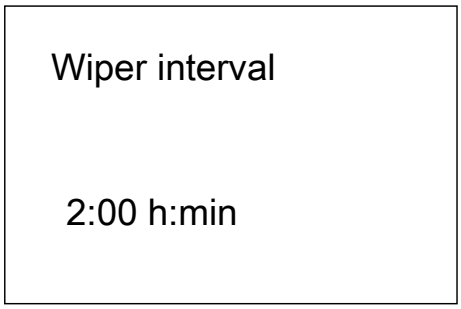


Fig. 11: Adjusting the wiper interval

For systems with an automatic wiper, the interval (h:min) between wiping can be set between 1:00 and 9:59. Adjustment takes place in steps of one minute each.

4.2.9 Adjusting the Display Range of the Trend Display

Default setting 100 days

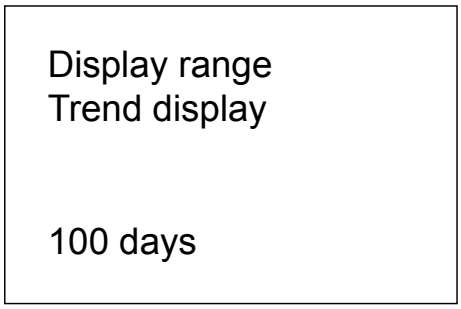


Fig. 12: Adjusting the Display Range of the Trend Display

The recording time of the UV 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. The display range can be set between 4 - 100 days.

4.2.10 Analogue output UV sensor signal: assigning the standard signal

Default setting

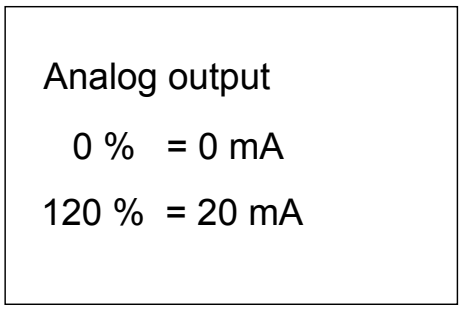


Fig. 13: Analogue output UV sensor signal: assigning the standard signal

0% = 0 mA

100 % = 20 mA (depending on the settings)

NOTICE!

Maximum value of the Trend display

The UV sensor signal assigned to the 20 mA is simultaneously the maximum value of the Trend display.

Adjust this UV sensor signal value to 120 % 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 controller.

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

- 0 or 4 mA corresponds to UV sensor signal 0 %
- The 20 mA value can be allocated to any maximum % value (0 % - 999 %).

4.2.11 Pause Function

Default setting

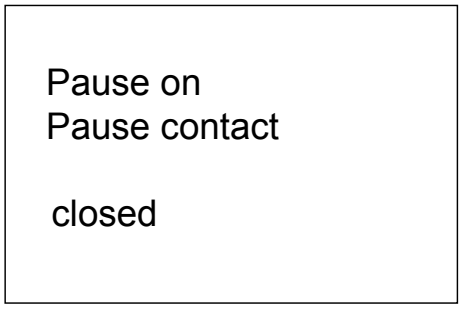


Fig. 14: Pause Function

Default setting: closed (UV-system starts up when the Pause contact is open)

The UV-system can be switched on and off by opening and closing an external contact 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.

4.2.12 Displaying/Resetting the Counter

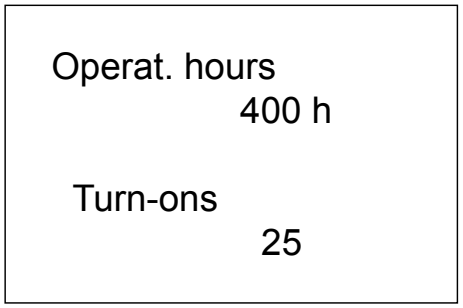


Fig. 15: OPERATING HOURSand TURN ONS

The Operating times and Turn on counters can not be reset.

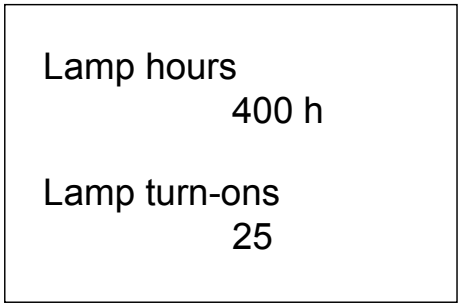


Fig. 16: LAMP HOURS and LAMP TURN ONS

The lamp hours and lamp on counters can be reset.

4.2.13 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.

5 Mounting and installation

WARNING!

Insufficient disinfection efficiency

Possible consequence: Illness

Please read the technical data sheet for your system.

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 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 a suitable filter prior to the UV system.

NOTICE!

Switching on and off

Possibility of increased wear to UV lamp

Operate the UV system in such a way that the frequent switching on and off of the UV lamp is avoided.

5.1 Radiation chamber

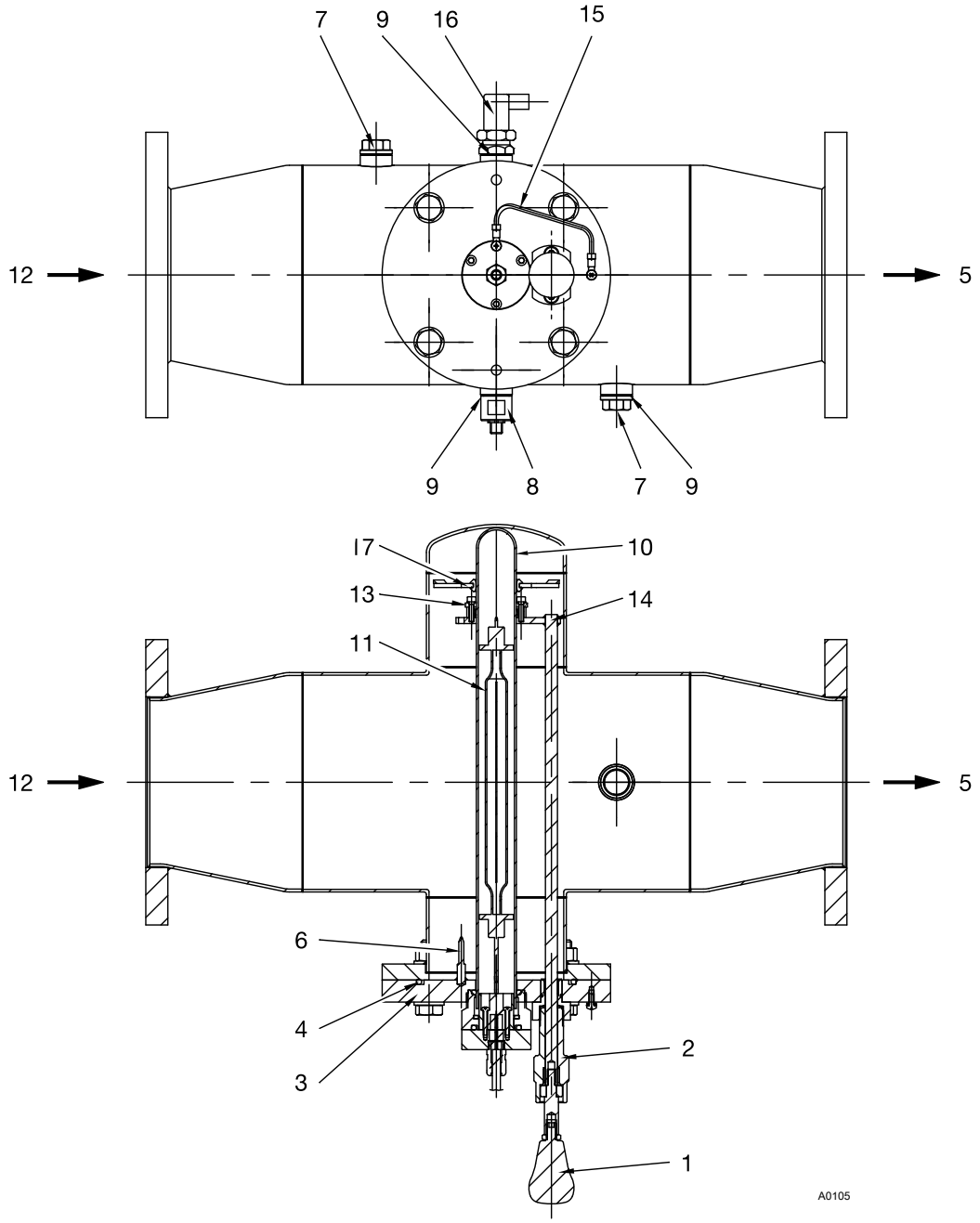


Fig. 17: Layout of the radiation chamber with manual wiper

1 Mushroom knob
2 Clamping screw
3 Chamber cover
4 O-ring
5 Outlet
6 Centring bolt
7 Air vent/Drain/Flushing connection with O-ring (depending on installation location)
8 UV sensor
9 O-ring
10 Lamp protection tube
11 Lamp
12 Inlet
13 Wiper element
14 Bracket with wiper rod
15 Protective earth conductor cable
16 Temperature switch
17 Support plate for lamp protection tube

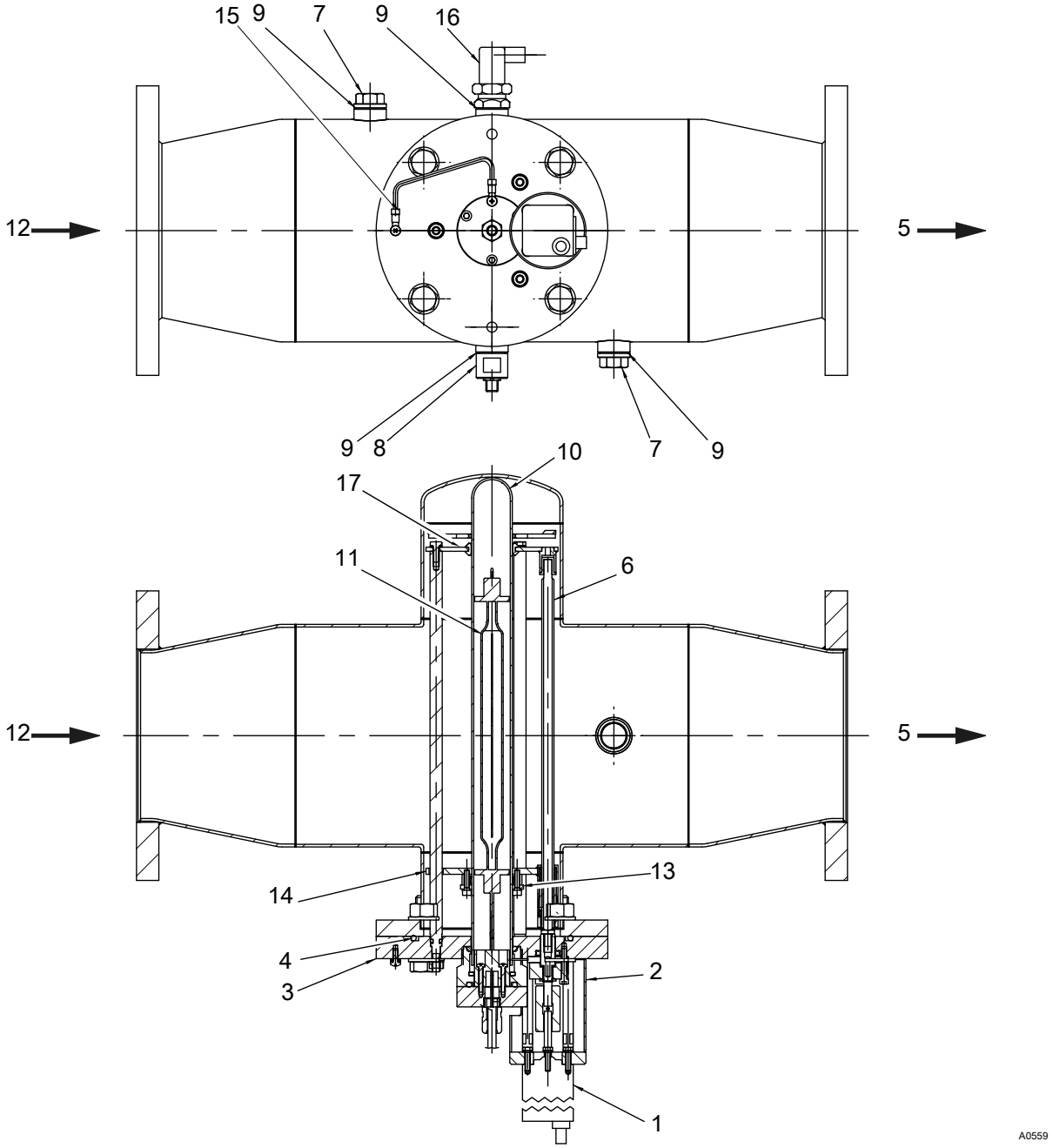


Fig. 18: Layout of the radiation chamber with automatic wiper

1. motor
2. Protection cover
3. Chamber cover
4. O-ring
5. Outlet
6. Wiper rod
7. Air vent/Drain/Flushing connection with O-ring (depending on installation location)
8. UV sensor
9. O-ring
10. Lamp protection tube
11. Lamp
12. Inlet
13. Wiper element
14. Bracket
15. Protective earth conductor cable
16. Temperature switch
17. Support plate UV lamp protection tube

5.1.1 Assembly

Location

CAUTION!

Location

Possibility of reduced power and early failure of lamp.

The UV system should be installed in such a way that the UV lamp lies horizontally.

NOTICE!

Maintenance work

Leave adequate room for maintenance work!

The clearance required can be found in the dimensions sheet enclosed (replacement of lamp protection tube).

Fix the radiation chamber in place with appropriate fixing material (pipe clamp, frame). The installation location can in principle be chosen at random and, if required, can be adapted to conditions on site. Ensure that the UV lamp lies horizontally. With UV systems that have a manual wiper, ensure that the wiper can be operated easily.

5.1.2 Fitting the Warning Label

NOTICE!

The supplied self-adhesive warning label should be fixed very visibly to the radiation chamber.

