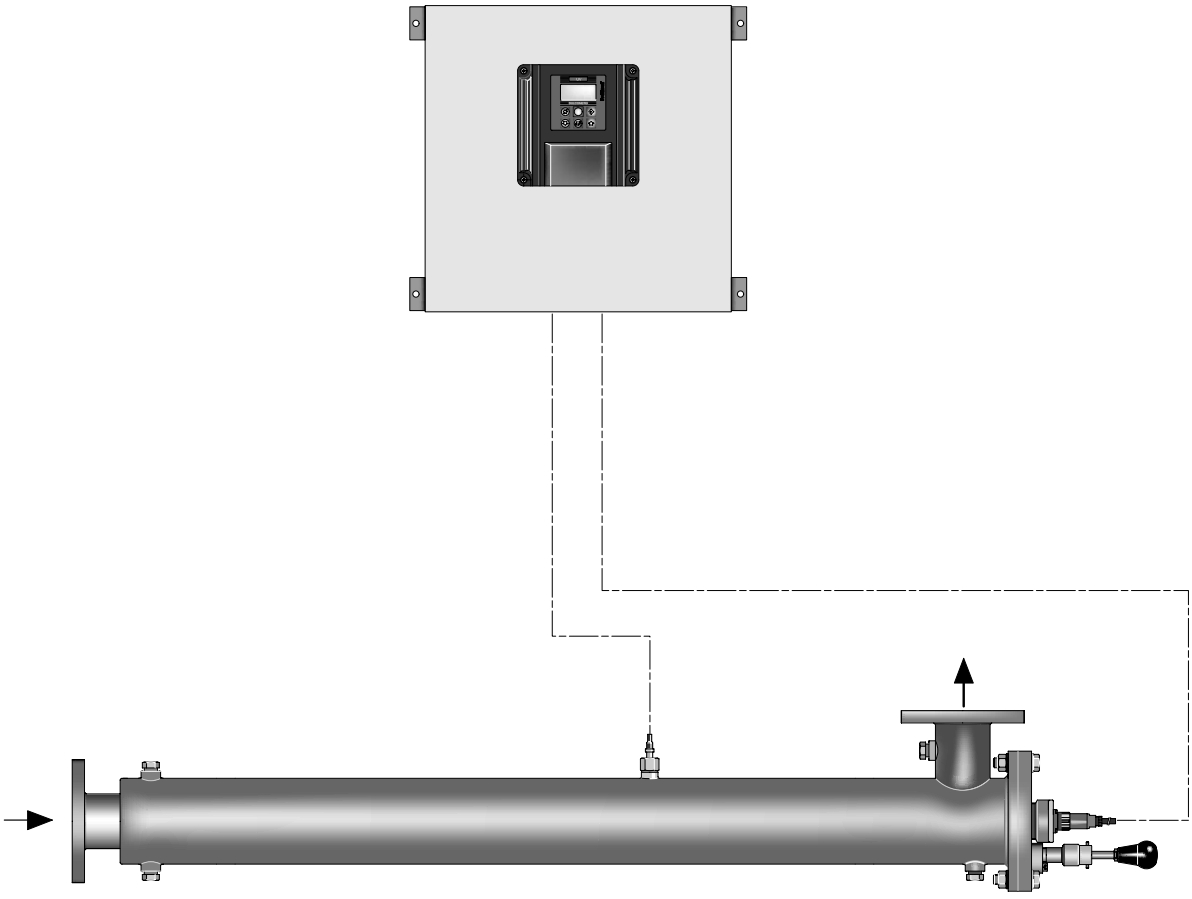
Operating Instructions

Dulcodes R

UV System with Manual Wiper



Dulcodes 1 x 300 R

Please affix the type identification label here!

Please completely read through the operating instructions first! Do not discard!

Damage caused by operating errors will invalidate the guarantee!

User Information

These operating instructions contain a continuous text description of the product,

- lists,
- ▶ instructions

and safety information identified with pictographs:

WARNING!

Disregard of the safety information may result in mortal danger or the risk of serious physical injury!

CAUTION!

Disregard of the safety information may result in the risk of minor physical injury and damage to property!

ATTENTION!

Disregard of the safety information may result in the risk of damage to property!

NOTE!

Information on disposal.

IMPORTANT!

Working information.

Imprint:
Operating instructions - Dulcodes R UV System with Manual Wiper

Address:
ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5-11
69123 Heidelberg
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Subject to technical modifications.

Table of Contents

1 Application/Use

Dulcodes R UV systems serve the purpose of disinfecting and photochemically treating

- drinking water
- service water and
- swimming pool water.

The UV disinfection process involves subjecting the water to be disinfected to short-wave UV light. This so-called UV-C radiation has a fast and reliable germicidal and sterilising effect.

Chloramines in swimming pool water, for instance, are reliably degraded as part of the photochemical treatment process.

Dulcodes R UV systems feature a manual wiper for the purpose of cleaning the protective tubes for the UV lamps.

Dulcodes UV systems are turnkey systems ready for connection.
They are available in different versions as defined by the identcode.
The performance data are defined in the datasheet supplied with the Dulcodes UV system.

Scope of delivery

- Radiation chamber
- UV lamps with protective tubes (quantity dependent on type of system)
- UV-C sensor
- Control cabinet with control system
- Installation material
- Documentation

2 Safety

2.1 Use for Intended Purpose

- The system serves the sole purpose of treating water.
- The system must only be used corresponding to the technical data and specifications defined in the operating instructions!
- Any other use or modifications are prohibited.
- Only persons specifically trained and authorised for the purpose are permitted to operate the system!
- You must observe the information provided in the operating instructions at the various phases in the life of the system!

2.2 Safety Information

WARNING!

- **UV-C radiation is harmful to the eyes and skin!**
  Place the UV lamps into operation only in their installed state!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!
- **If not calibrated correctly, a sensor cannot perform its monitoring function.**
  Under unfavourable circumstances, it is then possible that insufficiently disinfected water may be fed to the consumer.
- **In the case of applications with stringent disinfection requirements (e.g. drinking water disinfection), disinfect/sterilise the piping system, e.g. in a high-chlorinating process, prior to initial operation! This is particularly necessary in piping systems that have already been subject to soiling, germs or micro-organisms.**
- **Make sure that**
  - the maximum permissible water flow rate is not exceeded and
  - the UV transmission does not drop below the minimum permissible levels
  otherwise adequate disinfection can no longer be guaranteed!
- **In the event of longer periods of operation of the UV system without flow, particularly in the case of larger systems, monitor the water temperature and switch off the system or flush the system to cool it (see “Intermittent Flushing”)!**
- **The place of installation must be dry and frost-free while ensuring the UV system is protected from the effects of chemicals, dyeing agents and vapours.**
- **The ambient temperature and the radiation temperature in the immediate vicinity must not exceed 40 °C!**
- **If the water to be disinfected contains solid particles or turbidity substances, a suitable filter should be installed upstream of the UV system.**
- **Make sure that the maximum permissible operating pressure is not exceeded (see Section 8 “Technical Data”).**
- **Switch off the master switch or disconnect the power plug before installation and connecting the UV lamps!**
- **Do not switch on the system before the radiation chamber is filled with water!**
- **Make sure that the UV lamps are operated with the standard current!**

IMPORTANT!

Take note of the technical datasheet supplied with the respective UV system!
Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %!

2.3 Safety Devices

Label on radiation chamber

CAUTION! Dangerous ultraviolet radiation

o UV-C radiation is harmful to the eyes and skin! Place the UV lamps into operation only in their installed state! Install the UV system in accordance with regulations and instructions before starting up the UV lamps!

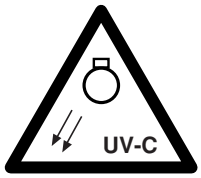
⋮

CAUTION: Danger

Disconnect power plug or switch off the system at the master switch before performing any maintenance work. Depressurise radiation chamber before performing maintenance work.

⋮

and



WARNING SYMBOL
CAUTION: UV-C radiation

Label on control cabinet

Disconnect power plug or switch off the system at the master switch before opening.

In the case of emergency

In the case of emergency, switch the red/yellow master switch (if provided) on the side of the control cabinet to OFF.
If the system has no master switch, disconnect the power plug!
If the master switch has no effect, disconnect the power plug! (The master switch does not disconnect the entire system from the power supply.)

3 Function

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

Operating with high efficiency, the UV low-pressure UV lamps used produce UV-C radiation of the wave length 254 nm which is particularly effective for disinfection and sterilisation purposes. The UV lamps are located in protective tubes made from high-grade quartz with high UV permeability.
The compact design of the radiation chamber, the optimised flow as well as the fitted turbulators ensure uniform radiation of the entire flow of water.

In connection with the UV-C sensor, a control system monitors the UV system.

Start-Up

The UV lamps are ignited after switching on the Dulcodes UV system.
In multi-lamp systems with a data bus to the ballast units, the bus is activated prior to ignition. This procedure can take several seconds depending on the size of the system.
After ignition, the lamps require several minutes until they reach operating temperature.

The UV-C sensor monitors the UV lamps: The flushing valve for start-up flushing opens as soon as the UV-C output exceeds the safety threshold.

The flushing valve also opens if the safety threshold is not reached within the maximum permissible warm-up time. If the safety threshold is still not reached within the maximum clear flushing time, the control will shut down the UV system and assume flow mode.

The shut-off valve opens after start-up flushing.
The UV system assumes normal operation.

Normal operation

The UV-C sensor still monitors the UV-C output during normal operation:

UV-C output drops below the warning threshold:
A warning is triggered.

UV-C output drops below the safety threshold:
The shut-off valve closes and the flushing valve opens.
If the safety threshold is no longer exceeded within the maximum clear flushing time, the control will shut down the UV system and assume flow mode.

All UV lamps are monitored to ensure they are operating correctly. If a lamp fails, the shut-off valve closes, the control shuts down the UV system and assumes flow mode.

Intermittent flushing

When intermittent flushing mode is active, after the maximum downtime, the flushing valve opens for the intermittent flushing time.

Switching off

When the UV system is switched off, the shut-off valve closes and the UV lamps are switched off. If an afterglow period is required for the lamps, the lamps will be switched off after the afterglow period has elapsed.

4 Control

Version

Since the electronics and software are subject to a continuous improvement process, the version number was introduced as a means of identification. This number must be specified in the event of complaints. The number can be shown on the display (see Section 4.3).

Presettings

The control of the Dulcodes UV system is preset on leaving the factory. It is therefore not necessary to change the settings for many applications.

IMPORTANT!

The settings can be changed only with the UV system switched off.
Exception: Lamp current setting

4.1 Display

A graphic display is provided.

In operating mode

Display of operating status
Warnings are indicated by flashing arrows and messages
A flashing error message draws attention to faults

In programming mode

Flashing indication of variable numerical values or data

IMPORTANT!

The display will revert to the normal display corresponding to the respective operating status 5 minutes after the last time a key was pressed.