5.1.3 Hydraulic Connections

CAUTION!

Installation regulations

Possibility of incorrect assembly

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

CAUTION!

Damage to lamp and wiper element

Possibility of damage to lamp and wiper element.

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 lamp, radiation chamber and wiper element.

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

NOTICE!

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

5.2 Contol Cabinet and Controller

5.2.1 Assembly

NOTICE!

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

The control 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 lamp and the UV sensor can be connected to the cables provided.

5.2.2 Electrical Connections

WARNING!

Electrical Connections

Possible consequence: Fatal or very serious injuries

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

5.2.3 Fitting the Temperature Sensor

WARNING!

Overheating of radiation chamber

Possible consequences: Serious injuries and material damage due to overheating.

The radiation chamber may overheat if the temperature switch is not fitted correctly .

The temperature sensor used for monitoring the water temperature must be screwed into its appropriate sleeve on the radiation chamber.

1. Carefully push the O-ring over the thread of the temperature sensor
2. The temperature sensor should be screwed "hand-tight" into the sleeve
3. Attach the connecting cable and fix in place

5.3 Fitting the UV lamp protection tube

5.3.1 Fitting the UV lamp protection tube without the 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 pull the transport protection (grey plastic pipe) completely out of the radiation chamber

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

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

5. 

CAUTION!

- Check the UV lamp protection tube for damage before fitting.
  - 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 13 mm and may not be offset at an angle.

Ensure that the UV lamp protection tube is sitting correctly! The UV lamp protection tube may not project out more than 13 mm and may not be offset at an angle.

5.3.2 Fitting the UV lamp protection tube 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, 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.

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 pin 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 UV 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 13 mm and may not be offset at an angle.

Ensure that the UV lamp protection tube is sitting correctly! The UV lamp protection tube may not project out more than 13 mm and may not be offset at an angle.

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)

5.3.3 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!

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
- Do not modify the fitted UV 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

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

1. Check whether the O-ring on the lamp protection tube bracket is in the groove provided - the sealing surfaces of the O-ring must be completely smooth and clean!
2. Place the O-rings provided into the groove on the lamp protection tube bracket
3. Take the UV lamp out of its protective packaging
4. Wipe the UV lamp with the cleaning cloth provided
5. Re-wipe the UV lamp with a soft cloth
6. Insert the UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm
7. Fix the UV lamp to the cable clamp with the aid of a Phillips head screwdriver
8. Insert the UV lamp fully into the UV lamp protection tube
9. Place the UV lamp cover onto the UV lamp protection tube bracket and, using the fixing screws provided, screw in and tighten using the supplied Allen key.

5.5 Retrofitting a Manual Wiper

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.

Should frequent cleaning of the lamp protection tubes be required, a manual wiper mechanism can be retrofitted for 1 kW, 2 kW and 3 kW system sizes.

To do so, the following retrofitting set is required:

Material number	UV system type
not available	Dulcodes 1x0.65 S
1035800	Dulcodes 1x1 S
1035801	Dulcodes 1x2 S
1035802	Dulcodes 1x3 S

5.5.1 Removing the UV lamp protection tube with manual wiper

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
- Do not modify the fitted UV lamp connection cable without authorisation

WARNING!

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

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

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

1. Close the shut-off valves upstream and downstream of the radiation chamber
2. Switch off the UV disinfection system with the STOP/START key
3. Switch off the main switch or disconnect from the mains power supply
4. Empty the radiation chamber
5. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
6. Loosen the fixing bushing from the locking of the clamping screw
7. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again!
8. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
9. Loosen the fixing screws of the lamp cover using an Allen key and remove the lamp cover and the lamp
10. Lay the UV lamp cover and the UV lamp completely to one side
11. Loosen the UV lamp protection tube bracket with a face pin spanner and remove it (place on the drill holes - not on the threads!)
12. Carefully remove the UV lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
13. Remove the O-Ring from the lamp protection tube
14. 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
15. Rinse the UV lamp protection tube with clean water and dry thoroughly with a soft cloth
16. Carefully push the UV lamp protection tube into the radiation chamber until it reaches its stop position
17. Push a new O-ring onto the end of the UV lamp protection tube - the sealing surfaces of the O-ring must be smooth and clean!
18. Loosen the fixing screws on the cover of the chamber
19. Remove the cover of the chamber

5.5.2 Assembly and installation of the manual wiper

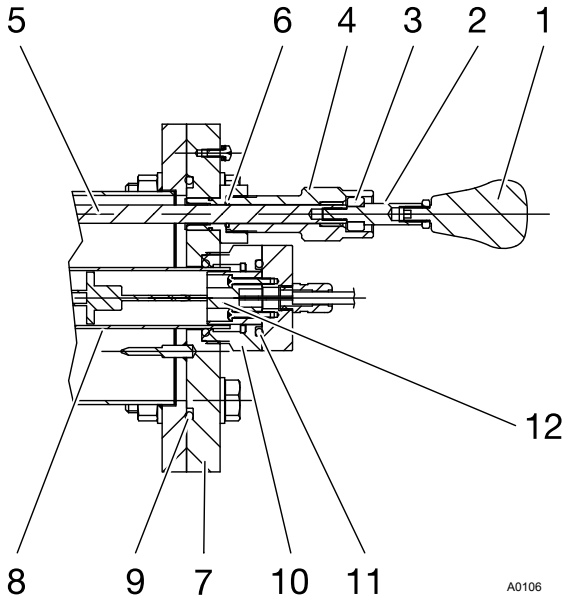


Fig. 19: Components of the manual wiper on the chamber cover and lamp connection

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 Lamp protection tube bracket
11 O-ring
12 Cable clamp

1. Insert the wiper rod with the wiper element through the fixing bushing of the chamber cover
2. Fit a new O-ring to the cover of the chamber
3. Screw the cover of the radiation chamber with the manual wiper to the radiation chamber so that it is moisture-proof
4. Fit the clamping screw but do not tighten
5. Screw the mushroom knob (with fixing bushing) on to the wiper rod using an open-ended 11 mm spanner
6. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again!
7. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)

8. 

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

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

9. 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

10. 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!)

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

12. 

CAUTION!

The seal on the wiper rod can become damaged

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

Push the wiper rod completely into the radiation chamber

13. Lock the fixing bushing in the clamping screw

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

15. 

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!

16. 

CAUTION!

When installing the lamp, rotate it in such a way that the lamp return cable is pointing downwards (between 4 o'clock and 8 o'clock). Otherwise this may result in early failure of the UV lamp.

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

17. Fix the UV lamp to the cable clamp with the aid of a Phillips head screwdriver
18. Insert the UV lamp fully into the UV lamp protection tube
19. Place the UV lamp cover onto the UV lamp protection tube bracket and, using the fixing screws provided, screw in and tighten with the Allen key.
20. Switch on the main switch or connect up the mains power supply
21. Switch on the UV system with the  key
22. Slowly open the shut-off valve upstream of the radiation chamber

5.6 Retrofitting an automatic wiper

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.

Should frequent cleaning of the lamp protection tubes be required, an automatic wiper can be retrofitted for system sizes greater than 1 kW.

To do so, the following retrofitting set is required: Automatic wiper

Material number	UV system type
not available	Dulcodes 1x0.65 S
on request	Dulcodes 1x1 S
on request	Dulcodes 1x2 S
on request	Dulcodes 1x3 S
on request	Dulcodes 2x2 S
on request	Dulcodes 2x3 S
on request	Dulcodes 3x3 S

5.6.1 Removing the UV lamp protection tube with automatic wiper

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
- Do not modify the fitted UV lamp connection cable without authorisation

WARNING!

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

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

1. Close the shut-off valves upstream and downstream of the radiation chamber
2. Switch off the UV disinfection system with the STOP/START key
3. Switch off the main switch or disconnect from the mains power supply
4. Empty the radiation chamber
5. Loosen the fixing screws of the lamp cover using an Allen key and remove the lamp cover and the lamp
6. Lay the UV lamp cover and the UV lamp completely to one side
7. Loosen the UV lamp protection tube bracket with a face pin spanner and remove it (place on the drill holes - not on the threads!)

8. Carefully remove the UV lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
9. Remove the O-Ring from the lamp protection tube
10. Wash the UV lamp protection tube with cleaning solution or immerse it in cleaning solution until the film has been removed without leaving a trace
11. Rinse the UV lamp protection tube with clean water and dry thoroughly with a soft cloth
12. Carefully push the UV lamp protection tube into the radiation chamber until it reaches its stop position
13. Push a new O-ring onto the end of the UV lamp protection tube - the sealing surfaces of the O-ring must be smooth and clean!
14. Loosen the fixing screws on the cover of the chamber
15. Remove the cover of the chamber

5.6.2 Assembly and installation of the automatic wiper

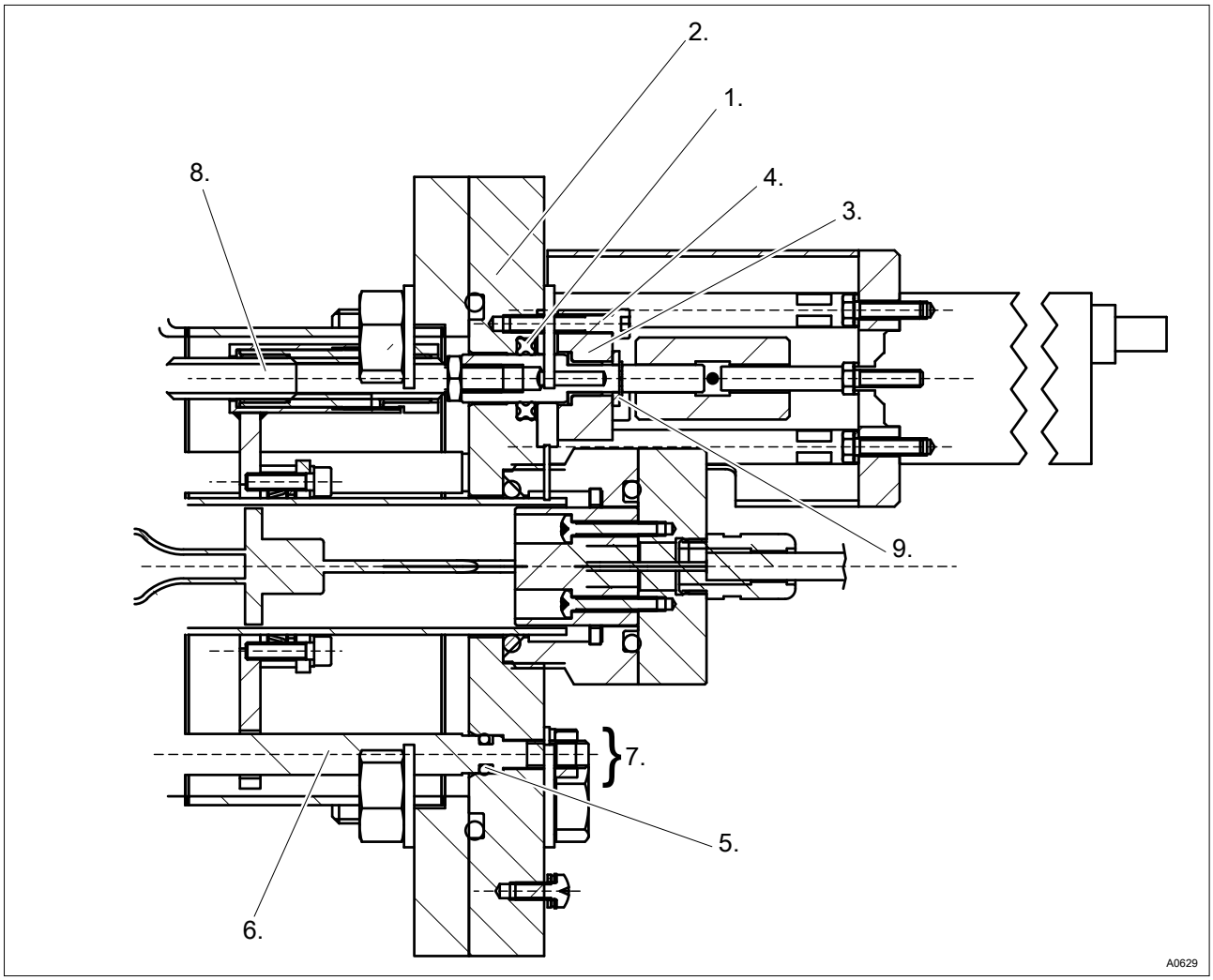
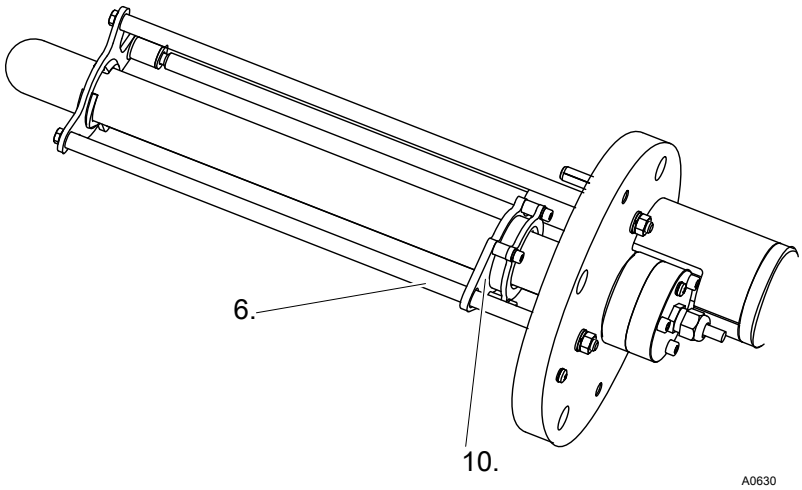
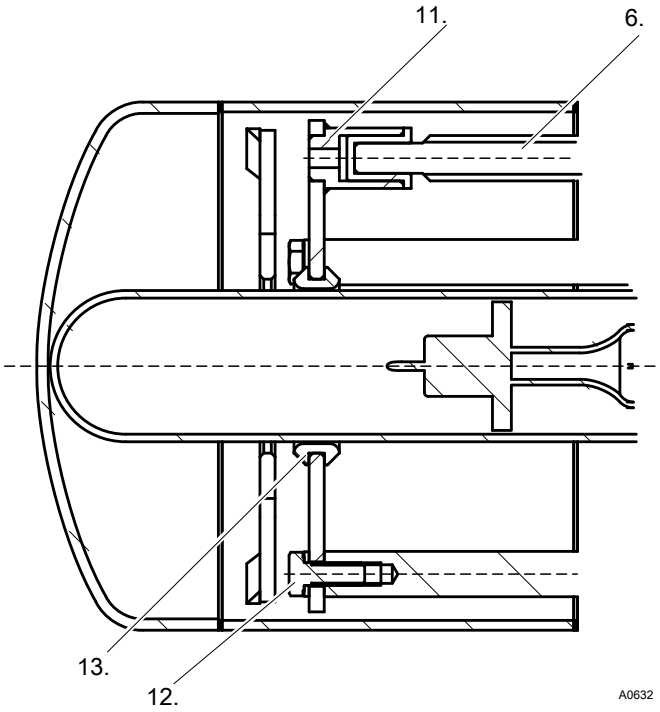