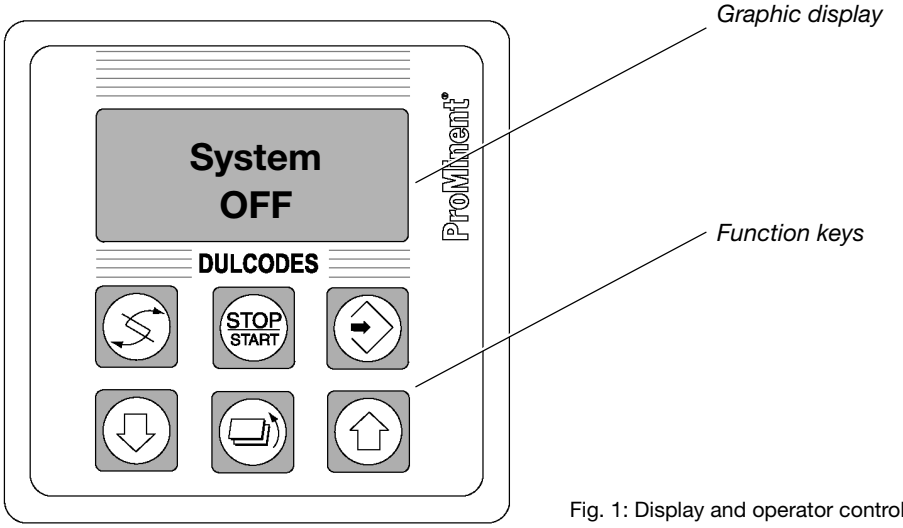


Fig. 1: Display and operator control unit

4.2 Function Keys

START/STOP 

To switch the UV system ON and OFF

CHANGE 

In operating mode:	Change display window
In programming mode:	Change adjustable parameters

BACK 

Move one level back in menu

DOWN 

In programming mode:	Decrease an indicated numerical value Change a data item

UP 

In programming mode:	Increase an indicated numerical value Change a data item

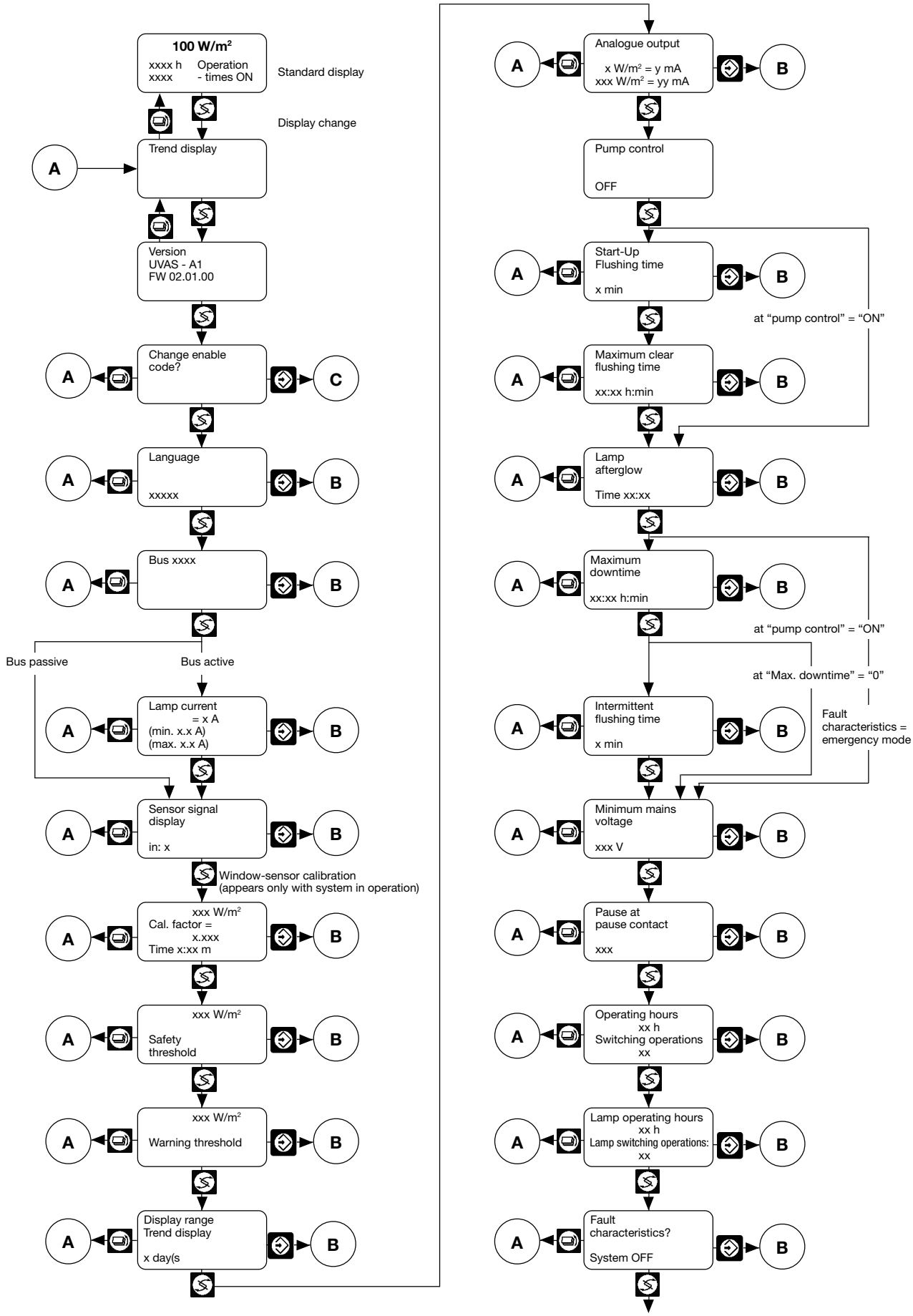
ENTER 

In operating mode:	Change to programming mode Acknowledge a fault
In programming mode:	Accept a set value or condition

IMPORTANT!

Press and hold the START/STOP key for at least 2 seconds.
The display will revert to the normal display corresponding to the respective operating status 5 minutes after the last time a key was pressed.

4.3 Operating Status Display and Parameter Setting

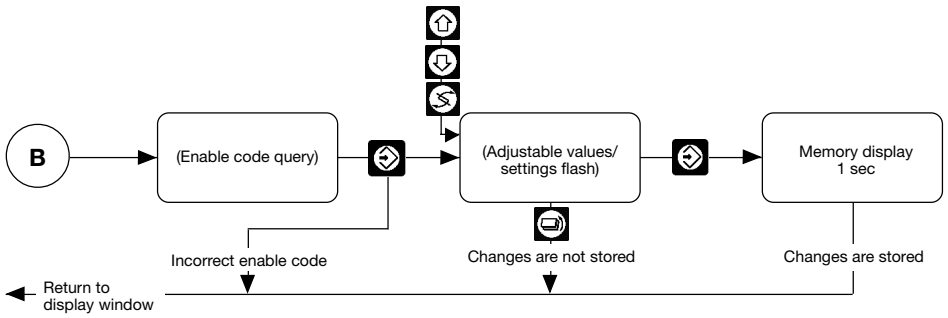


A Return to trend display

B Assume programming mode (see Page 9)

C Assume "Change enable code" mode (see Page 10)

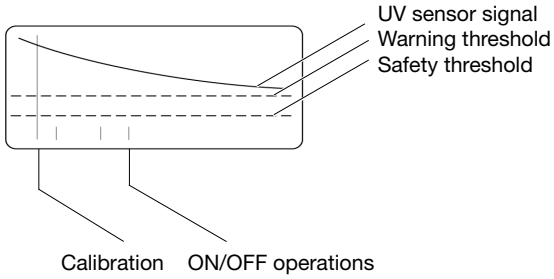
Programming instructions



IMPORTANT!

Once the enable code has been entered correctly, it is no longer necessary to re-enter the code during further programming procedures. The flashing values or settings appear directly when the ENTER key is pressed.
The enable is deleted automatically 5 minutes after the last time a key is pressed or after returning to the trend or standard display.

4.3.1 Trend Display



The trend display serves the purpose of monitoring the lamp ageing process, the formation of a coating on the protective tubes or changes in the water quality.

The progression of the UV sensor signal is displayed in a time window. Horizontal lines denote the safety threshold and warning threshold. The short vertical lines indicate switch-on operations of the UV disinfection system. The display range of the UV sensor signal is between 0 W/m² (or %) and the value that was assigned to the analogue output value of 20 mA (see 4.3.11). The time window is adjustable (see 4.3.8) and provides a continuous display: After the selected time has elapsed, the oldest value is deleted and the new value displayed.

IMPORTANT!

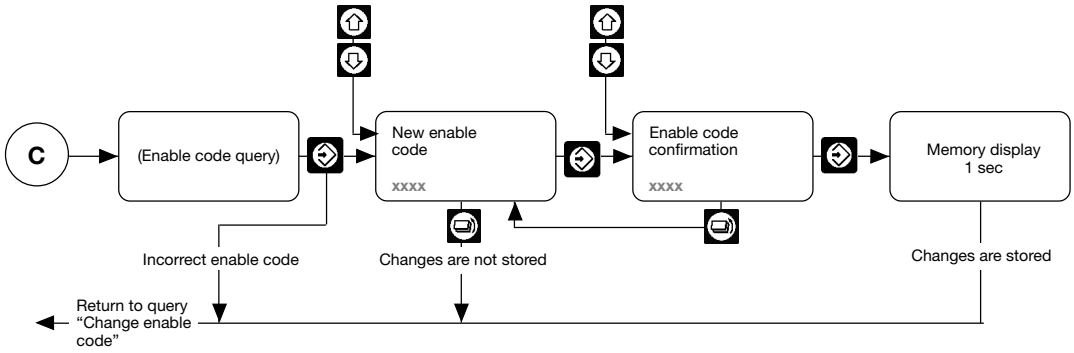
- **Each calibration of the UV-C sensor is documented by a solid vertical line in the trend display.**
- **The content of the trend display is deleted when the display range is changed and when the operating hours counter is reset.**

Presetting

Time window:	100 days
Maximum value of sensor signal:	400 W/m²

4.3.2 Changing Enable Code

To prevent unauthorised changes to the settings, the system control has an enable code for programming mode. This code can be freely selected by the operator.
Programming mode is still disabled after changing the enable code. The disable is cancelled only after entering the new enable code.



CAUTION!

- ***Note down the enable code! Parameters can be set only after entering the correct enable code.***
- ***The default enable code does not provide protection against unauthorised changes.***

Presetting 5000

4.3.3 Setting Language

Language

English

It is possible to choose between various languages.

4.3.4 Activating/Deactivating Ballast Bus

Bus active
10 lamps
EVG#001
EVG identifier

Bus passive

The ballasts feature a bus interface. The UV lamps are ignited and switched off and their operation monitored via this bus interface. The lamp current can also be varied.
With the system switched on, the number of ballasts can be indicated when the bus is active. The serial number of the individual ballasts can be checked with the UP and DOWN keys.

IMPORTANT!

The bus must be switched to active in UV systems that feature ballasts with a bus interface. The lamps cannot be ignited when the bus is set to passive.

Presetting Active

4.3.5 Setting UV Lamp Current

Lamp current
= 3.5 A
(min. 3.0 A)
(max. 3.5 A)

The lamp current can be freely selected within a defined range in connection with ballasts that feature a bus interface. This adjustment makes it possible to adapt the UV lamps to specific operating conditions.
The lamp current is also adjustable in operating and flushing modes.

The permissible limits for the lamp current are not monitored when the system is switched off. If a lamp current is set outside the permissible limits, the error message “Lamp Current” will appear after switching on the system and initialising the bus.

IMPORTANT!

The lamps are to be operated with standard current. Any deviation is appropriate and permitted only in very few exceptional cases.
The range of the permissible lamp current as well as the standard current is defined under “Technical Data” in Section 8.

ATTENTION!

Operation of the UV lamps with a current outside the permissible range can lead to premature failure:
- **The lamp current set too high causes overheating of the lamps and a reduction in the UV-C output.**
- **A lamp current set too low can cause a marked reduction in the UV-C output.**

Water temperatures < 8 °C If there is a slight reduction in the UV output from the UV lamps at water temperatures < 8 °C, the UV output can be increased by slightly increasing the lamp current by 0.1 to 0.3 A above the standard current.