Fig. 20: Assembly and installation of the automatic wiper

1. Grease the X-Ring (1) on the inside diameter using Carbaflo 2371 (TN1026526) and insert it in the cover (2)
2. Screw the bearing cover (3) on to the chamber cover (2) using the screws (4)
3. Push the O-ring (5) onto the spacer rod (6)
4. Press the spacer rod (6) into the chamber cover (2) and screw it in with the fastening set (7)
5. Push the wiper rod (8) through the chamber cover (2) into the bearing cover (3)
6. Secure the wiper rod (8) with the retaining ring/supporting washer (9)



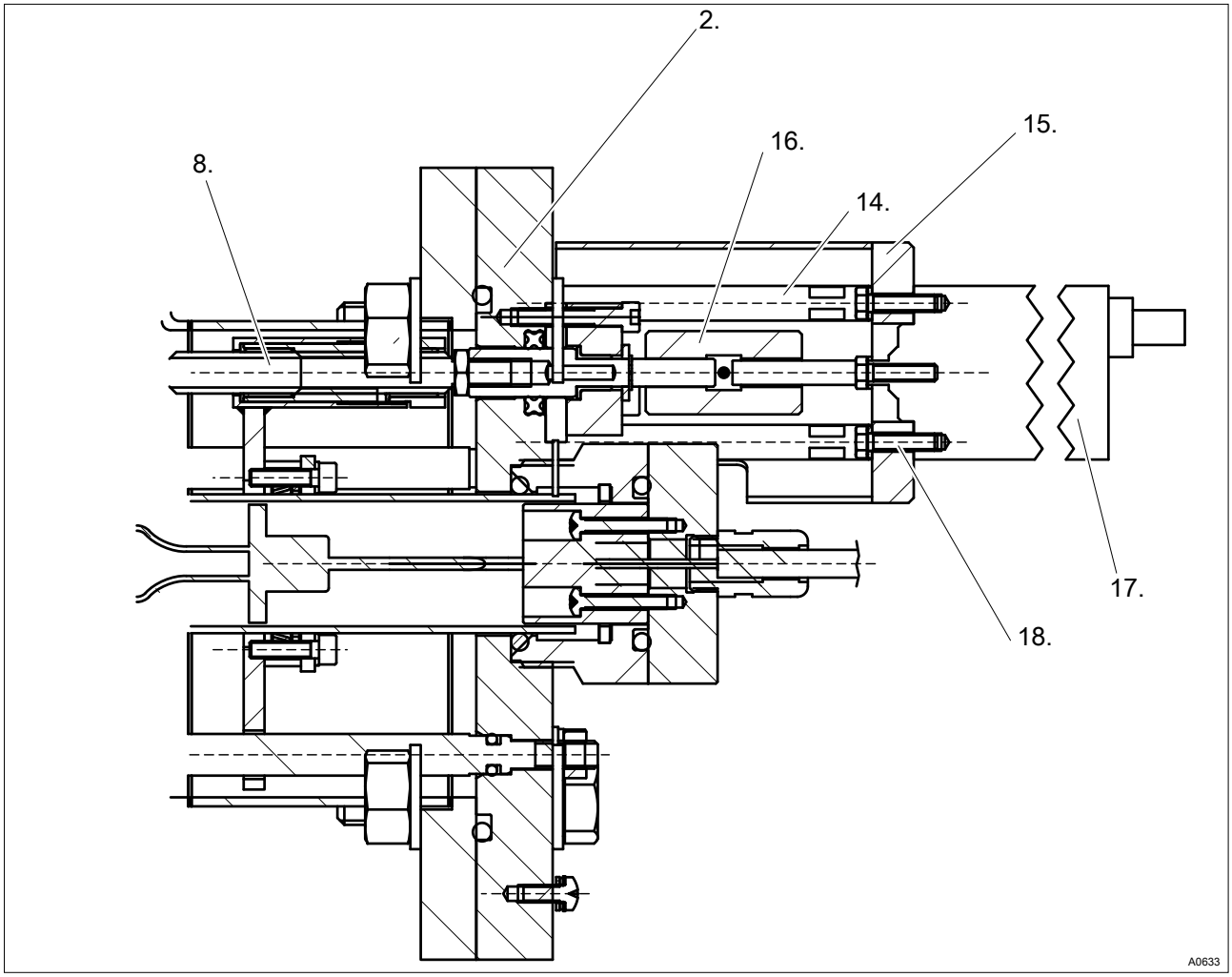
7. Push the bracket (10) onto the opposing spacer rod (6), so that the wiper cannot tilt



8. Push the support plate (11) with the slide bearing to the front onto the threaded rod

9. Screw the support plate (11) on to the spacer rods (6) using the fastening set (12)

10. Clip the bearing ring (13) centrally on the support plate (11)



11. Screw the distance pin (14) into the chamber cover (2)
12. Screw the adapter plate (15) with the hexagon screws/circlip on to the distance pin (14)
13. Push the hexagon sleeve (16) onto the hexagon axle of the wiper rod (8)
14. Screw the actuator drive motor (17) to the adapter plate (15) using the fastening set (18)

Place the fitted wiper unit on a support so that now the end position of the wiper when operated by the actuator motor can be defined.

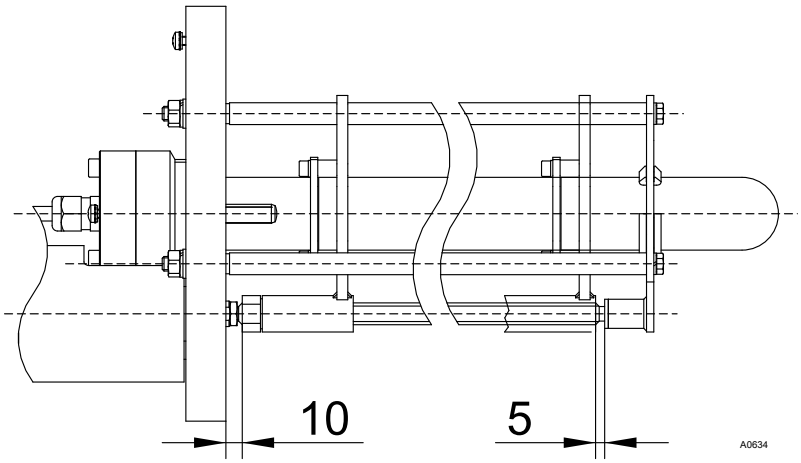


Fig. 21: Adjustment instructions end stop

15. Now adjust the end position of the wiper. This is described in the adjustment instructions of the actuator motor. Adjust the wiper so that the wiper stops as shown in Fig. 21 5 to 10 mm in front of the stops

CAUTION!

Inspecting the UV lamp protection tube for damage

- You must not refit a damaged UV lamp protection tube
- Ensure that the UV lamp protection tube is seated correctly
  - The UV lamp protection tube may not project by more than 13 mm and must not be offset at an angle

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

17. 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.

Place on the holes - not on the threads.

18. Screw the UV lamp protection tube bracket into the chamber cover and tighten the screws

19.

Condition of the O-rings

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

Insert the UV lamp into the UV lamp protection tube

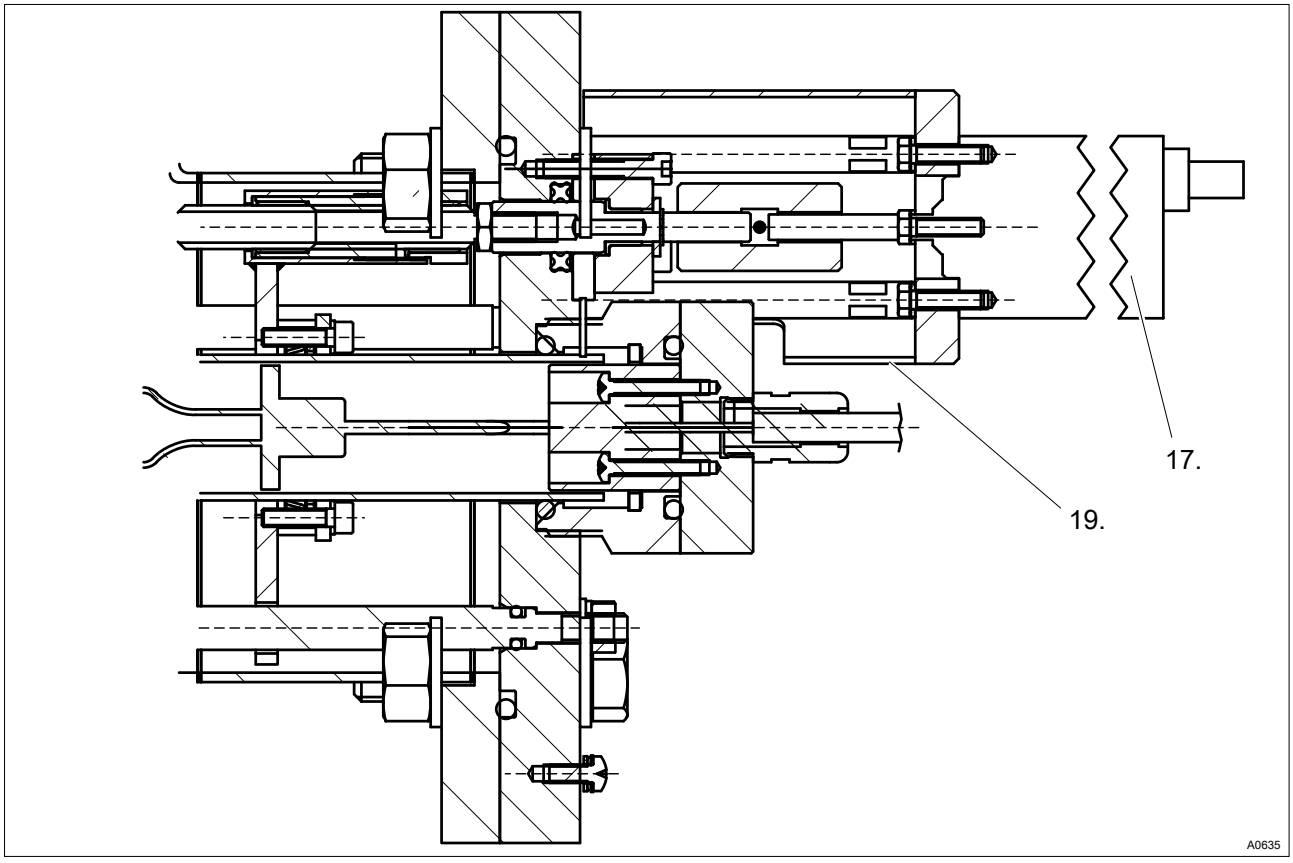
⇨ The UV lamp must project approx. 100 mm

20. Secure the the UV lamp at the cable clamp using a Phillips screwdriver

21. Completely insert the UV lamp into the UV lamp protection tube

22. Place the UV lamp cover onto the UV lamp protection tube bracket

23. Screw the UV lamp cover onto the bracket using an Allen key



24. Push the the protection cover (19) in the longitudinal direction up to the end position over the actuator motor (17)

25. Switch the main switch on, or inert the mains plug in a mains outlet

26. Switch the UV system on using the STOP/START button

27. Slowly open the shut-off valves upstream and downstream of the radiation chamber

6 Commissioning

6.1 Leak Testing and Ventilation of the Radiation Chamber

Tighten the clamping screw on the wiper rod by hand only until no water comes out under operating pressure

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 vent plug
4. Close the air vent plug - this takes very little effort
5. Check that the radiation chamber is not leaking
6. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off valve)

6.2 Switching on the UV system

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

The power of system types Dulcodes 1x2 S to 3x3 S can be manually controlled in three steps by a step switch.

Setting the steps

- Step 1: 50% of the stated rated power in kW
- Step 2: 75% of the stated rated power in kW
- Step 3: 100% of the stated rated power in kW

Setting the power output allows the system to be adjusted to the load of the pool. If the chloramine contamination is low then the system power can be reduced.

1. Switch the main switch on
2. Check the control parameters in programming mode. If necessary, change them
3. **NOTICE!**
   Ensure that the UV lamp is operated at maximum output. Set the manual step switch to the maximum UV lamp output.

   Switch on the UV system using the key; to do this keep the key pressed down for at least 2 seconds
4. Should the controller go into PAUSE mode, activate the Pause contact

   ⇨ Once the lamp has ignited, it will take approx. 1 - 3 minutes until the full UV output has been reached.

6.3 Calibrate UV Sensor

WARNING!

Insufficient treatment

Possible consequence: Illness

- Only a correctly calibrated UV sensor will guarantee adequate treatment
- Water must be flowing through the radiation chamber when calibrating the UV sensor .
- The UV sensor should always be calibrated with new UV emitters
- The UV lamp should be operated at maximum output when calibrating the UV sensor.

The safety threshold and warning threshold are no longer monitored during calibration. For safety reasons, calibration is automatically interrupted after 5 minutes without the changes made being saved. The time count down can be seen in the display.

The UV sensor signal must be stable before the start of calibration. A changing UV sensor signal shows that the UV lamp has not yet warmed up sufficiently (5 to 10 minutes).

6.3.1 UV Sensor Calibration

NOTICE!

Burn-in time

All new UV lamps need a burn-in time of 100 to 200 hours. For this reason, the UV sensor should be rechecked approx. 200 operating hours after commissioning and recalibrated if necessary.

Calibration

1. Use the key to move to SENSOR CALIBRATION
2. Confirm with the key; the REQUEST ACCESS CODE display appears
3. Enter access code and confirm with key
   ⇨ SENSOR CALIBRATION re-appears. Settable values flash on and off.
4. Using keys and ,set the UV sensor value to 100 %
5. Confirm with key
   ⇨ the message "Data is saved" appears. The UV sensor is now calibrated.
6. Exit programming mode with key (BACK)
   ⇨ The Dulcodes UV disinfection system is now ready for operation.

7 Maintenance

WARNING!

UV-C radiation

Possible consequence: Serious injuries

UV-C radiation is harmful to the eyes and skin

– Only operate the UV lamp ⚠ when it is 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!

General safety measures

Depressurise the radiation chamber before commencing any maintenance work

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

NOTICE!

Maximum permissible service life

he UV lamps should be replaced at the latest after their maximum permissible service life. Otherwise, the operating safety of the UV system cannot be guaranteed.

The maximum permissible service life is 8,000 operating hours, unless otherwise state on the enclosed data sheet.

The maintenance of the UV system is limited to cleaning the UV lamp protection tube and the sensor window as well as the replacement of the UV lamp at the end of its maximum permissible life time. On systems with manual wipers, the wiper element and the O-ring of the clamping screw must also be replaced.

On systems, which have a fan in the control cabinet, the filter mats of the fan and the air outlet filter on the control cabinet must be replaced regularly (normally once per year). An operating log should be kept as a record; a form is included in the Appendix.

7.1 Cleaning the UV lamp protection tube

CAUTION!

Unsuitable cleaning agent

Possible personal injury / material damage to the UV systems

- Do not use corrosive acids or acids that could cause stress cracks, such as hydrochloric acid
- Read the safety data sheet for the cleaning agent selected!
- Wear protective clothing when cleaning (protective eyewear, protective gloves ...)
- Ensure that no cleaning solution penetrates the lamp protection tube
- Ensure, when cleaning UV systems that no cleaning solution enters the pipework

NOTICE!

Cleaning time

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

NOTICE!

Disposal of cleaning agent

Possible environmental hazard.

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

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

An annual clean of the UV lamp protection tubes when replacing the UV lamp suffices for many UV systems. Clean more frequently when operating with types of water that have a tendency to become dirty. The UV lamp protection tubes can be cleaned 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.

Cleaning agents for manual cleaning

In spite of cleaning with a wiper, we recommend manual cleaning using cleaning solution, if you remove the UV lamp protection tube within the scope of UV lamp replacement.

On systems, which are fitted with manual wipers, the UV lamp protection tubes can be cleaned while still installed using the manual wiper.

In UV system with automatic wiper, cleaning of the lamp protection tube while fitted is carried out every 2 years, dependent on the set wiper interval (presetting 2 h).

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 nut

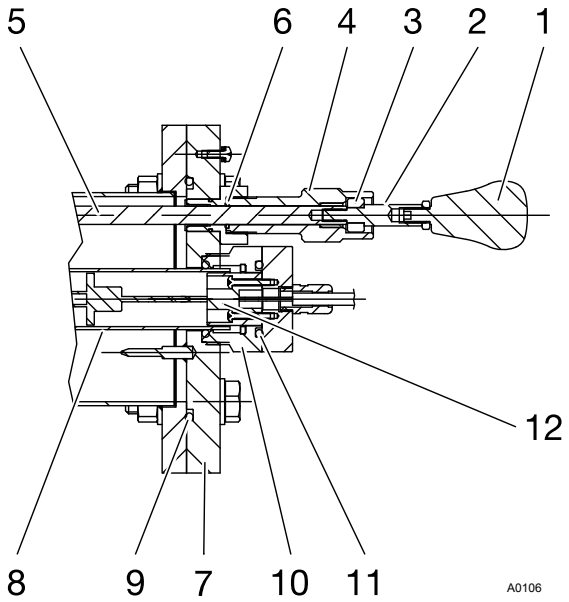


Fig. 22: Components of the manual wiper on the chamber cover and lamp connection

1 Handle
2 Guide bolt
3 Fixing nut
4 Clamping screw
5 Wiper rod
6 O-ring
7 Chamber cover
8 Lamp protection tube
9 O-ring
10 Lamp protection tube bracket
11 O-ring
12 Cable clamp

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 nut from the locking mechanism 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 nut onto 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

For systems without manual wipers, the irrelevant points can be skipped .

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!

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 nut

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 failures
- For this reason, always clean the UV lamp thoroughly with a cloth moistened with alcohol before installing it
- Then wipe the UV lamp with a soft dry cloth
- Also thoroughly clean the glass of the UV lamp return cable.

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 using the STOP key
3. Switch off the main switch or disconnect from the mains power supply
4. Empty the radiation chamber
5. Loosen the fixing screws of the UV lamp cover using an Allen key, and remove the UV lamp cover and the UV lamp

6. Lay the UV lamp cover and the UV lamp completely to one side
7. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
8. Loosen the fixing nut from the locking mechanism of the clamping screw
9. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again
10. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
11. Loosen the UV lamp protection tube bracket with a face spanner and remove it (place on the drill holes - not on the threads!)
12. Carefully remove the UV lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
13. Remove the O-Ring from the lamp protection tube
14. 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
15. Rinse the UV lamp protection tube with clean water and dry thoroughly with a soft cloth .
16. Carefully push the UV lamp protection tube into the radiation chamber until it reaches its stop position
17. 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
18. 

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 out more than 13 mm and may not be offset at an angle .

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

19. 

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)

20. Push the wiper rod completely into the radiation chamber

21. Lock the fixing nut onto the clamping screw

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

23. 

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 nut

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

24. 

CAUTION!

When fitting the UV lamp, rotate it so that the UV lamp return cable is pointing downwards. Otherwise this may result in early failure of the UV lamp.

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

25. Fix the UV lamp to the cable clamp with the aid of a Phillips head screwdriver

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

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

28. Attach the pin plug with the UV lamp connection cable to the nut on the cover of the UV lamp and fix in place with the knurled nut.

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

30. Switch on the UV system using the  key

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

32. 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/START 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
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 of 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 Replacing the wiper elements (systems with manual wiper)

Maintenance interval: 1 - 2 years

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!

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

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

8. Loosen the fixing bushing from the locking of the clamping screw
9. Pull the wiper rod out to its stop position - it must remain in its stop position until it is pushed in again
10. Tighten the clamping screw slightly by hand (approx, 1/4 turn in a clockwise direction)
11. Loosen the lamp protection tube bracket with a face pin spanner and remove it (place on the holes, not on the threads)
12. Carefully remove the UV lamp protection tube completely out of the radiation chamber and place on a suitable clean surface
13. Remove the O-Ring from the lamp protection tube
14. 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
15. Rinse the UV lamp protection tube with clean water and dry thoroughly with a soft cloth
16. Remove the screws of the cover of the radiation chamber
17. Carefully lay the radiation chamber cover and the fully removed wiper rod in a suitable, clean place
18. Remove one hexagonal screw on a wiper
19. Remove the old wiper element to one side
20. Insert the new wiper element from the side - the wiping lip must point away from the radiation chamber
21. Insert the Allen head screw with its nut into the wiper and tighten
22.

> **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

23. 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
24. Screw the cover of the radiation chamber onto the radiation chamber so that it is moisture-proof
25. Carefully push the UV lamp protection tube into the radiation chamber until it reaches its stop position
26. 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!

27. 

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!)

28. 

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)

29. Push the wiper rod completely into the radiation chamber

30. Lock the fixing bushing in the clamping screw

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

32. 

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.

33. **CAUTION!**
When fitting the UV lamp, rotate it so that the UV lamp return cable is directed downwards. Otherwise this may result in early failure of the UV lamp.

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

34. Fix the UV lamp to the cable clamp with the aid of a Phillips head screwdriver

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

36. 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.

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

38. Switch on the UV system using the STOP/START key

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

40. 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 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.

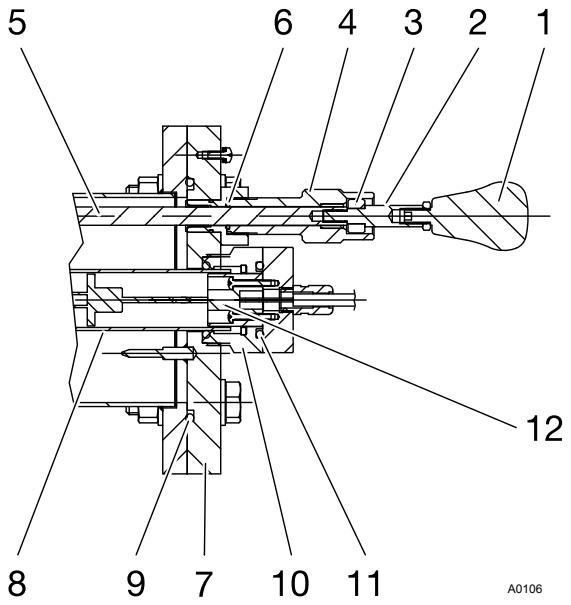


Fig. 23: Components of the manual wiper on the chamber cover and lamp connection

1 Handle
2 Guide bolt
3 Fixing nut
4 Clamping screw
5 Wiper rod
6 O-ring
7 Chamber cover
8 Lamp protection tube
9 O-ring
10 Lamp protection tube bracket
11 O-ring
12 Cable clamp

1. Depressurise the radiation chamber.
2. Loosen the clamping screw slightly (approx. 1/4 turn in an anti-clockwise direction)
3. Loosen the fixing nut from the locking mechanism of the clamping screw
4. Fully remove the wiper rod
5. Unscrew the handle from the wiper rod using an SW 11 wrench
6. Push the wiper rod approx. 150 mm into the radiation chamber
7. Remove the clamping screw
8. Pull the wiper rod again fully out - it will pull out the O-ring at the same time

   ⇨ Clean the wiper rod if required
9. Replace the O-ring
10. Fit the clamping screw but do not tighten firmly
11. Screw the handle (with fixing nut) with an SW 11 wrench to the wiper rod .

12.

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

13. Lock the fixing nut onto the clamping screw

14.

Tighten the clamping screw on the wiper rod by hand only until no water comes out under operating pressure

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

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 nut

7.4 Maintenance of the automatic wiper

Maintenance interval: 1 year

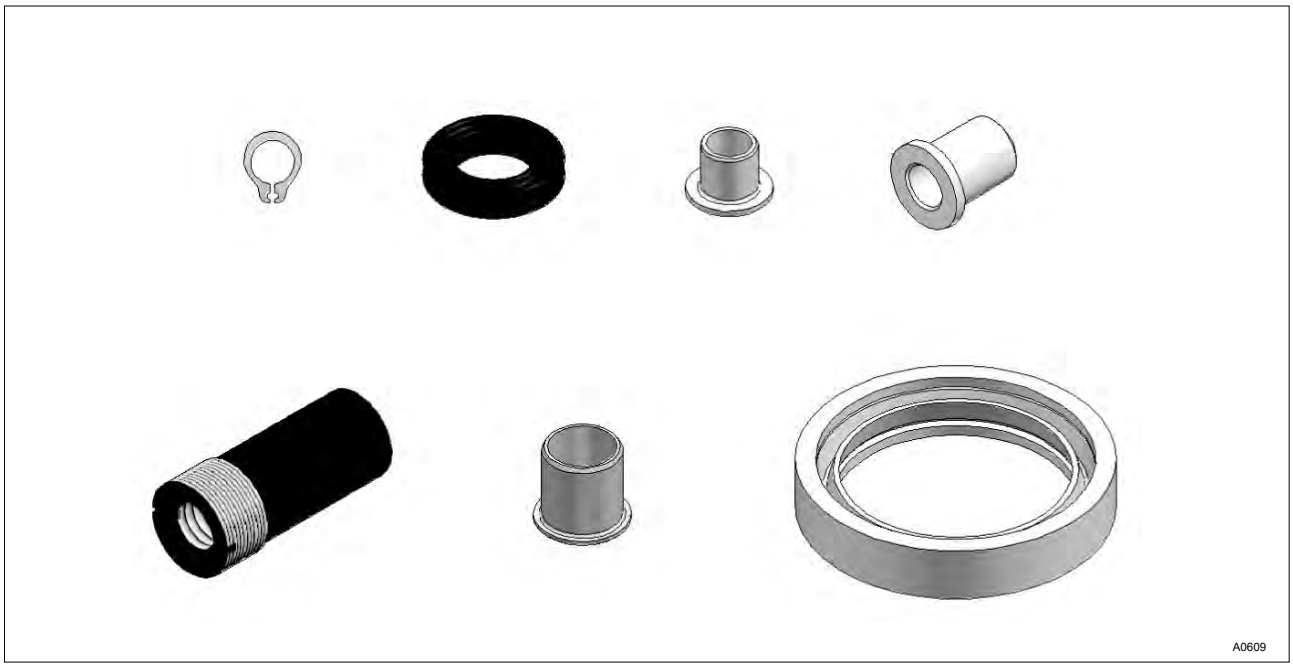


Fig. 24: Spare parts kit TN1037735

You must replace the parts 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/START 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

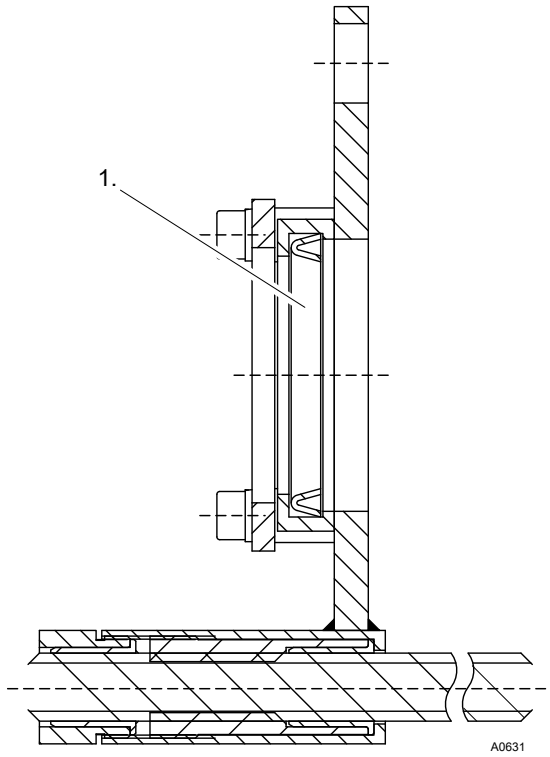


Fig. 25: Wiper element

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 STOP/START 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!