End of effective life The UV-C output of lamps close to the end of their effective life can be slightly extended by increasing the lamp current by 0.2 to 0.4 A above the standard current.

Presetting 3.5 A

4.3.6 Sensor Signal Display

Sensor signal display

in: W/m²

The UV-C sensor monitors the UV-C output.
A drop in the sensor signal can be caused by:
- A coating forming on the lamp protective tubes
- Distinct deterioration in the UV transmission of the water
- Reduction in UV-C output of the lamps due to lamp ageing.

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

IMPORTANT!

The sensor signal is shown in W/m² as standard. Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %!

Presetting W/m²

4.3.7 Sensor Calibration

100 W/m²
Cal. factor =
1.000
Time 5:00

The UV-C sensor is calibrated at the factory and does not need recalibration.

4.3.8 Setting Trend Display Range

Display range
Trend display

100 day(s)

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

Presetting 100 days

4.3.9 Setting Safety Threshold

50.0 W/m²

Safety
threshold

Reliable water treatment is no longer ensured if the UV-C output decreases to such an extent that the sensor signal drops below the safety threshold. In this case, the shut-off valve, if fitted, is closed. This situation is indicated by two flashing arrows on the display.

A signalling device can be connected to the SAFETY THRESHOLD signalling relay of the control. The relay is closed when the safety threshold is undershot.

WARNING!

After changing a UV lamp, check the safety and warning threshold and readjust if necessary!

Adequate disinfection is ensured only when the safety threshold is set correctly.

IMPORTANT!

The safety threshold must be below the warning threshold. It is not possible to set this threshold outside the warning threshold.
Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %!

➤ Switch on the system with the Start/Stop key

➤ Wait until the UV lamps develop their full power output, i.e. the UV-C sensor signal is stable

➤ Read off the indicated UV-C intensity and note down

➤ Switch off the system with the Start/Stop key

➤ Set the safety threshold to 50 % of the read-off UV-C intensity

Example: Read UV-C intensity: 100 W/m²
Therefore: Safety threshold = 100 W/m² 0.50 = 50.0 W/m²

➤ Now set the warning threshold (see Section 4.3.10 “Setting Warning Threshold”).

4.3.10 Setting Warning Threshold

55.0 W/m²

Warning threshold

A warning is triggered if the UV-C output decreases to such an extent that the sensor signal drops below the warning threshold. The lamp protection tubes should be cleaned or the lamps replaced or the water quality improved by suitable preparation in order to avoid the signal dropping below the safety threshold. The signal dropping below the warning threshold is indicated by a flashing arrow on the display.

A signalling device can be connected to the WARNING THRESHOLD signalling relay of the control. The relay is closed when the warning threshold is undershot.

WARNING!

After changing a UV lamp, check the safety and warning threshold and readjust if necessary!

IMPORTANT!

The warning threshold must be above the safety threshold.
It is not possible to set the warning threshold below the safety threshold.
Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %!

Preconditions:

- The stable UV-C intensity of the UV lamps was noted down
- The safety threshold was set (see Section 4.3.9 “Setting Safety Threshold”).

➤ Set the warning threshold to 110 % of the set safety threshold.

Example: Set safety threshold: 50 W/m²
Therefore: Warning threshold = 50 W/m² 1.10 = 55.0 W/m²

The procedure for setting the safety threshold and warning threshold is now completed, the system is ready for operation and can be switched on with the Start/Stop key.

4.3.11 Analogue Output Sensor Signal Assigning Standard Signal

Analogue output

0 W/m² = 0 mA
400 W/m² = 20 mA

The signal from the UV-C sensor can be recorded on a plotter for documentation purposes. The plotter is to be connected to the standard output of the control for this purpose.

It is possible to choose between a standard signal of 0 to 20 mA and 4 to 20 mA:
- 0 or 4 mA corresponds to the sensor signal 0 W/m²
- 20 mA can be assigned to any value.

IMPORTANT!

The sensor signal value assigned to 20 mA simultaneously serves as the maximum value of the trend display.
Set this sensor signal value to 125 % of the maximum value to ensure the trend display (see 4.3.1) can never “overflow”.

Presetting 0 W/m² = 0 mA
400 W/m² = 20 mA (depending on settings)

4.3.12 Activating Pump Control

Pump control

OFF

The pump control must be activated in order to drive a delivery pump with the pump relay.

The pump relay is in dropped-out state when the system is switched off and remains in dropped-out state with the pump control “OFF” even when the system is running.

When the system is switched on with the pump control ON, the system will exit the warm-up phase on exceeding the warning threshold. The pump relay picks up.

The pump relay drops out when the system is switched off or when the system assumes pause state.

If the safety threshold is undershot during operation or if a UV lamp fails, the pump relay will drop out and the system assumes flow mode.

Presetting OFF

ATTENTION!

The UV system may be operated only with the radiation chamber completely filled with water. With the radiation chamber empty or only partially filled there is the risk of damaging the UV lamps and radiation chamber. Particular care must therefore be taken to ensure that the radiation chamber cannot run empty while the pump is switched off.

IMPORTANT!

Start-up, clear and intermittent flushing are not possible with the pump control “ON”. The corresponding programming windows are therefore blanked out.

IMPORTANT!

Since, in most cases, the delivery pump has a certain afterrunning period, the lamp afterglow time should be set to at least 1 minute in applications requiring a high degree of disinfection reliability.

4.3.13 Setting Start-Up Flushing Time

Start-Up
Flushing time

1 min

The aim of start-up flushing is to ensure that only perfectly treated water flows to the consumer. The automatic flushing valve (if fitted) for start-up flushing opens as soon as the UV lamps have reached operating temperature after ignition and the sensor signal is above the safety threshold. Only then does the shut-off valve open.

IMPORTANT!

A start-up flushing period of 1 minute is sufficient in the majority of cases.
The start-up flushing period can be set to 0 min if no flushing valve is installed.

Presetting 1 min

4.3.14 Setting Maximum Clear Flushing Time

Maximum clear flushing time

00:01 h:min

Clear flushing is mainly used for drinking water disinfection where maximum clear flushing times of more than 10 hours are often implemented. The shut-off valve will close and the flushing valve open if, for example, the UV transmission in ground water or spring water deteriorates after heavy rainfall to such an extent that the UV-C sensor signal drops below the safety threshold. Normal operation of the UV system will be restored as soon as the water quality has improved. The UV system will switch to flow mode if the UV-C sensor signal does not rise above the safety threshold again within the maximum clear flushing time.

Presetting 1 min

4.3.15 Setting Lamp Afterglow

Lamp afterglow

OFF

In large UV systems for drinking water disinfection it is possible that a longer period of time may elapse until the shut-off valve closes or the water flow is otherwise interrupted. In this case, the lamp afterglow function prevents water that has not been properly disinfected from reaching the consumer while the UV system is switched off.
A lamp afterglow period of 1 minute is sufficient in the majority of cases.

Presetting OFF

4.3.16 Setting Standstill and Intermittent Flushing Time

Maximum standstill time

00:00 h:min

Intermittent flushing time

1 min

Standstill flushing is used particularly for the own supply of drinking water. Long periods of time without tapping off water can be assumed in connection with UV systems in self-supply applications. In such cases, standstill flushing is recommended in order to avoid impermissible overheating and radiation of the water.

If a flow control instrument whose contact closes on exceeding a minimum flow rate is connected to the FLOW switched input of the control, the flushing valve will be opened for the intermittent flushing period if no water is tapped off within the maximum standstill period.

If no flow control instrument is connected to the FLOW switched input of the control, i.e. the input is open, the flushing valve will open for the set intermittent flushing time after the maximum standstill period (periodic flushing).

A maximum standstill flushing period of 5 hours is set in most cases. An intermittent flushing time of 1 minute is normally sufficient.

No intermittent flushing occurs if the maximum standstill period is set to 00:00.

Presetting 00:00 h:min (maximum standstill period)
1 min (intermittent flushing time)

4.3.17 Setting Minimum Mains Voltage

Minimum mains voltage

180 V

Monitoring the mains voltage prevents uncontrolled failure of the UV system and of the lamps due to excessively low mains voltage. If the mains voltage drops below the minimum value, the control assumes the undervoltage state and shuts down the system. The system automatically resumes operation when the mains voltage exceeds its permissible minimum value again.

ATTENTION!

Changing the minimum mains voltage is permitted only after consultation with the Service Department.

Presetting 180 V

4.3.18 Pause Function

Pause at pause contact

closed

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

Presetting closed (UV system starts operation with pause contact open)

4.3.19 Displaying/Resetting Counters

Operating hours
400 h
Switching operations
25

Lamp operating hours
400 h
Lamp switching operations
25

The OPERATING HOURS and SWITCHING OPERATIONS counters: cannot be reset
The LAMP OPERATING HOURS and SWITCHING OPERATIONS counters: can be reset.

4.3.20 System Behaviour in the Case of Fault

System behaviour in the case of fault?

System OFF

The UV system is normally shut down in the event of a fault. In special applications, however, it may be appropriate to allow the system to continue operation with restricted output (emergency operation).

WARNING!

- **The disinfection output of the UV system is drastically reduced in emergency mode.**
- **Emergency mode is not permitted in connection with applications with demanding requirements in terms of disinfection output such as in drinking water disinfection or comparable applications.**
- **Distinctly reduced output levels can be expected in applications where emergency operation of the UV system is permitted.**
- **In emergency mode, a shut-off valve (if fitted) opens immediately after pressing the START/STOP key and not after exceeding the safety threshold. There is no monitoring as to whether the UV lamps have heated up to operating temperature and provide adequate UV output. If necessary, the water flow should be turned off manually (manual shut-off valve, switching off the delivery pump manually, etc.) for 5 to 10 minutes after switching on emergency mode.**
- **Before enabling emergency mode in the program menu and before switching on emergency mode, the system operator must check to ensure that danger to persons and property by the drastically reduced system output is ruled out.**
- **ProMinent shall reject any warranty claims or claims for compensation in the event of damage during emergency operation of the UV system.**

A special code is required for the purpose of reprogramming the system behaviour in the event of faults. This code can only be obtained from ProMinent on request. After entering the special code, emergency mode can then be selected under system behaviour in the event of faults.

If emergency mode is selected in response to a fault, as before, the system will assume flow mode in the event of a lamp failing or if the safety threshold is undershot after the clear flushing time has elapsed. The system then assumes emergency mode by pressing the CHANGE key on the display. The fault is therefore not confirmed with the ENTER key.

Emergency mode can also be triggered by closing the FLOW switched input.
Automatic transition to emergency mode can be achieved by bypassing the input.

The UV lamps are ignited, the shut-off valve is opened and the pump relay picks up in emergency mode. The alarm relay (fault signalling relay), however, remains dropped out, i.e. lamp failure and the sensor signal are no longer monitored. The signalling relay for WARNING THRESHOLD and SAFETY THRESHOLD undershot remains dropped out.

IMPORTANT!

Intermittent flushing is not possible in systems where emergency mode has been enabled. The programming windows for max. standstill period and intermittent flushing time are therefore blanked out.

Since the pump relay picks up in emergency mode even with the pump control OFF, the pump relay can be used for the purpose of signalling emergency mode in systems with the pump control set to OFF. In systems with the pump control set to ON, emergency mode can be identified by the fact that the pump relay is still picked up although the alarm relay has dropped out.