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!

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!

Insufficient treatment efficiency

Possible consequence: Illness

Please read the Technical Data Sheet enclosed with the respective UV system!

- The UV amps should be replaced by new lamps at the very latest when:
  - the UV sensor signal approaches the safety threshold without this being based on other causes, such as the formation of a coating on the lamp protection tubes or a serious deterioration of the UV-transmission
  - the operating life of the UV lamp is approaching the maximum service life of the lamp or has exceeded it.

CAUTION!

Fingerprints on the UV lamp

Possible consequence: 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 failures
- For this reason, always clean the UV lamp thoroughly with a cloth moistened with alcohol before installing it
- Then wipe the UV lamp with a soft dry cloth
- Also thoroughly clean the glass of the UV lamp return cable

NOTICE!

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

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

1. Switch off the UV system using the STOP/START 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. Loosen the fixing screws of the UV lamp cover using the Allen key supplied, remove the lamp cover and pull out the lamp by approx. 100 mm
5. Loosen the UV lamp at the cable clamp with the aid of a Phillips head screwdriver
6. Fully remove the UV lamp and lay it to one side
7. Check whether the O-ring on the UV lamp protection tube bracket is lying in the groove provided – the sealing surfaces of the O-ring must be completely smooth and clean
8. **CAUTION!**
   When fitting the UV lamp, rotate it so that the UV lamp return cable is pointing downwards. Otherwise this may result in early failure of the UV lamp.

   Insert the new UV lamp into the UV lamp protection tube and allow it to project out approx. 100 mm
9. Fix the UV lamp to the cable clamp with the aid of a Phillips head screwdriver
10. Insert the UV lamp fully into the UV lamp protection tube
11. Place the UV lamp cover onto the lamp protection tube bracket and, using the fixing screws provided, screw in and tighten with the Allen key
12. Switch on the main switch or connect up the mains power supply
13. Swich on the UV system with the STOP/START key
14. Slowly open the shut-off valve upstream of the radiation chamber
15. Open the shut-off valve downstream of the radiation chamber (only necessary with a manual shut-off)

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 switch ons

1. When the UV system switched off, with the key to display the UV lamp hours and UV lamp switch ons
2. Confirm with the key; the "Request Access Code" display appears
3. Enter access code and confirm with key; the "Reset" display appears
4. Confirm with the key; the display is now reset

7.6 Calibrate UV Sensor

Calibrate the UV-C sensor compliant to the specifications, see *Chapter 6.3 “Calibrate UV Sensor ” on page 49* .

7.7 Replacing the Filter Mats

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

CAUTION!

General safety measures

Dirty filter mats on the fan and air outlet filter can lead to the control cabinet overheating and concomitant damage

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 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

8 Troubleshooting

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
- Troubleshooting on the open control cabinet and the replacement of components may only be done by an authorised electrical engineer

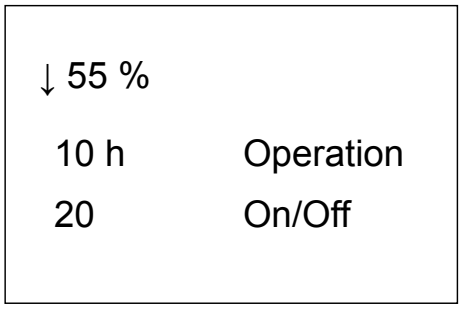


Fig. 26: Warning threshold transgressed

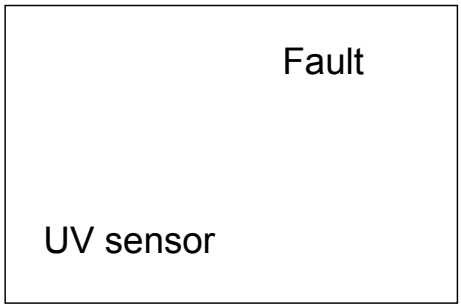


Fig. 27: Safety threshold transgressed

Fault alert*	Possible cause	Remedy
Warning threshold transgressed Message: downward pointing arrow Safety threshold transgressed Message: UV sensor	Lamp output too low	Increase lamp output (using the manual dial on systems with output control)
	Coating formed on the lamp protection tube and/or the UVC sensor	Clean lamp protection tube and UVC sensor
	Deterioration in the UV-transmission of the water to be treated	Improve water quality Possible cause UV lamp at the end of its service life
	UV lamp at the end of its UV emission service life	Replace the UV sensor
	UV sensor not calibrated	Calibrate UV Sensor, see *Chapter 6.3 “Calibrate UV Sensor ” on page 49*
Acknowledge *fault alert with the key		

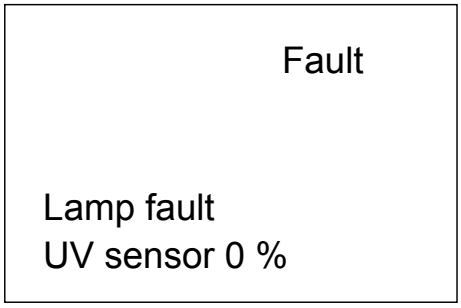


Fig. 28: Safety threshold transgressed

Fault alert*	Possible cause	Remedy
Safety threshold transgressed Message: Lamp fault; UV sensor 0 %	UV lamp defective	Replace UV lamp
	Starters defective	Replace starters
Acknowledge *fault alert with the key		

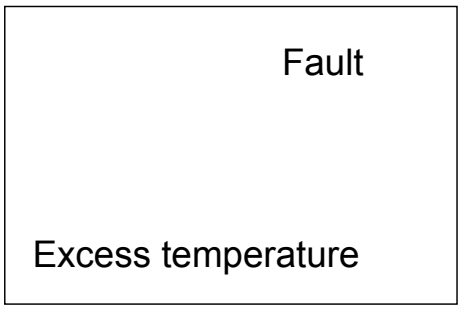


Fig. 29: Message: Excess temperature

Fault alert*	Possible cause	Remedy
Message: Excess temperature	Temperature switch defective	Replace temperature switch
	Water flow rate too low	Increase water flow rate
Acknowledge *fault alert with the key		

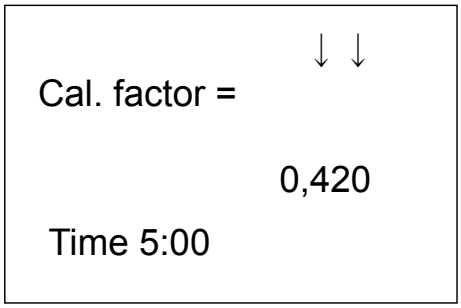


Fig. 30: Flashing double arrow during calibration

Display	Possible cause	Remedy
Flashing double arrow during calibration	UV lamp protection tube and/or UV sensor are dirty	Clean UV lamp protection tube and/or UV sensor
	UV sensor defective	Use a new UV sensor
If a flashing double arrow appears in the calibration display instead of the sensor signal, the sensor signal is too small for correct calibration. Calibration cannot be performed.		

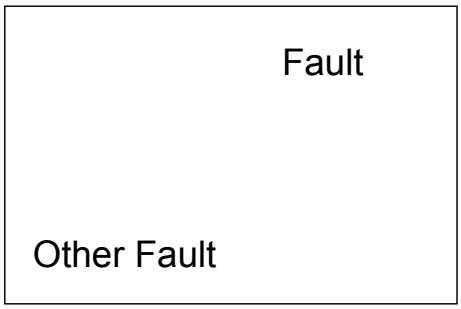


Fig. 31: Message: Other faults

Fault alert*	Possible cause	Remedy
Message: 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	Bridge contacts at fault input
Acknowledge *fault alert with the key		

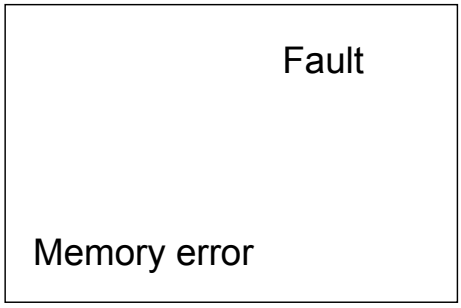


Fig. 32: Message: Memory error

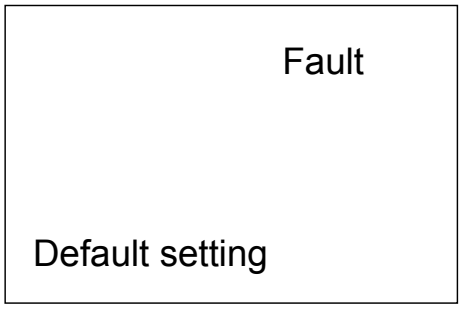


Fig. 33: Message: Default setting

Fault alert*	Possible cause	Remedy
Message: Memory error or Message: Default setting	During self-testing, the controller has detected an error in the memory	Replace the controller (only an electrical engineer is authorised to do so)
Acknowledge *fault alert with the key		

9 Technical data

Performance data

NOTICE!

Data sheet

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

Type	Number of lamps	Lamp output	power input
1x0.65S	1	0.65 kW	0.75 kW
1x1S	1	1.00 kW	1.10 kW
1x2S	1	2.00 kW	2.10 kW
1x3S	1	3.00 kW	3.20 kW
2x2S	2	4.00 kW	4.20 kW
2x3S	2	6.00 kW	6.20 kW
3x3S	3	9.00 kW	9.20 kW

Type	Volume	Max. flow*	Connector Selectable nominal width
1x0.65S	10 l	17 m ^{3}/h	DN 65/80
1x1S	16 l	51 m ^{3}/h	DN 100/125
1x2S	27 l	89 m ^{3}/h	DN 125/150
1x3S	66 l	177 m ^{3}/h	DN 200/250
2x2S	100 l	240 m ^{3}/h	DN 200/250
2x3S	100 l	330 m ^{3}/h	DN 250
3x3S	DN 250 = 100 l	500 m ^{3}/h	DN 250/300

*** 98 %/cm transmission; 600 J/m ^{2}**

Type	Minimum clearance for Maintenance work	Net weight / Operating weight Radiation chamber	
1x0.65S	335 mm	21 kg / 31 kg	
1x1S	400 mm	31 kg / 47 kg	
1x2S	500 mm	38 kg / 65 kg	

Type	Minimum clearance for Maintenance work	Net weight / Operating weight Radiation chamber	
1x3S	600 mm	52 kg / 118 kg	
2x2S	1000 mm	78 kg / 166 kg	
2x3S	1000 mm	78 kg / 166 kg	
3x3S	1000 mm	78 kg / 166 kg	

Permissible operating temperatures:

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

*Operating pressure**

The permissible operating pressure is possibly lower with systems that have a non-standard design,

Requirements of the water to be treated:

- Maximum temperature: 40 °C
- Maximum operating pressure: 6 bar*)
- No corrosive or abrasive properties, chloride content < 250 ppm
- No tendency for sedimentation

9.1 Dimensions sheet

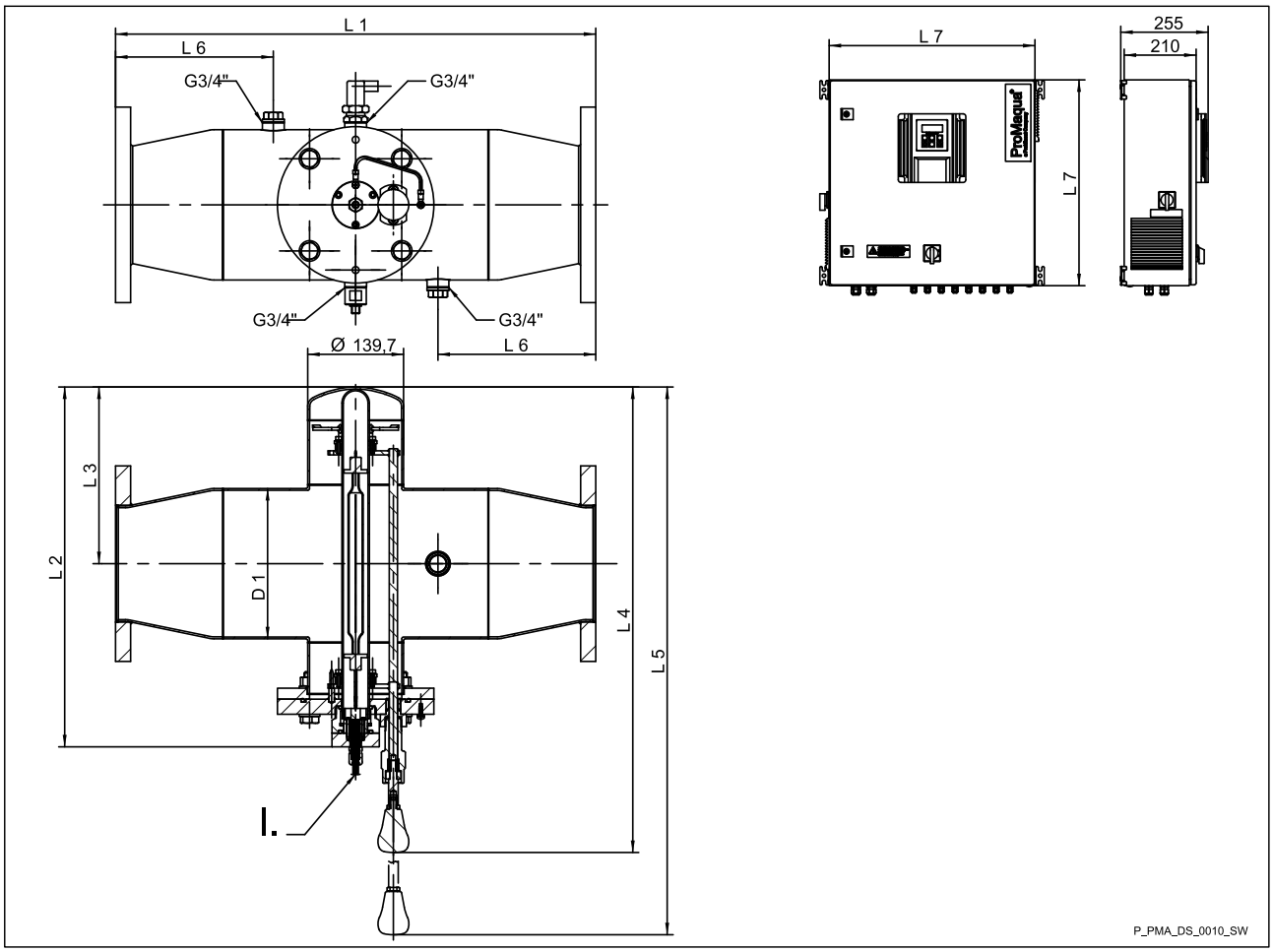


Fig. 34: Dulcodes 0.65 kW - 3 kW dimensions sheet (drawings not to scale)

Type	1x0.65 S	1x1 S	1x2 S	1x3 S
D1	114,3	168,3	219,1	323,9
L1	500,0	700,0	700,0	800,0
L2	349,0	425,0	525,0	625,0
L3	137,0	208,0	258,0	308,0
L4	-	579,0	679,0	779,0
L5	-	819,0	1019,0	1219,0
L6	150,0	230,0	230,0	280,0
L7	500,0	500,0	600,0	600,0
∅	88,9	139,7	139,7	139,7
I.	Cable length approx. 5 metre			
Drawings not true to scale.				