4.3.21 Alarm Signalling Relay

A signalling device can be connected to the ALARM signalling relay.
The relay drops out in the event of a fault or power failure.

4.3.22 Fault Switched Input

An external fault-signalling device such as an overtemperature switch can be connected to the FAULT switched input.

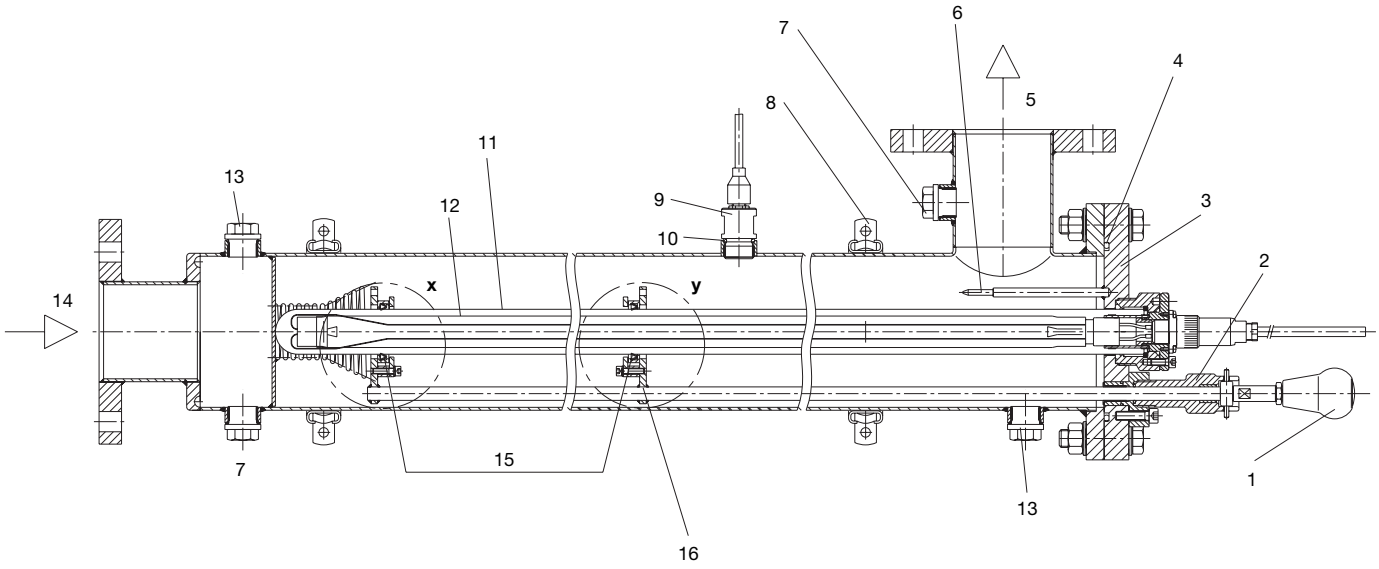
IMPORTANT!

The FAULT switched input is bypassed on delivery. If the jumper is removed without connecting a fault signalling device, the control will assume flow mode and it will no longer be possible to operate the UV system.

ATTENTION!

Remove the jumper when connecting a fault-signalling device otherwise no fault/malfunction will be signalled.

5 Assembly and Installation



Detail X

Detail Y

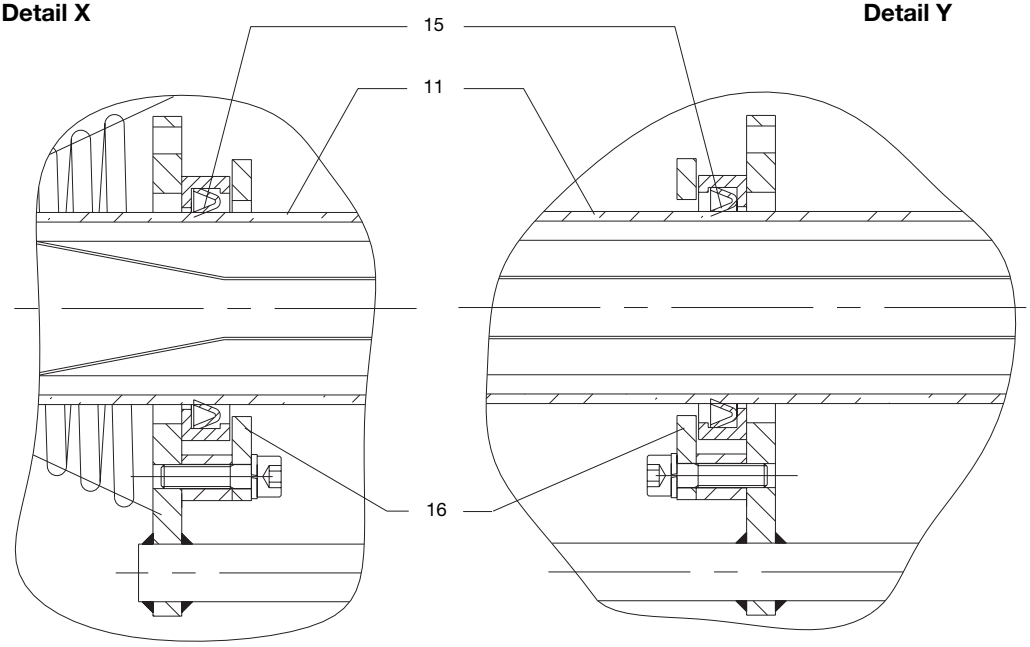


Fig. 2: Design of radiation chamber with details X and Y

1 Knob
2 Clamping screw
3 Chamber cover
4 O-ring
5 Outlet
6 Centring pin
7 Vent/discharge (depending on installation position)
8 Securing element
9 UV sensor
10 O-ring
11 Protective tube
12 UV lamp
13 Flushing connection
14 Inlet
15 Wiper element
16 Retaining plate with wiper rod

Please take note of the following safety information prior to installation:

WARNING!

Make sure that

- **the maximum permissible water flow rate is not exceeded and**
- **the UV transmission does not drop below the minimum permissible levels**

otherwise adequate treatment will no longer be guaranteed!

The maximum permissible water flow rate is defined in the supplied datasheet.
It is an integral function of the required radiation exposure level and of the minimum permissible UV transmission of the water to be treated.

ATTENTION!

- **The place of installation must be dry and frost-free while ensuring the UV system is protected from the effects of chemicals, dyeing agents and vapours.**
- **The ambient temperature and the radiation temperature in the immediate vicinity must not exceed 40 °C!**
- **If the water to be disinfected contains solid particles or turbidity substances, a suitable filter should be installed upstream of the UV system.**
- **Make sure that the maximum permissible operating pressure is not exceeded.**

IMPORTANT!

Despite the use of modern lamp ballasts with protective lamp ignition, the UV system should be operated such as to avoid frequently switching the UV lamps on and off.

5.1 Radiation Chamber

The design and version of the radiation chamber are defined in the “Technical Data” (Section 8).

5.1.1 Installation

ATTENTION!

- **Leave sufficient space for maintenance and servicing work!**
  The necessary clearance is defined in the dimensions sheet (changing lamp protective tube).

Vertical wall mounting

➤ Using the installation material provided, secure the radiation chamber vertically on a wall or a suitable frame. It must be possible to operate the manual wiper.

Reclined/horizontal

➤ Using the installation material provided, secure the radiation chamber horizontally on a wall or a suitable frame.

CAUTION!

The outlet flange must face either vertically upward or vertically downward!
Otherwise, it will not be possible to fully vent the radiation chamber via the connections provided!

5.1.2 Fitting Knob

The knob is supplied separately with some types of system. The knob must be fitted now:

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)

➤ Completely pull out the wiper rod

➤ Use a WAF 11 open-ended spanner to secure the knob (with fixing bush) onto the wiper rod

➤ Slide the wiper rod completely into the radiation chamber

➤ Lock the fixing bush in the clamping screw

➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)

5.1.3 Affixing Warning Sign

IMPORTANT!

Affix the supplied self-adhesive warning sign such that it is clearly visible on the radiation chamber.

5.1.4 Hydraulic Connections

ATTENTION!

- **Make the hydraulic connection of the radiation chamber in accordance with valid general guidelines as well as the locally applicable installation regulations.**
- **Use UV-resistant material for the hydraulic connection!**
  If PVC is used, it is possible that the PVC material may discolour in the area of the connection and even turn brittle under unfavourable conditions.
- **In applications with demanding disinfection requirements (e.g. drinking water disinfection) without facilities for interrupting the water flow in the case of fault/malfunction (e.g. shutting down the delivery pump):**
  Fit an automatic shut-off valve downstream of the radiation chamber and connect to the control!
  The automatic shut-off valve must close automatically to ensure the flow of water is interrupted also in the event of power failure.

IMPORTANT!

- **Fit valves upstream and downstream of the radiation chamber for the purpose of shutting off the radiation chamber when performing maintenance and servicing work!**
- **Fit suitable stopcocks upstream and downstream of the radiation chamber for the purpose of taking microbiological samples!**
- **For radiation chambers that are regularly cleaned by filling with a cleaning solution, it is recommended to replace the water drain screw and vent screw by suitable valves.**
- **It is advisable to use a suitable acid-resistant pump to fill larger radiation chambers via the water drain opening.**
- **If the radiation chamber is filled using a pump, it is advisable to circulate the cleaning solution via the vent opening. This will shorten the cleaning time and improve the results.**

ATTENTION!

The UV system may be operated only with the radiation chamber completely filled with water. With the radiation chamber empty or only partially filled there is the risk of damaging the UV lamps and radiation chamber. Particular care must therefore be taken to ensure that the radiation chamber cannot run empty while the pump is switched off.

5.2 Control Cabinet and Control

5.2.1 Installation

➤ The control cabinet and/or the carrier panel with the control and ballast are to be mounted on the wall or a suitable frame such that the lamps and sensors can be connected with the cables provided.

ATTENTION!

The lamp connection cable and the sensor cable must not be extended!

5.2.2 Electrical Connections

WARNING!

- **Comply with the valid general guidelines as well as the locally applicable installation regulations!**
- **Perform installation work only with the power supply to the system disconnected!**
- **When a safety extra-low voltage (SELV) is applied to one of the terminals of X4, mains voltage must not be applied to the other terminals of X4!**

- **Connect a PE conductor to the radiation chamber and to the chamber cover!**
- **Secure the power supply by means of a suitable residual current-operated circuit breaker!**
- **Only an authorised electrician is permitted to open the control cabinet!**
- **The lamp connection cable and the sensor cable must not be extended!**
- **Electrical installation must be performed by an authorised electrician using the supplied documentation and diagrams (circuit diagram).**

5.2.3 Opening Control Unit

IMPORTANT!

It is necessary to open the control unit only if it is not installed in the control cabinet.

WARNING!

Before opening, make sure that no voltage is applied to the control unit!

➤ Undo the 4 screws at the top of the housing
➤ Open the housing:
for this purpose exert pressure with the index finger on to the front edge of the housing while simultaneously pulling forward so that the catch hook disengages
➤ Carefully pull the upper section forward away from the lower section (both sections are connected by a ribbon cable!)
➤ Fit the upper section with both guide rails in the approx. 80 mm high plug-in slot

All connection terminals are now freely accessible. Blanked off holes that must be broken out to insert the connection cables are provided on the underside of the control unit.
The openings in the rear row are intended for PG-11 screwed glands.
The 5 openings in the front row are intended for PG-7 screwed glands.

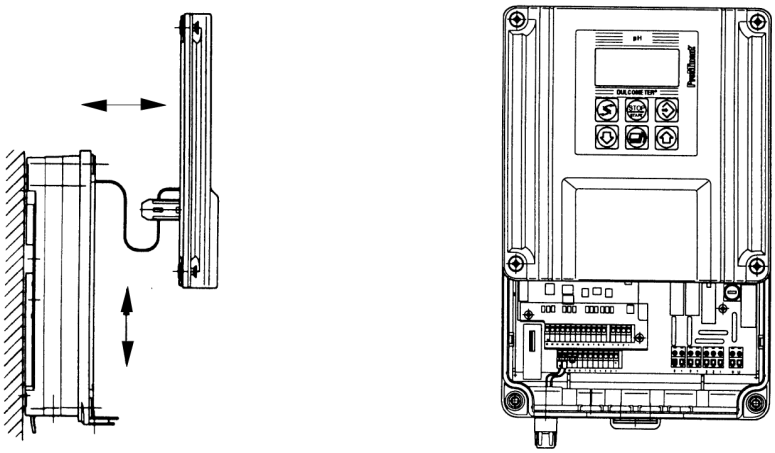
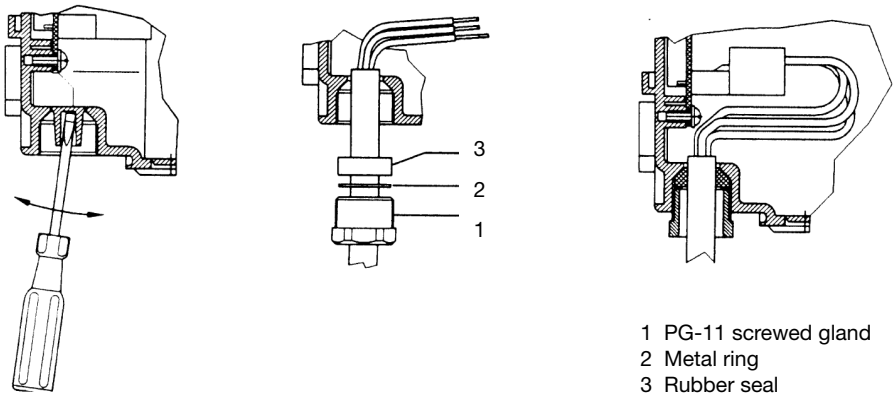


Fig. 3: Opening control unit

ATTENTION!

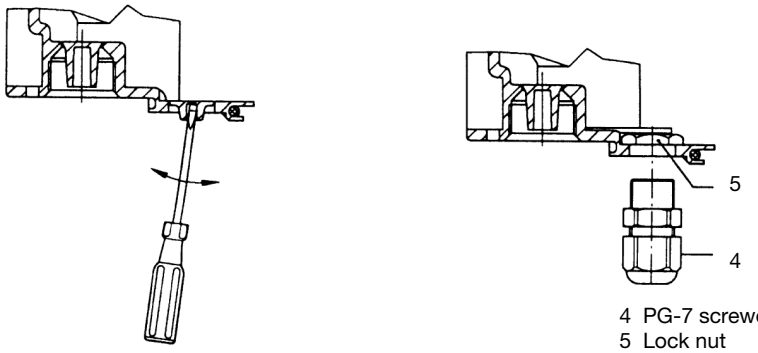
Use the appropriate tools to break out the blanked off cable leadthroughs on the underside of the control unit so as no to damage the pc-board and the thread.

➤ Break out blanked-off cable leadthroughs on the underside of the control unit
➤ First install the cables in the rear row:
Fit screwed gland, thrust collar and seal from supplied supplementary kit on the cable, screw into the threaded hole and tighten by hand
➤ Pull PG-7 screwed glands over the cable and lock with lock nut
➤ Route strands to the terminals corresponding to the terminal connection diagram
➤ Connect unused terminals to the corresponding plug connectors
➤ Close control unit



1 PG-11 screwed gland
2 Metal ring
3 Rubber seal

Fig. 4: Cable leadthrough – rear row



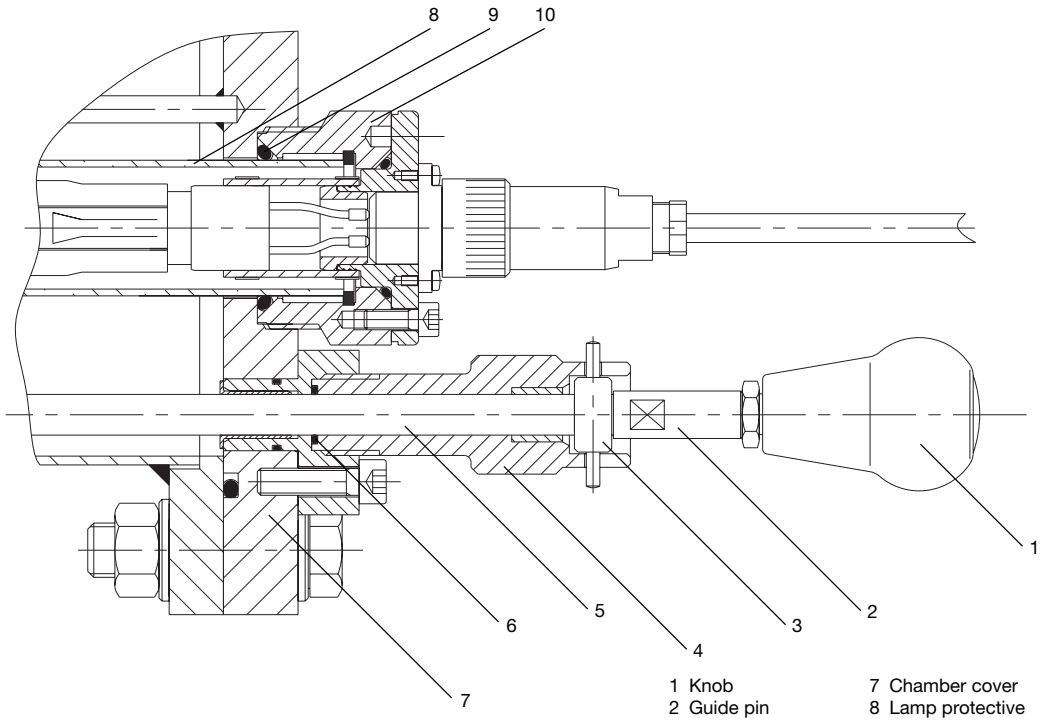
4 PG-7 screwed gland
5 Lock nut

Fig. 5: Cable leadthrough – front row

5.3 Installing Lamp Protective Tubes

ATTENTION!

Take particular care during this work to ensure that the extended wiper rod is not bent!



1 Knob
2 Guide pin
3 Fixing bush
4 Clamping screw
5 Wiper rod
6 O-ring
7 Chamber cover
8 Lamp protective tube
9 O-ring
10 Protective tube retaining fixture

Fig. 6: Components of the manual wiper on the chamber cover and parts of the UV lamp

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Release the fixing bush out of the lock of the clamping screw
➤ Pull the wiper rod as far as it will go – it must remain against the stop until it is inserted again!
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)
➤ Use a pin-type face spanner to loosen the protective tube retaining fixture and remove (place spanner in the holes – not against the threads!)
➤ Carefully pull the transport retainer (grey plastic tube) completely out of the radiation chamber
➤ Carefully slide the lamp protective tube as far as it will go into the radiation chamber
➤ Fit a new O-ring onto the end of the lamp protective tube

ATTENTION!

- **Before installing, check the lamp protective tube for damage!**
  A damaged protective tube must not be reinstalled.
- **Make sure the protective tube is fitted correctly!**
  The lamp protective tube may protrude by a maximum of 40 mm and exhibit no angle offset!

➤ Secure protective tube retaining fixture in the chamber cover and firmly tighten using a pin-type face spanner (place spanner in the holes – not against the threads!)

ATTENTION!

The seal of the wiper rod may be easily damaged!
Make sure the surface of the wiper rod is clean before reinserting it in the radiation chamber!

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Slide the wiper rod completely into the radiation chamber
➤ Lock the fixing bush in the clamping screw
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)

CAUTION!

With operating pressure applied, an unsecured wiper rod can shoot out of the radiation chamber and cause personal injury!
Therefore, always lock the wiper rod with the fixing bush!

CAUTION!

The outlet flange must face either vertically upward or vertically downward!
Otherwise, it will not be possible to fully vent the radiation chamber via the connections provided!

5.4 Installing and Connecting UV Lamps

WARNING!

- **Switch off the master switch or disconnect the power plug before installation and connecting the UV lamps!**
- **Place the UV lamps into operation only in their installed state!**
  UV-C radiation is harmful to the eyes and skin!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!
- **Do not change/modify the lamp connection cables already fitted!**
- **Do not change/modify the distance between the connector and lamp cover!**
  Otherwise it will not be possible to ensure that the lamp rests against the closed end of the protective tube. This position, however, is the prerequisite for safe and reliable disinfection!

ATTENTION!

Touch the glass of the UV lamps only wearing cotton gloves!
Fingerprints burn into the glass and can cause premature failure. Before fitting the lamps, remove fingerprints with a cloth moistened with alcohol!

➤ Check to ensure that the O-ring on the retaining fixture for the lamp protective tube is fitted in the groove provided for this purpose – the sealing surfaces of the O-ring must be completely smooth and clean!

ATTENTION!

When fitting the UV lamps, turn them such that the two connected cables face away from the UV sensor!
Otherwise a lower radiation output will be measured!

IMPORTANT!

With the system shut down, plug the connector together with the lamp cover onto the lamp before inserting the lamp in the protective tube.

➤ Insert the lamp in the protective tube and leave protruding by approx. 100 mm
➤ Plug the connector together with lamp cover and O-ring to the lamp
➤ Completely insert the lamp in the protective tube.
➤ Place the lamp cover on the retaining fixture for the protective tube and fit the mounting screws using the Allen key provided and firmly tighten.
➤ Connect the circular plug with the lamp connection cable to the socket on the lamp cover and secure with the knurled nut.

5.5 Installing and Connecting UV-C Sensor

WARNING!

- **The UV system must only be placed into operation with the UV-C sensor installed in position.**
  Harmful UV radiation can escape from the system if the lamps are placed into operation with the UV-C sensor removed.

➤ Carefully fit the O-ring over the thread onto the undercut of the UV-C sensor
➤ Completely insert the UV-C sensor in the sleeve and secure; only very little force is necessary for this purpose
➤ Connect the sensor connection cable to the sensor plug and secure with the knurled screw.

6 Start-Up

WARNING!

In the case of applications with stringent disinfection requirements (e.g. drinking water disinfection), disinfect/sterilise the piping system, e.g. in a high-chlorinating process, prior to initial operation!
This is particularly necessary in piping systems that have already been subject to soiling, germs or micro-organisms.

6.1 Checking the Radiation Chamber for Leaks and Venting

➤ Open vent screw on radiation chamber
➤ Slowly open shut-off valve upstream of radiation chamber
➤ Fill radiation chamber until water emerges from the vent screw
➤ Close vent screw, only very little force is required
➤ Check radiation chamber for leaks
➤ Open shut-off valve downstream of radiation chamber
(necessary only for manual shut-off valve)

ATTENTION!

Use the clamping screw of the manual wiper as a vent screw if system is wall-mounted vertically!

IMPORTANT!

Hand-tighten the clamping screw at the wiper rod only to such an extent that there are only just no water leaks under operating pressure.

6.2 Switching On Disinfection System

ATTENTION!

Do not switch on the system before the radiation chamber is filled with water!

➤ Switch on master switch or connect power plug
➤ Check parameters in programming mode of the control system and change if necessary
(see 4.3 Operating Status)

ATTENTION!