Dulcodes 2x2 kW, 2x3 kW, 3x3 kW, multiple UV lamp systems

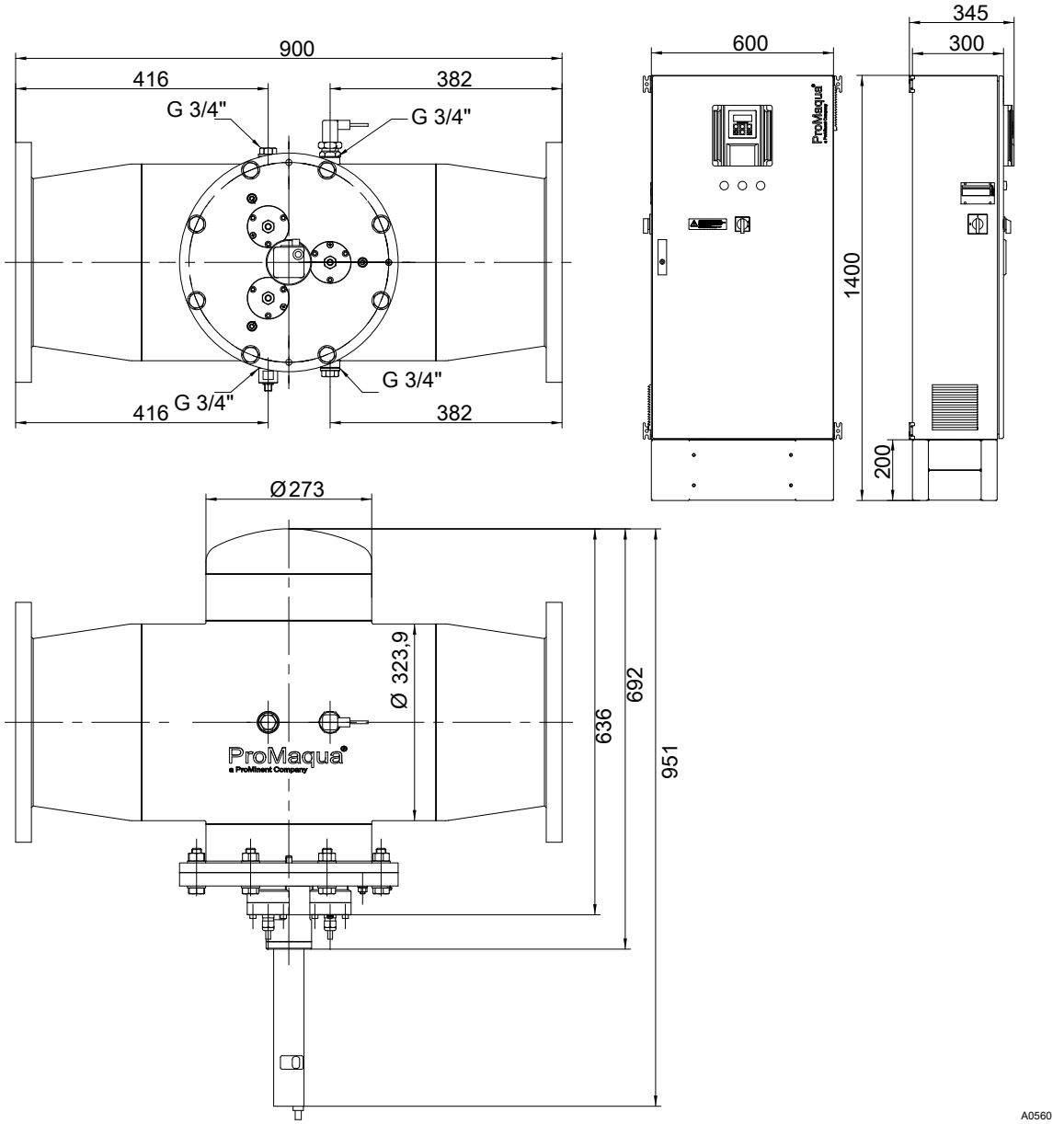


Fig. 35: Dulcodes 2x2 kW, 2x3 kW, 3x3 kW, multiple UV lamp systems (drawings not to scale)

Type	2x2 kW	2x3 kW	3x3 kW
DN	200	250	250
DN	250	---	300

9.2 Electrical data

NOTICE!

Fuses

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

Type	Voltage	Frequency
1x0.65S	230 V AC	50 Hz
1x1S	230 V AC	50 Hz
1x2S	400 V AC	50/60 Hz
1x3S	400 V AC	50/60 Hz
2x2S	400 V AC	50/60 Hz
2x3S	400 V AC	50/60 Hz
3x3S	400 V AC	50/60 Hz

Fuse	Version	Spare parts number
Upper fuse (proprietary provision by controller)	0.16 A slow	712048
Lower fuse (switched mains outputs) (XR1-XR3)	2,50 A slow	712033

Control cabinet

- Inputs
  - Contact inputs (-X3:1 ... -X3.6):
    for contacts or switching transistors:
    Open circuit voltage: 5V ±0.5 V
    Input resistance: 10 kOhm
- Outputs
  - Voltage outputs (-X1:1 ... -X1.10):
    Type of contact: NOC
    Load capacity: 250 V AC / 3 A / 100 VA
    With inductive loads provide RC protection circuits
  - Relay outputs (-X4:1 ... -X4.6):
    Type of contact: NOC
    Load capacity: 250 V AC / 3 A / 100 VA
    With inductive loads provide RC protection circuits
  - Alarm relay (-X4:7 ... -X4.9):
    Type of contact: Change-over contact
    Load capacity: 250 V AC / 3 A / 100 VA
    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 0.65 kW - 3 kW single UV lamp system without wiper or manual wiper

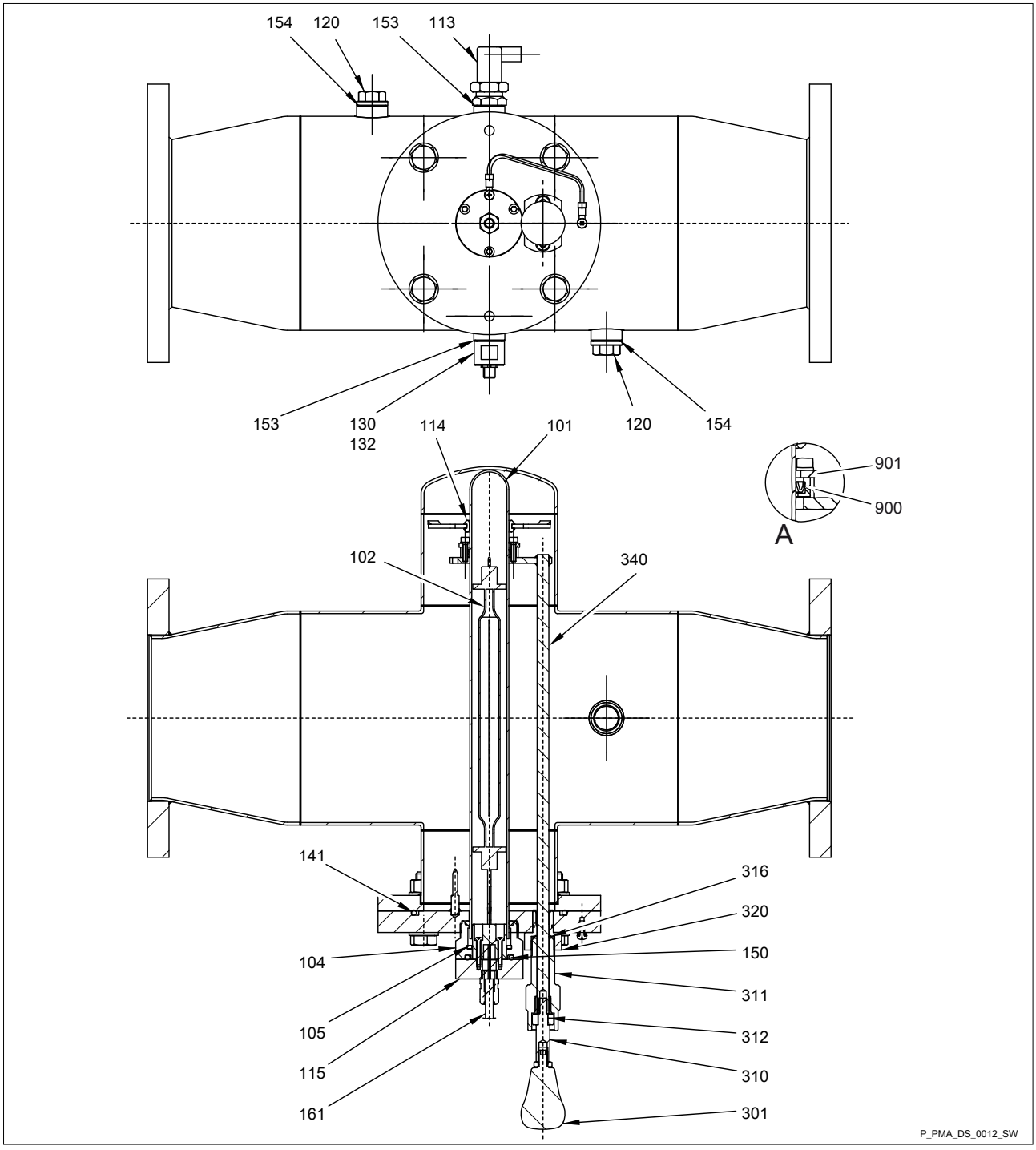


Fig. 36: Spare parts drawing Dulcodes S single UV lamp system with manual wiper

Spare parts list 0.65 kW - 3 kW single UV lamp system without wiper or manual wiper

No.	Description	Spare parts number	Replacement interval	each
101	UV lamp protection tube	1035218	on request	1

No.	Description	Spare parts number	Replacement interval	each
	d40x2x315 mm Q, 0.65 kW			
101	UV lamp protection tube d40x2x380 mm Q, 1 kW	1035166	on request	1
101	UV lamp protection tube d40x2x480 mm Q, 2 kW	1035041	on request	1
101	UV lamp protection tube d40x2x580 mm Q, 3 kW	1035193	on request	1
102	UV lamp 0.65 kW, 1 kW	1035179	max. 8000 h	1
102	UV lamp 2 kW	1035057	max. 8000 h	1
102	UV lamp 3 kW	1035180	max. 8000 h	1
104	UV lamp protection tube bracket	1035059	on request	1
105	Retainer 48.5/38.7 x 3 PTFE white	1035074	on request	1
113	Temperature switch G 3/4	1035104	on request	1
114	Bearing ring D 52.4/41 x 12 PTFE	1035058	on request	1
120	Locking screw DIN 910 G 3/4	1002753	on request	1
130	UV sensor M G 3/4 1.4539	1034147	on request	1
132	UV sensor connection cable 10 m	1028063	on request	1
141	O-ring 149.2 - 5.34 EPDM	1027463	after opening chamber	1
150	O-ring 40 - 5 EPDM	1023569	on request	2
153	O-ring/M 22.00 - 3.00 EPDM	1002175	on request	2
154	O-ring/M 25.00 - 2.00 EPDM	792872	on request	2
301	Turning mushroom knob GN 597-45-M10	1027877	on request	
310	Guide bolt M8/M10x65	1027931	on request	1
311	Complete clamping screw for wiper rod	1027975	on request	1
312	Fixing bushing with pins	1027930	on request	1
316	O-ring 11.91 - 2.62 EPDM	790410	1 year	1
320	Complete bearing flange for wiper rod	1024944	on request	1
340	Wiper rod compl. UVS 1KW	1035177	on request	1
340	Wiper rod compl. UVS 1KW	1035131	on request	1
340	Wiper rod compl. UVS 1KW	1035178	on request	1
860	Face pin spanner for ∅ 14 - 100 mm	409805	on request	1
-	Filter mat each 3322/700	1004212	1/2 - 1 year	2

No.	Description	Spare parts number	Replacement interval	each
	Control cabinet ventilation			
900	Wiper element	1027879	1 - 2 years	1
901	Holding ring d62/45x4	1028100	on request	1

10.2 Spare parts 1 kW - 3 kW single UV lamp system with automatic wiper

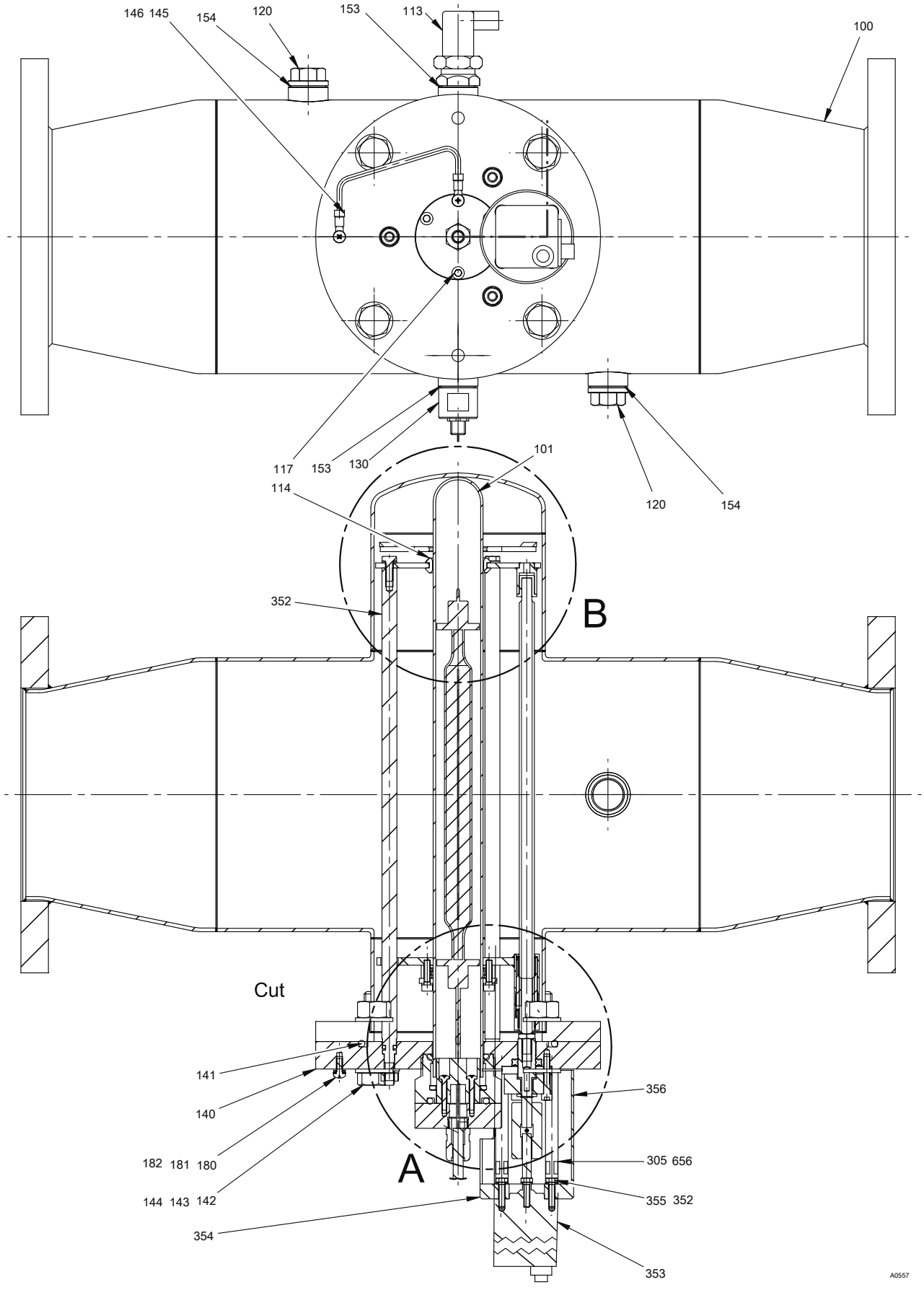


Fig. 37: Spare parts drawing Dulcodes S single UV lamp system with automatic wiper

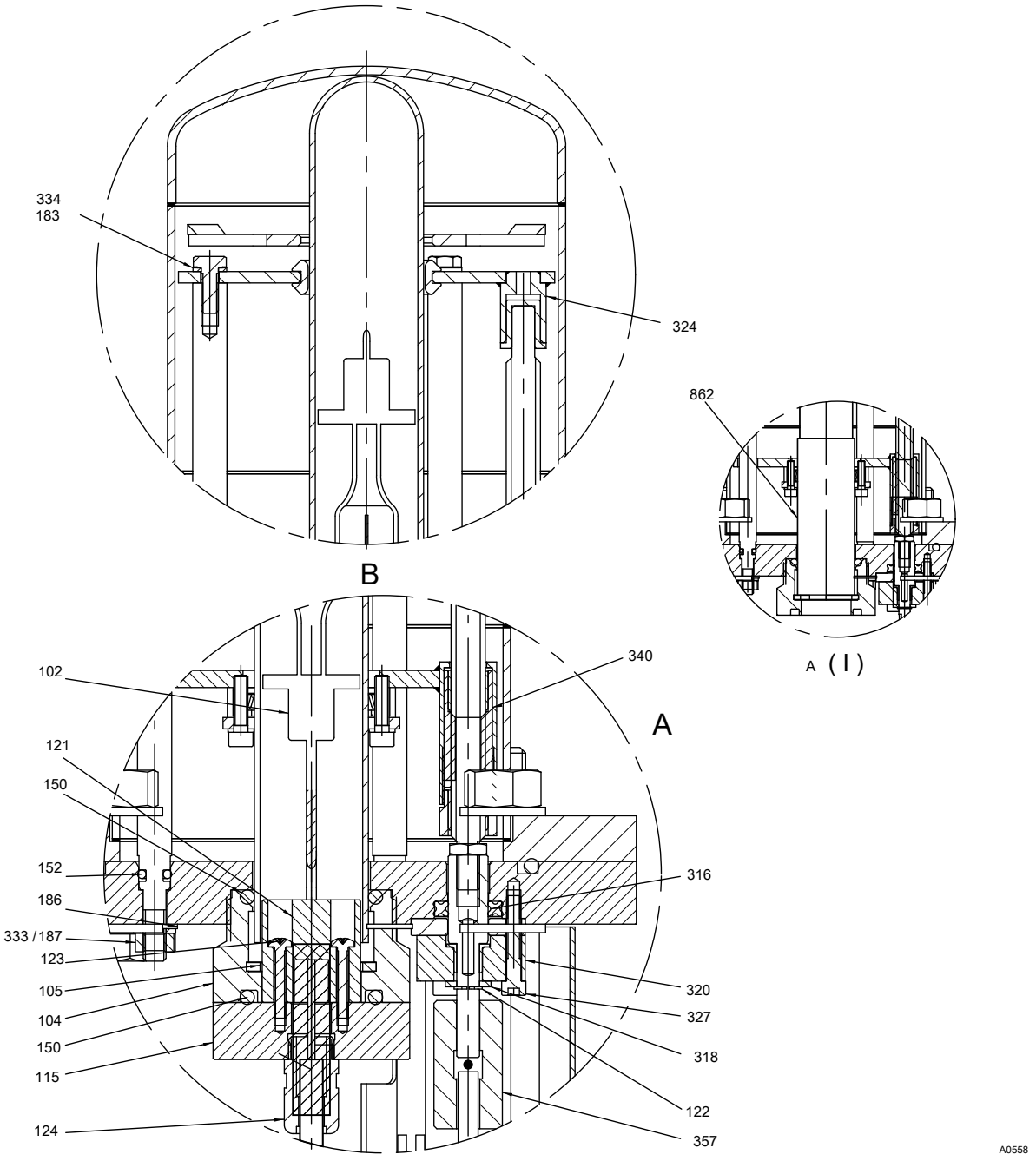


Fig. 38: Spare parts drawing Dulcodes S single UV lamp system with automatic wiper, detail "A" and "B"

I. As supplied

Spare parts list 1 kW - 3 kW single UV lamp system with automatic wiper

No.	Description	Spare parts number	Replacement interval	each
90	Spare parts kit UVS 2 kW and 3 kW	1037735	1 year	1
90	Spare parts kit UVS 1 kW		1 year	1
95	Installation tool for UVS motor bearing bush	1036907	on request	1
96	Installation tool for UVS motor threaded sleeve	1037738	on request	1
∗ = included in spare parts kit UVS 1 - 3 kW (1037735)				

No.	Description	Spare parts number	Replacement interval	each
101	UV lamp protection tube d40x2x480 mm Q, 2 kW	1035041	on request	1
101	UV lamp protection tube d40x2x580 mm Q, 3 kW	1035193	on request	1
102	UV lamp 2 kW	1035057	max. 8000 h	1
102	UV lamp 3 kW	1035180	max. 8000 h	1
104	UV lamp protection tube bracket	1035059	on request	1
105	Retainer 48.5/38.7 x 3 PTFE white	1035074	on request	1
113	Temperature switch G 3/4	1035104	on request	1
114	Bearing ring D 52.4/41 x 12 PTFE	1035058	on request	1
115	Washer ⌀69 x 20 - M 16 x 1.5	1035004	on request	1
120	Locking screw DIN 910 G 3/4	1002753	on request	1
121	Cable clamp, complete, ⌀34.5 x 36	1035011	on request	1
122 ✻	Retaining ring DIN 471, 8 x 0.8	467238	on request	1
130	UV sensor M G 3/4 1.4539	1034147	on request	1
131	UV sensor connection cable 10 m	1028063	on request	1
141	O-ring 149.2 - 5.34 EPDM	1027463	after opening chamber	1
150	O-ring 40 - 5 EPDM	1023569	on request	2
152	O-ring/M 6.00 - 3.00 FPM-B	740331	on request	1
153	O-ring/M 22.00 - 3.00 EPDM	1002175	on request	2
154	O-ring/M 25.00 - 2.00 EPDM	792872	on request	2
161	Control lead LiYY 2 x 0.5 mm^2	725152		
316✻	X-Ring 13.75 x 5.3 x 4.75 70 EPDM 281	1010384	1 year	1
320	Bearing cover complete UVS motor wiper	1037028	on request	1
340	Wiper rod complete UVS 2 kW automatic wiper	1037069	on request	1
340	Wiper rod complete UVS 3 kW automatic wiper	1037680	on request	1
353	Motor actuator D714s	1037490	on request	1
360	Ölflex Classic 100 4 G 0.75 grey	1024879	on request	1
361	Contact box STAK 3N grey	1037535	on request	1
362✻	Slide bearing 8 x 10 x 10 Iglidur H1	1037033	on request	1
363✻	Bearing D 16 x 17 PVDF	1037100	on request	1
364✻	Threaded sleeve Tr12 x 3 POM	1037070	on request	1
✻ = included in spare parts kit UVS 1 - 3 kW (1037735)				

No.	Description	Spare parts number	Replacement interval	each
365*	Slide bearing D 16.8 x 15 Iglidur A500	1037575	on request	1
653	Label "ProMaqua" blue/orange 20 cm long	1031184	on request	1
860	Face pin spanner for ∅ 14 - 100 mm	409805	on request	1
880	Filter mat each 3322/700 Control cabinet ventilation	1004212	1/2 - 1 year	2
900*	Wiper element	1027879	on request	1
901	Haltering d 62 / 45 x 4 for UVR PTFE pure white	1028100	on request	1
* = included in spare parts kit UVS 1 - 3 kW (1037735)				

10.3 Spare parts 2x2 kW, 2x3 kW, 3x3 kW multiple UV lamp system with manual wiper

Spare parts list and spare parts drawing

A spare parts list and spare parts drawing for multiple UV lamp systems with manual wiper are available upon request.

10.4 Spare parts 2x2 kW, 2x3 kW, 3x3 kW multiple UV lamp system with automatic wiper

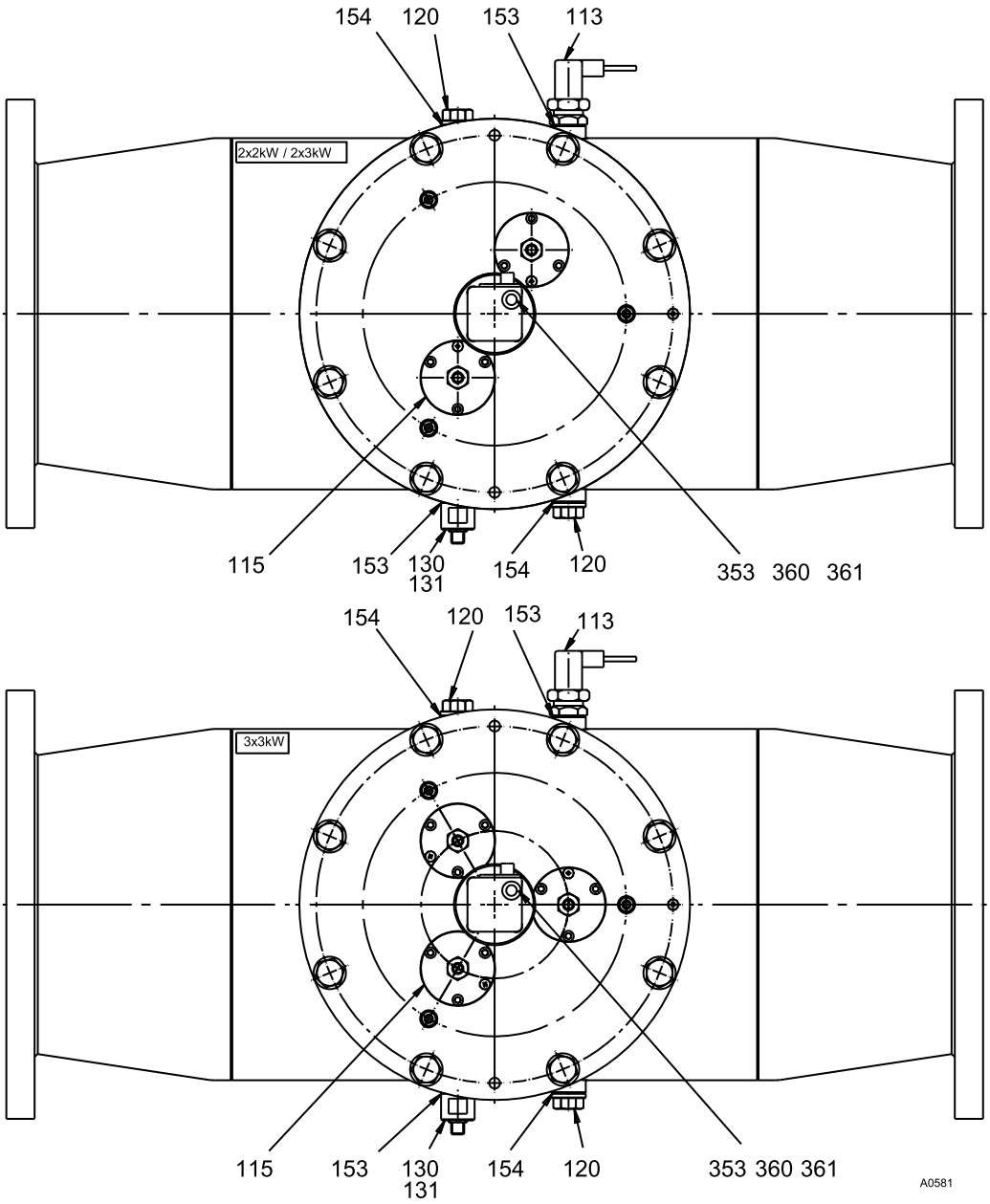


Fig. 39: Spare parts drawing Dulcodes S multiple UV lamp system with automatic wiper