Make sure that the UV lamps are operated at the standard current!

➤ Switch on UV system with the START/STOP key;
press the START/STOP key and hold for at least 2 seconds.
➤ If the control assumes the PAUSE state, operate the pause contact

After being ignited, it can take several minutes for the UV lamps to reach their full UV output.

IMPORTANT!

Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %.

6.3 Calibrating UV-C Sensor

The UV-C sensor is calibrated at the factory and does not need recalibration.

If recalibration is required, please send the system in to ProMinent.

IMPORTANT!

Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %.
All new UV lamps require a burn-in period of 100 to 200 hours. Therefore, check the safety threshold and the warning threshold approximately 200 operating hours after commissioning (start-up).

7 Maintenance

Maintenance of the UV system is restricted to cleaning the lamp protective tubes and the sensor window replacing the wiper elements and O-ring of the clamping screw as well as to replacing the UV lamps at the end of their maximum permissible useful life.

In the case of systems that have a fan installed in the control cabinet, the filter mats of the fan and the air outlet filter in the control cabinet should be replaced at regular intervals (normally once a year).

An operation log should be kept for documentation purposes; a corresponding form can be found in the annex.

WARNING!

- **Replace the UV-C lamps after the maximum permissible useful life at the latest! Otherwise, operational reliability of the UV system can no longer be guaranteed.**
- **If not otherwise specified in the supplied datasheet, the maximum permissible useful life is 14,000 hours.**
- **Disconnect the power plug or switch off the mains switch before performing any maintenance/servicing work.**
- **Depressurise radiation chamber before performing maintenance work.**
- **UV-C radiation is harmful to the eyes and skin!**
  Place the UV lamps into operation only in their installed state!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!
- **Soiled filter mats of the fan and of the air outlet filter can cause overheating and irreparable damage to the control cabinet.**

7.1 Cleaning Lamp Protective Tubes

Iron, manganese or lime deposits can form on the lamp protective tubes during operation. Since these deposits absorb UV radiation, they should be removed at regular intervals.

IMPORTANT!

The protective tubes should be cleaned at the latest when the sensor signal drops below the warning threshold provided this is not due to other reasons such as lamp ageing or substantial deterioration in UV transmission.

In many UV systems, it is sufficient to clean the lamp protective tubes once a year as part of the lamp replacement procedure. More frequent cleaning – also daily – will be required if the system is operated with dirty water.
All protective tubes in multi-lamp systems must be cleaned.
The lamp protective tubes can be cleaned in installed position with the manual wiper or by hand when removed or by filling the radiation chamber with a cleaning solution. Acids are particularly suitable for cleaning purposes such as diluted phosphoric acid, citric acid or diluted nitric acid.

CAUTION!

- **Do not use acids that cause corrosion or stress corrosion cracking as hydrochloric acid!**
- **Observe the safety datasheet of the selected cleaning agent!**
- **Wear the necessary protective clothing when cleaning the system (safety goggles, protective gloves ...)!**
- **Make sure that no cleaning solution enters the lamp protective tubes!**
- **Take particular care when cleaning UV systems to ensure that no cleaning solution enters the piping system! This requirement applies particularly to drinking water disinfection and similar applications.**

NOTE!

Dispose of the used cleaning solution in accordance with valid guidelines and regulations!

7.1.1 Cleaning with Manual Wiper

CAUTION!

- **Firmly hold the knob after releasing the fixing bush!**
  The water pressure in the radiation chamber presses the wiper rod with a certain force in the direction of the system operator!
- **Take particular care during this work to ensure that the extended wiper rod is not bent!**

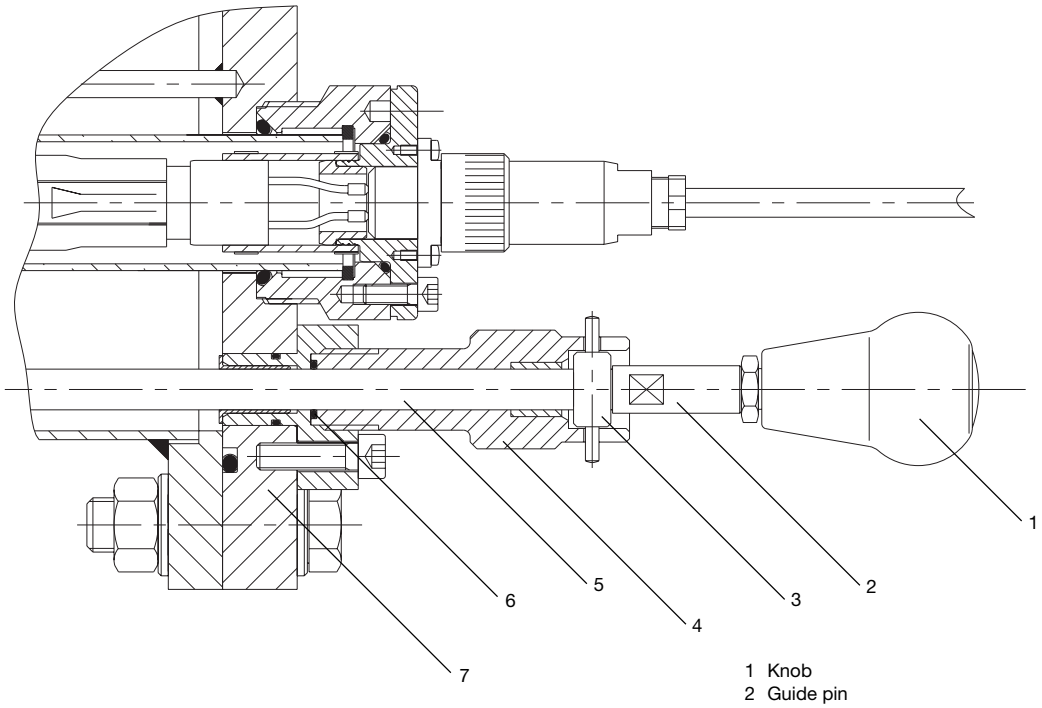


Fig. 7: Parts of the manual wiper at the chamber cover

1 Knob
2 Guide pin
3 Fixing bush
4 Clamping screw
5 Wiper rod
6 O-ring
7 Chamber cover

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Hold the knob to prevent it shooting towards the rear
➤ Release the fixing bush out of the lock of the clamping screw
➤ Pull or slide the wiper rod as far as it will go out of the radiation chamber

ATTENTION!

The seal of the wiper rod may be easily damaged!
Make sure the surface of the wiper rod is clean before reinserting it in the radiation chamber!

➤ Slide the wiper rod completely into the radiation chamber. Repeat this procedure several times
➤ Check that the control indicates an adequate level of lamp output
➤ Slide the wiper rod completely into the radiation chamber
➤ Lock the fixing bush in the clamping screw
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)

CAUTION!

With operating pressure applied, an unsecured wiper rod can shoot out of the radiation chamber and cause personal injury!
Therefore, always lock the wiper rod with the fixing bush!

➤ Use clean water to flush the loosened dirt from the radiation chamber (flushing connections)
➤ Connect the radiation chamber hydraulically to the overall system (shut-off valves)

7.1.2 Cleaning After Removing the Lamp Protective Tubes

WARNING!

- **Switch off the master switch or disconnect the power plug before installation and connecting the UV lamps!**
- **Place the UV lamps into operation only in their installed state!**
  UV-C radiation is harmful to the eyes and skin!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!

ATTENTION!

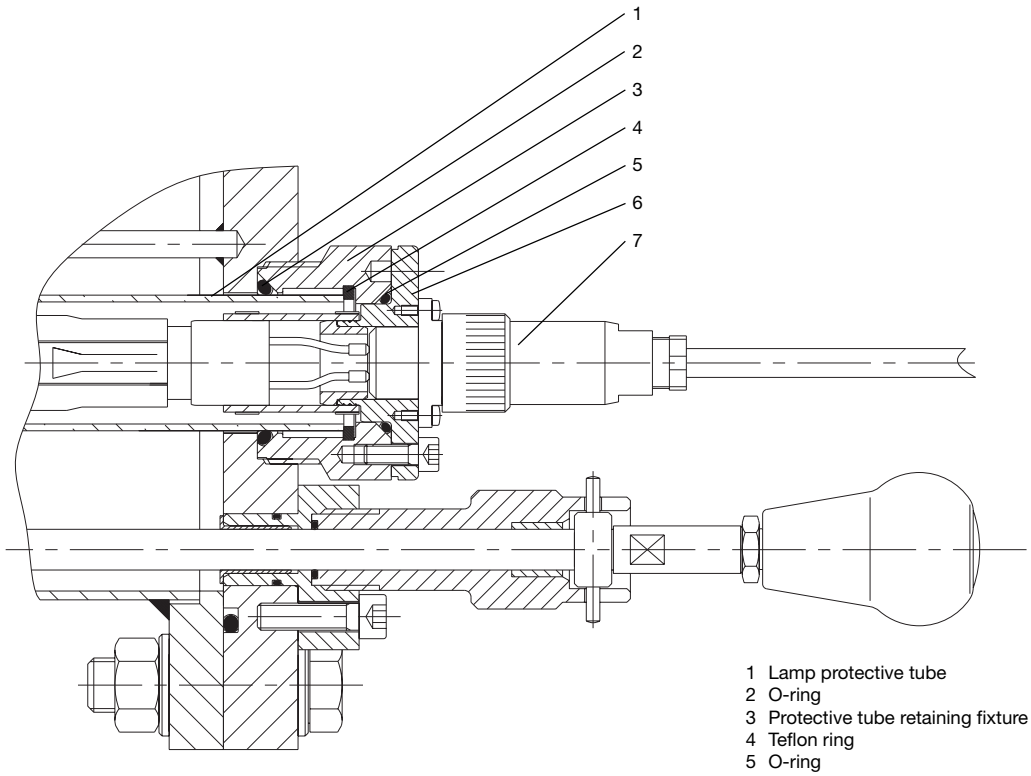
- **Take particular care during this work to ensure that the extended wiper rod is not bent!**
- **Touch the glass of the UV lamps only wearing clean cotton gloves!**
  Fingerprints burn into the glass and can cause premature failure.
  Before fitting the lamps, remove fingerprints with a cloth moistened with alcohol!

➤ Close the shut-off valves upstream and downstream of the radiation chamber

➤ Switch off the UV disinfection system with the START/STOP key;

➤ Switch off the master switch or disconnect the power plug

➤ Discharge the radiation chamber



1 Lamp protective tube
2 O-ring
3 Protective tube retaining fixture
4 Teflon ring
5 O-ring
6 Lamp cover
7 Circular plug

Fig. 8: Sectional view of lamp connection

➤ Release the circular plug on the lamp cover by turning the knurled nut and disconnect
➤ Use an Allen key to release the securing screws of the lamp cover, lift lamp cover and pull out the lamp by approx. 100 mm
➤ Disconnect connection plug with lamp cover from the lamp
➤ Completely pull out the lamp and place to one side

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction) (see Fig. 6)
➤ Release the fixing bush out of the lock of the clamping screw
➤ Pull the wiper rod as far as it will go – it must remain against the stop until it is inserted again!
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)
➤ Use a pin-type face spanner to loosen the protective tube retaining fixture and remove (place spanner in the holes – not against the threads!)
➤ Carefully pull the protective tube completely out of the radiation chamber and keep in a suitable, clean place
➤ Remove the O-ring from the lamp protective tube
➤ Wipe the protective tube clean with cleaning solution or immerse in cleaning solution until the coating is completely removed
➤ Rinse protective tube with clear water and dry with a soft cloth
➤ Carefully slide the lamp protective tube as far as it will go into the radiation chamber
➤ Fit a new O-ring onto the end of the lamp protective tube – the sealing surfaces of the O-ring must be smooth and clean!

ATTENTION!

- **Before installing, check the lamp protective tube for damage!**
  A damaged protective tube must not be reinstalled.
- **Make sure the protective tube is fitted correctly!**
  The lamp protective tube may protrude by a maximum of 40 mm and exhibit no angle offset!

➤ Secure protective tube retaining fixture in the chamber cover and firmly tighten (place spanner in the holes – not against the threads!)

ATTENTION!

The seal of the wiper rod may be easily damaged!
Make sure the surface of the wiper rod is clean before reinserting it in the radiation chamber!

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Slide the wiper rod completely into the radiation chamber
➤ Lock the fixing bush in the clamping screw
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)

CAUTION!

With operating pressure applied, an unsecured wiper rod can shoot out of the radiation chamber and cause personal injury!
Therefore, always lock the wiper rod with the fixing bush!

➤ Check to ensure that the O-ring on the retaining fixture for the lamp protective tube is fitted in the groove provided for this purpose – the sealing surfaces of the O-ring must be completely smooth and clean!

ATTENTION!

When fitting the UV lamps, turn them such that the two connected cables face away from the UV sensor!
Otherwise a lower radiation output will be measured!

IMPORTANT!

With the system shut down, plug the connector together with the lamp cover onto the lamp before inserting the lamp in the protective tube.

➤ Insert the lamp in the protective tube and leave protruding by approx. 100 mm
➤ Connect plug together with lamp cover to the lamp
➤ Completely insert the lamp in the protective tube.
➤ Place the lamp cover on the retaining fixture for the protective tube and fit the mounting screws using the Allen key provided and firmly tighten.
➤ Connect the circular plug with the lamp connection cable to the socket on the lamp cover and secure with the knurled nut.
➤ Switch on the master switch or connect the power plug
➤ Switch off the UV system with the START/STOP key;
➤ Slowly open the shut-off valve upstream of radiation chamber
➤ Open the shut-off valve downstream of the radiation chamber (required only for manual shut-off valve)

The UV-C sensor should also be cleaned every time the lamp protective tubes are cleaned (see Section 7.1.4)!

7.1.3 Cleaning with Cleaning Solution

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

➤ Switch on UV system with the START/STOP key
➤ Switch off master switch or disconnect power plug
➤ Close shut-off valves upstream and downstream of the radiation chamber
➤ Open water drain plug and vent screw and remove
➤ Discharge radiation chamber
➤ Reinstall water drain plug and tighten; only very little force is required for this purpose
➤ Fill the radiation chamber with cleaning solution via the vent opening
➤ Allow the cleaning solution to soak in for at least 20 minutes
➤ Open water drain plug and remove
➤ Discharge (empty) radiation chamber and dispose of cleaning solution according to requirements
➤ Thoroughly flush radiation chamber with clean water until all remains of the cleaning solution are removed
➤ Screw in water drain plug and tighten; only very little force is required for this purpose
➤ Slowly open shut-off valve upstream of radiation chamber
➤ Fill radiation chamber until water emerges from the vent screw

ATTENTION!

Use the clamping screw of the manual wiper if system is wall-mounted vertically!

➤ Close vent screw; only very little force is required for this purpose
➤ Open shut-off valve downstream of radiation chamber
(only necessary for manual shut-off valve)
➤ Check radiation chamber for leaks
➤ Switch on master switch or connect power plug

The UV system is now ready for operation.

IMPORTANT!

- **For radiation chambers that are regularly cleaned by filling with a cleaning solution, it is recommended to replace the water drain screw and vent screw by suitable valves.**
- **It is advisable to use a suitable acid-resistant pump to fill larger radiation chambers via the water drain opening.**
- **If the radiation chamber is filled using a pump, it is advisable to circulate the cleaning solution via the vent opening. This will shorten the cleaning time and improve the results.**
- **The cleaning solution can be reused several times if it is collected and stored in a suitable container.**

7.1.4 Cleaning the UV-C Sensor

➤ Disconnect sensor connection cable from UV-C sensor
➤ Unscrew UV-C sensor out of radiation chamber
➤ Clean quartz window with a rag soaked in cleaning solution until the coating is completely removed
➤ Rinse quartz window with clear water and dry with a soft cloth
➤ Check O-ring for damage. Replace damaged seal
➤ Reinstall UV-C sensor and firmly tighten; only slight pressure is required for this purpose
➤ Connect sensor cable to UV-C sensor
➤ Slowly open shut-off valve upstream of radiation chamber
➤ Fill radiation chamber until water emerges from the vent screw

ATTENTION!

Use the clamping screw of the manual wiper if system is wall-mounted vertically!

➤ Close vent screw; only very little force is required for this purpose
➤ Open shut-off valve downstream of radiation chamber
(necessary only for manual shut-off valve)
➤ Check radiation chamber for leaks
➤ Switch on master switch or connect power plug

The UV system is now ready for operation.

7.2 Replacing Wiper Elements

WARNING!

- **Switch off the master switch or disconnect the power plug before installation and connecting the UV lamps!**
- **Place the UV lamps into operation only in their installed state!**
  UV-C radiation is harmful to the eyes and skin!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!

ATTENTION!

- **Take particular care during this work to ensure that the extended wiper rod is not bent!**
- **Touch the glass of the UV lamps only wearing clean cotton gloves!**
  Fingerprints burn into the glass and can cause premature failure.
  Before fitting the lamps, remove fingerprints with a cloth moistened with alcohol!

➤ Close the shut-off valves upstream and downstream of the radiation chamber
➤ Switch off the UV system with the START/STOP key;
➤ Switch off the master switch or disconnect the power plug
➤ Discharge the radiation chamber

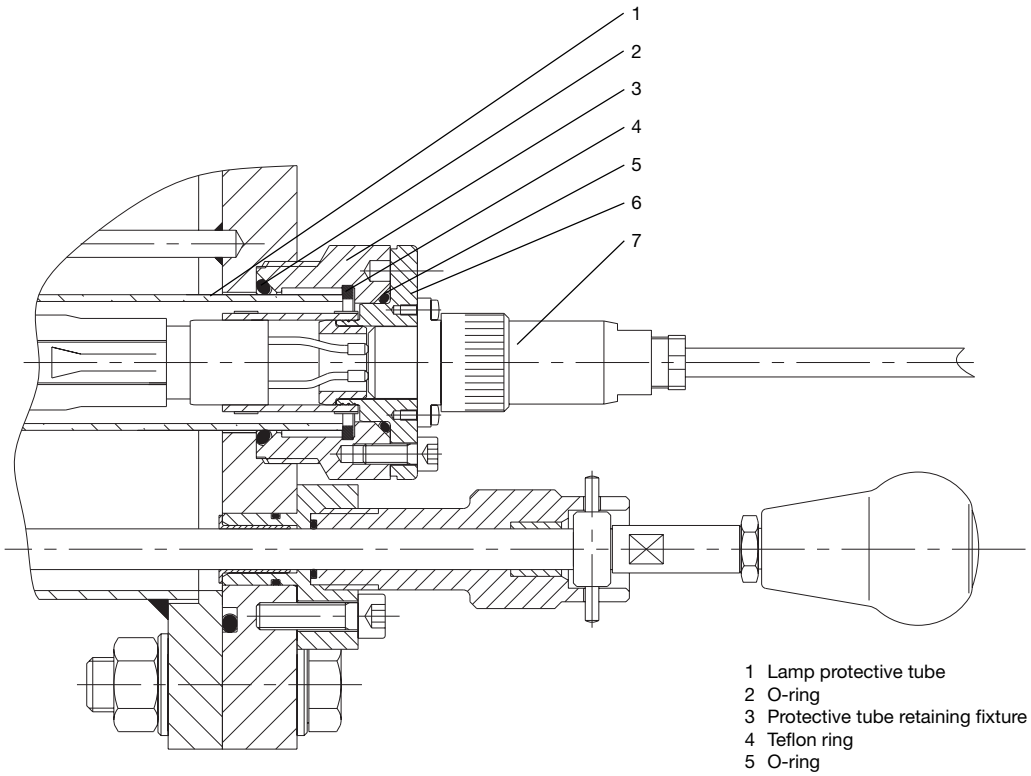


Fig. 9: Sectional view of lamp connection

➤ Release the circular plug on the lamp cover by turning the knurled nut and disconnect
➤ Use the supplied Allen key to undo the mounting screws holding the lamp cover, lift lamp cover and pull out the lamp by approx. 100 mm
➤ Disconnect connection plug with lamp cover from the lamp
➤ Completely pull out the lamp and place to one side

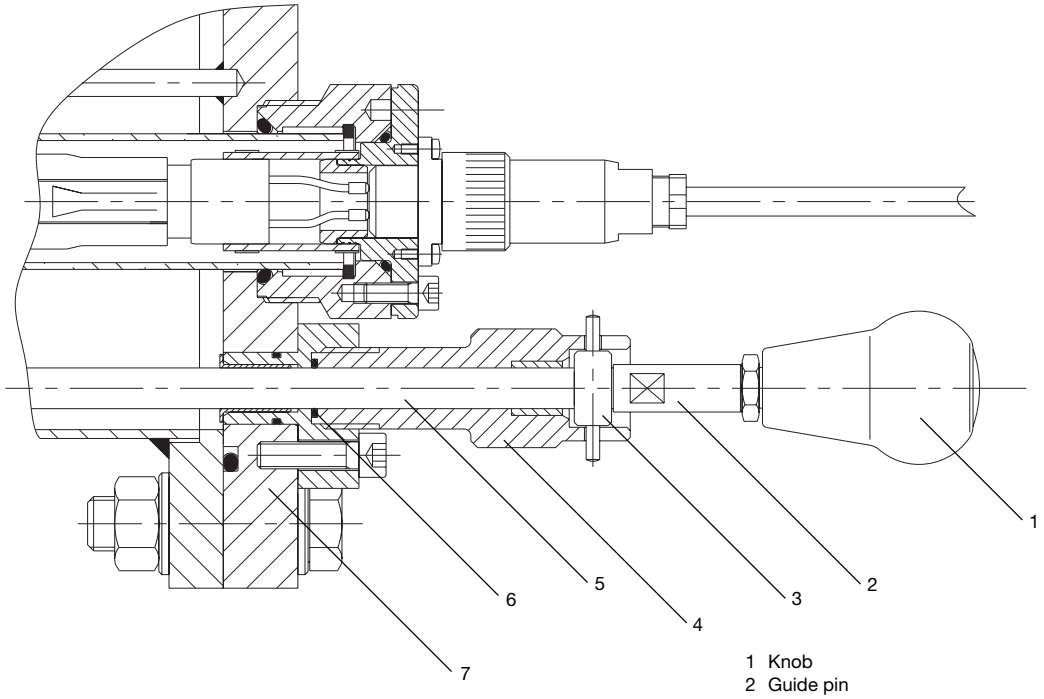


Fig. 10: Parts of the manual wiper at the chamber cover

1 Knob
2 Guide pin
3 Fixing bush
4 Clamping screw
5 Wiper rod
6 O-ring
7 Chamber cover

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Release the fixing bush out of the lock of the clamping screw
➤ Pull the wiper rod as far as it will go – it must remain against the stop until it is inserted again!
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)
➤ Use a pin-type face spanner to loosen the protective tube retaining fixture and remove (place spanner in the holes – not against the threads!)
➤ Carefully pull the protective tube completely out of the radiation chamber and keep in a suitable, clean place
➤ Remove the O-ring from the lamp protective tube
➤ Wipe the protective tube clean with cleaning solution or immerse in cleaning solution until the coating is completely removed
➤ Rinse protective tube with clear water and dry with a soft cloth
➤ Remove the screws holding the radiation chamber cover
➤ Carefully place the radiation chamber cover together with the completely extended wiper rod in an appropriate, clean place
➤ Remove one socket head cap screw at one wiper
➤ Remove the old wiper element to the side
➤ Fit the new wiper element from the side – the wiper lip must face away from the radiation chamber cover (see Details in Section 5, Fig. 2)
➤ Fit the socket head cap screw with the socket in the wiper and tighten

ATTENTION!