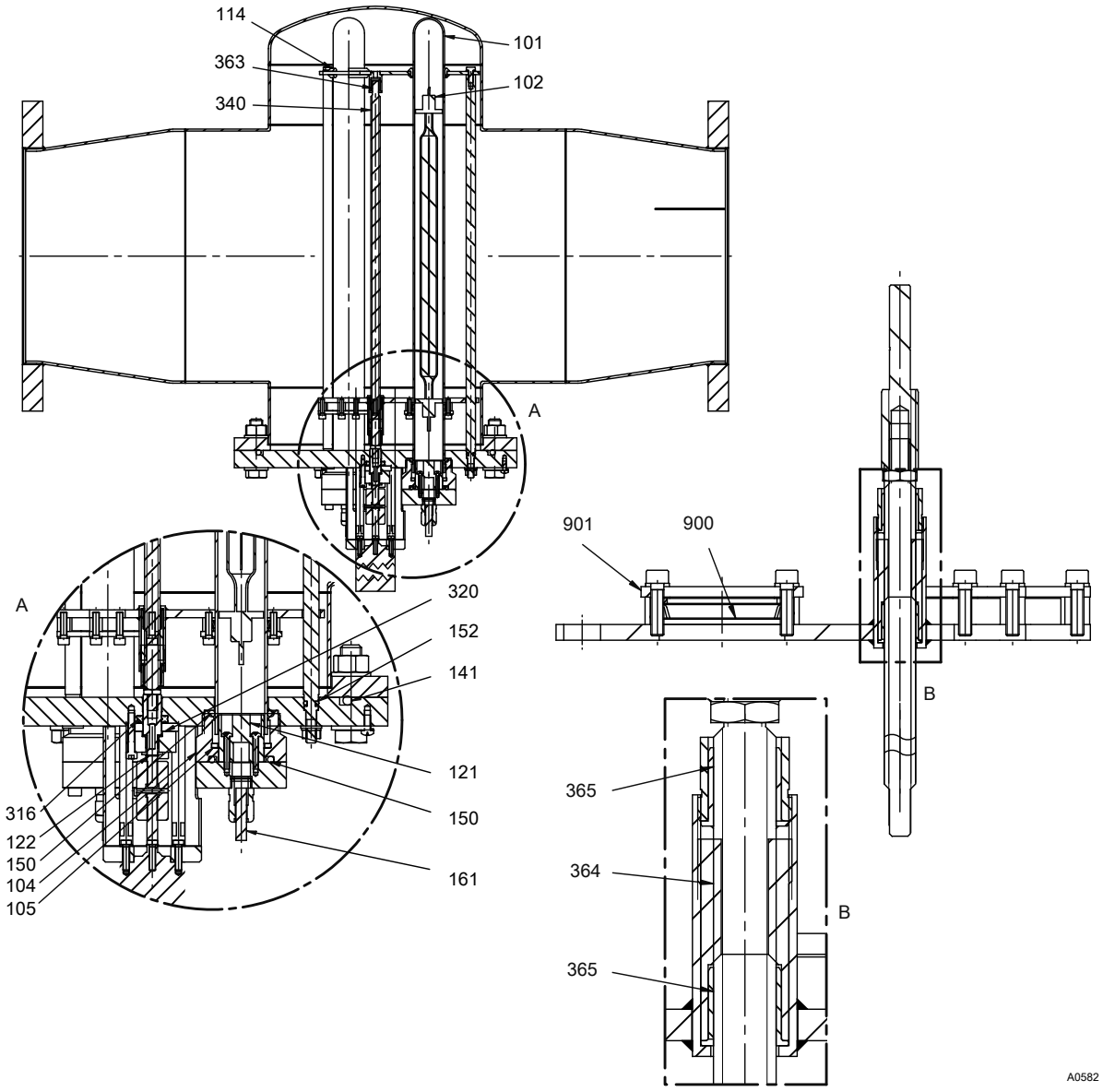


Fig. 40: Spare parts drawing Dulcodes S multiple UV lamp system with automatic wiper, detail "A" and "B"

Spare parts list 2x2 kW, 2x3 kW, 3x3 kW multiple UV lamp system with automatic wiper

No.	Description	Spare parts number	Replacement interval	each
090	Spare parts kit UVS 3x3 kW	1037757	1 year	1
090	Spare parts kit UVS 2x2 kW, 2x3 kW	1037756	1 year	1
095	Bearing bush installation tool	1036907		1
096	Threaded sleeve installation tool	1037738		1
101	UV lamp protection tube d40x2x580 mm	1035193	on request	1
102	UV lamp 2 kW	1035057	max. 8000 h	1
102	UV lamp 3 kW	1035180	max. 8000 h	1
∗ = included in spare parts kit UVS 3x3 kW (1037757) or spare parts kit UVS 2x2 kW, 2x3 kW (1037756)				

No.	Description	Spare parts number	Replacement interval	each
104	UV lamp protection tube bracket	1035059	on request	1
105	Retainer 48.5/38.7 x 3 PTFE white	1035074	on request	1
113	Temperature switch G 3/4	1035104	on request	1
114	Bearing ring D 52.4/41 x 12 PTFE	1035058	on request	1
115	Washer D 69 x 20; M16 x 1.5	1035004	on request	1
120	Locking screw DIN 910 G 3/4	1002753	on request	1
121	Complete cable clamp; D34; 5 x 36	1035011	on request	1
122 *	Retaining ring DIN 471; 8 x 0.8	467238	on request	1
130	UV sensor M G 3/4 1.4539	1034147	on request	1
131	UV sensor connection cable 10 m	1028063	on request	1
141	O-ring 149.2 - 5.34 EPDM	1027463	after opening chamber	1
150	O-ring 40 - 5 EPDM	1023569	on request	1
152	O-ring 6 - 3 FPM-B	740331	on request	1
153	O-ring/M 22.00 - 3.00 EPDM	1002175	on request	1
154	O-ring/M 25.00 - 2.00 EPDM	792872	on request	1
161	Control lead LiYY; 2 x 0.5 mm^2	725152		1
316	X-Ring 13; 75 x 5; 3 x 4; 75 70 EPDM 28	1010384	1 year	1
320	Bearing cover complete with UVS motor	1037028	on request	1
340	Wiper rod complete for 2x2 kW, 2x3 kW	1037485	on request	1
340	Wiper rod complete for 3x3 kW	1037522	on request	1
353	Motor actuator	1037490	on request	1
360	Ölflex Classic 100 4 G 0.75 grey	1024879	on request	1
361	Contact box STAK 3N grey	1037535	on request	1
362 *	Slide bearing F 8x10x10 Iglidur	1037033	on request	1
363 *	Bearing D16x17; PVDF	1037100	on request	1
364 *	Threaded sleeve Tr 12 x 3 POM	1037070	on request	1
365 *	Slide bearing D16, 8 x 15, Iglidur	1037575	on request	1
653	Label "ProMaqua" blue/orange	1031184	on request	1
860	Face pin spanner for ∅ 14 - 100 mm	409805	on request	1

*** = included in spare parts kit UVS 3x3 kW (1037757) or spare parts kit UVS 2x2 kW, 2x3 kW (1037756)**

No.	Description	Spare parts number	Replacement interval	each
880	Filter mat each 3322/700 Control cabinet ventilation	1004212	1/2 - 1 year	2
900 *	Wiper element	1027879	1 - 2 years	1
901	Holding ring d62/45 x 4	1028100	on request	1

* = included in spare parts kit UVS 3x3 kW (1037757) or spare parts kit UVS 2x2 kW, 2x3 kW (1037756)

10.5 Dulcodes S Terminal Wiring Diagram

WARNING!

Mains voltage on protective low voltage

Possible consequence: Fatal or very serious injuries.

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

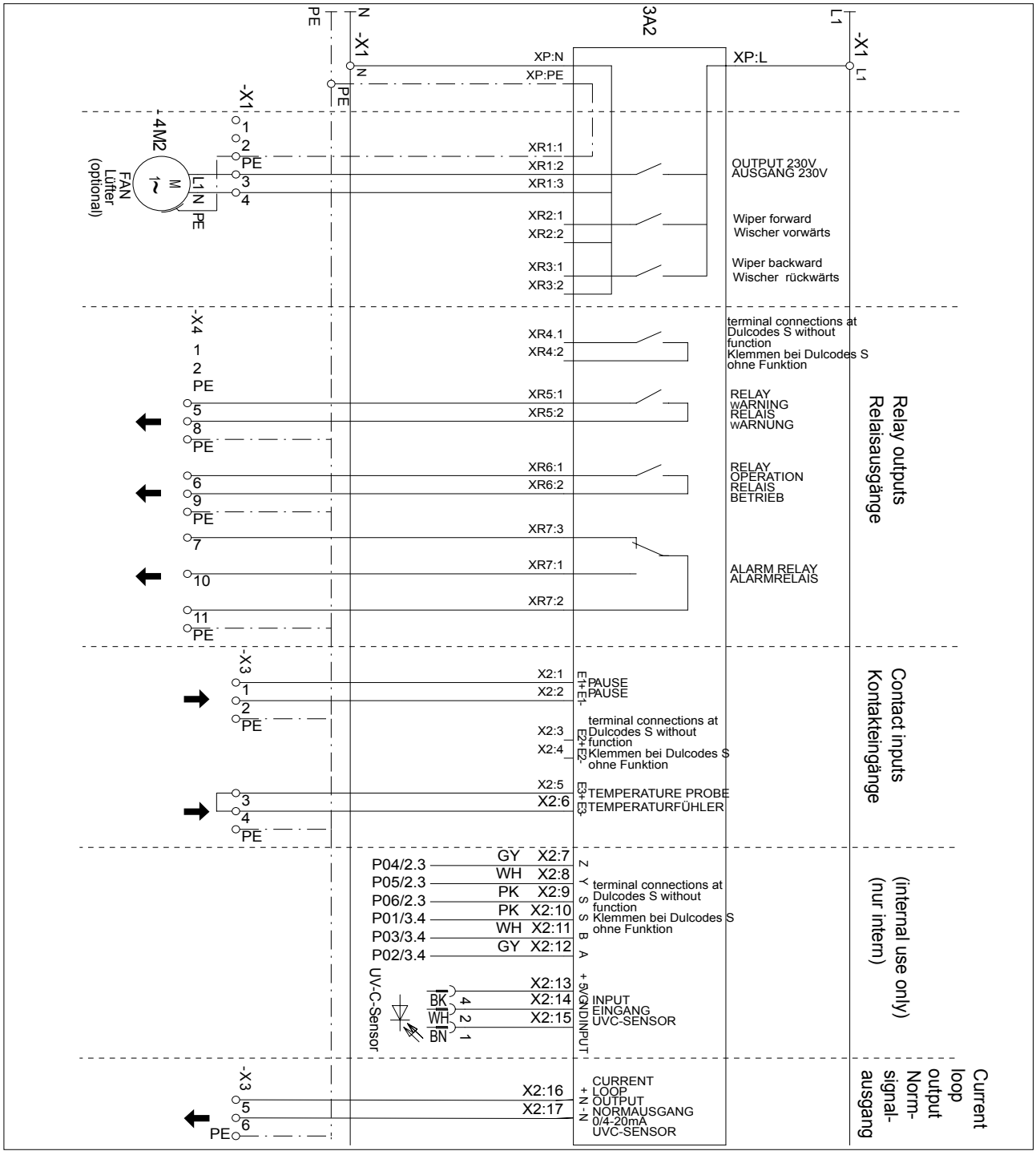


Fig. 41: Dulcodes S Terminal Wiring Diagram

10.6 Dulcodes UV System Unit Operating Log

No.	Date	Switch ons UV lamp	Signal display sensor [%]	UV transmission [%/1 cm]	Flow rate [m^3/h]	Maintenance work completed	Signature

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. 42: EC Declaration of Conformity/ Dulcodes S without wipers or with manual wiper

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 - - - - - 7 - - - - -***
Serial number:	***Please refer to the type plate on the device***
Relevant EC regulations	***EU - Machinery Directive (2006/42/EC)*** ***EU - EMC Directive (2004/108/EC)*** ***EU Pressure Equipment Directive (97/23/EC)*** ***Compliance with the protection targets of the Low Voltage Directive 2006/95/EC according to Appendix I, No. 1.5.1 of the Machinery Directive 2006/42/EC***
Harmonised standards applied, in particular:	***EN ISO 12100-1, EN ISO 12100-2*** ***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. 43: EC Declaration of Conformity / Dulcodes S with automatic wiper

12 Index