Although the socket head cap screw has been tightened, the wiper element must be loose in the wiper!
If this is not the case, rectify the cause or use another wiper element!

➤ Replace the other wiper elements as described
➤ Fit a new O-ring on the radiation chamber cover
➤ Carefully insert the radiation chamber cover together with wiper rod, still fully extended, in the radiation chamber – the wiper rod must fit in its mount on the radiation chamber cover and remain in this position until the lamp protective tube is fitted.
➤ Firmly secure the cover to the radiation chamber such that it makes a tight seal
➤ Carefully slide the lamp protective tube as far as it will go into the radiation chamber
➤ Fit a new O-ring onto the end of the lamp protective tube – the sealing surfaces of the O-ring must be completely smooth and clean!

ATTENTION!

- **Before installing, check the lamp protective tube for damage!**
  A damaged protective tube must not be reinstalled.
- **Make sure the protective tube is fitted correctly!**
  The lamp protective tube may protrude by a maximum of 40 mm and exhibit no angle offset!

➤ Secure protective tube retaining fixture in the chamber cover and firmly tighten (place spanner in the holes – not against the threads!)

ATTENTION!

The seal of the wiper rod may be easily damaged!
Make sure the surface of the wiper rod is clean before reinserting it in the radiation chamber!

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Slide the wiper rod completely into the radiation chamber
➤ Lock the fixing bush in the clamping screw
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)

CAUTION!

With operating pressure applied, an unsecured wiper rod can shoot out of the radiation chamber and cause personal injury!
Therefore, always lock the wiper rod with the fixing bush!

➤ Check to ensure that the O-ring on the retaining fixture for the lamp protective tube is fitted in the groove provided for this purpose – the sealing surfaces of the O-ring must be completely smooth and clean!

ATTENTION!

When fitting the UV lamps, turn them such that the two connected cables face away from the UV sensor!
Otherwise a lower radiation output will be measured!

IMPORTANT!

With the system shut down, plug the connector together with the lamp cover onto the lamp before inserting the lamp in the protective tube.

➤ Insert the lamp in the protective tube and leave protruding by approx. 100 mm
➤ Connect plug together with lamp cover to the lamp
➤ Completely insert the lamp in the protective tube.
➤ Place the lamp cover on the retaining fixture for the protective tube and fit the mounting screws using the Allen key provided and firmly tighten.
➤ Connect the circular plug with the lamp connection cable to the socket on the lamp cover and secure with the knurled nut.
➤ Switch on the master switch or connect the power plug
➤ Switch off the UV system with the START/STOP key;
➤ Slowly open the shut-off valve upstream of radiation chamber
➤ Open the shut-off valve downstream of the radiation chamber (required only for manual shut-off valve)

7.3 Replacing O-Ring on Clamping Screw

Maintenance interval: 1 year

CAUTION!

- **Take particular care during this work to ensure that the extended wiper rod is not bent!**
- **Depressurise the radiation chamber!**

➤ Slacken off the clamping screw a little (approx. 1/4 turn in counterclockwise direction)
➤ Release the fixing bush out of the lock of the clamping screw
➤ Completely pull out the wiper rod
➤ Use a WAF 11 open-ended spanner to unscrew the knob from the wiper rod
➤ Slide the wiper rod approx. 150 mm into the radiation chamber
➤ Remove clamping screw
➤ Completely pull the wiper rod towards the outside – together with the O-ring

➤ Clean the wiper rod if necessary
➤ Replace the O-ring
➤ Reinstall clamping screw but do not tighten
➤ Use a WAF 11 open-ended spanner to secure the knob (with fixing bush) onto the wiper rod

ATTENTION!

The seal of the wiper rod may be easily damaged!
Make sure the surface of the wiper rod is clean before reinserting it in the radiation chamber!

➤ Slide the wiper rod completely into the radiation chamber
➤ Lock the fixing bush in the clamping screw
➤ Lightly tighten the clamping screw by hand (approx. 1/4 turn in clockwise direction)

IMPORTANT!

Hand-tighten the clamping screw at the wiper rod only to such an extent that there are only just no water leaks under operating pressure.

CAUTION!

With operating pressure applied, an unsecured wiper rod can shoot out of the radiation chamber and cause personal injury!
Therefore, always lock the wiper rod with the fixing bush!

7.4 Changing UV Lamps

WARNING!

- **Switch off the master switch or disconnect the power plug before installation and connecting the UV lamps!**
- **UV-C radiation is harmful to the eyes and skin!**
  Place the UV lamps into operation only in their installed state!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!
- **Do not change/modify the lamp connection cables already fitted!**
- **Do not change/modify the distance between the connector and lamp cover!**
  Otherwise it will not be possible to ensure that the lamp rests against the closed end of the protective tube. This position, however, is the prerequisite for safe and reliable disinfection!
- **The UV lamps should be renewed at the latest when**
  - **the sensor signal approaches the safety threshold provided there are no other causes such as coating formed on the lamp protective tubes or a substantial deterioration in UV transmission;**
  - **the operating period of the lamps approaches or exceeds the maximum useful life of the lamps.**
- **Switch off the master switch or disconnect the power plug before installation and connecting the UV lamps!**
- **Place the UV lamps into operation only in their installed state!**
  UV-C radiation is harmful to the eyes and skin!
  Install the UV system in accordance with regulations and instructions before starting up the UV lamps!

ATTENTION!

- **Touch the glass of the UV lamps only wearing clean cotton gloves!**
  Fingerprints burn into the glass and can cause premature failure.
  Before fitting the lamps, remove fingerprints with a cloth moistened with alcohol!

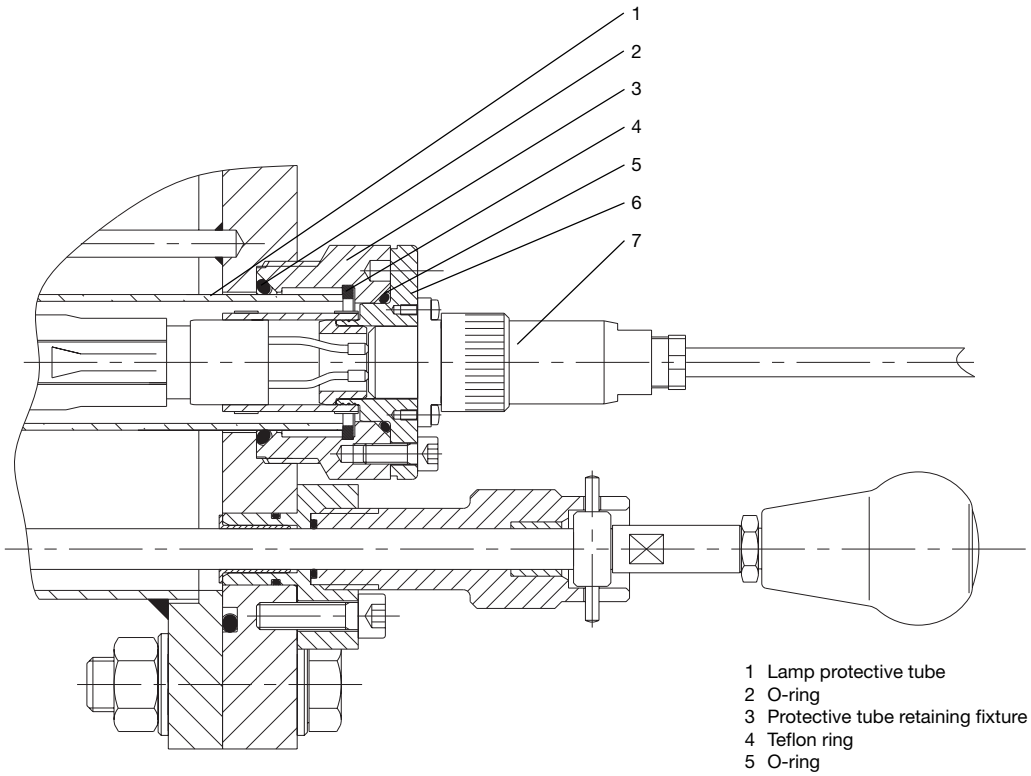
NOTE!

- **Clean the protective tubes every time the UV lamps are replaced!**
- **Dispose of the used lamps corresponding to the applicable guidelines and regulations. In most cases, they are disposed of together with used fluorescent tubes.**

INFORMATION FOR MULTI-LAMP SYSTEMS

- **All UV lamps must be replaced when changing the lamps at the end of their maximum useful life.**
- **All UV lamps must be replaced when changing the lamps due to ageing.**
- **Only new UV lamps should be used to replace defective lamps.**
- **If only a defective UV lamp is replaced in the event of lamp failure, the new lamp should always be fitted in the protective tube located furthest away from the measuring position of the UV-C sensor.**
- **All UV lamps must be replaced in the event of lamp failure towards the end of their maximum useful life.**

➤ Close the shut-off valves upstream and downstream of the radiation chamber
➤ Switch off the UV system with the START/STOP key
➤ Switch off the master switch or disconnect the power plug



1 Lamp protective tube
2 O-ring
3 Protective tube retaining fixture
4 Teflon ring
5 O-ring
6 Lamp cover
7 Circular plug

Fig. 11: Sectional view of lamp connection

➤ Release the circular plug on the lamp cover by turning the knurled nut and disconnect
➤ Use an Allen key to release the securing screws of the lamp cover, lift lamp cover and pull out the lamp by approx. 100 mm
➤ Disconnect connection plug with lamp cover from the lamp
➤ Completely pull out the lamp and place to one side
➤ Check to ensure that the O-ring on the retaining fixture for the lamp protective tube is fitted in the groove provided for this purpose – the sealing surfaces of the O-ring must be completely smooth and clean!

ATTENTION!

When fitting the UV lamps, turn them such that the two connected cables face away from the UV sensor!
Otherwise a lower radiation output will be measured!

IMPORTANT!

With the system shut down, plug the connector together with the lamp cover onto the lamp before inserting the lamp in the protective tube.

➤ Insert the lamp in the protective tube and leave protruding by approx. 100 mm
➤ Connect plug together with lamp cover to the lamp
➤ Completely insert the lamp in the protective tube.
➤ Place the lamp cover on the retaining fixture for the protective tube and fit the mounting screws using the Allen key provided and firmly tighten.
➤ Connect the circular plug with the lamp connection cable to the socket on the lamp cover and secure with the knurled nut.
➤ Switch on the master switch or connect the power plug
➤ Switch off the UV disinfection system with the START/STOP key;
➤ Slowly open the shut-off valve upstream of radiation chamber
➤ Open the shut-off valve downstream of the radiation chamber (required only for manual shut-off valve)

WARNING!

After changing a UV lamp, check the safety and warning threshold and readjust if necessary!

Adequate disinfection is ensured only when the safety threshold is set correctly.

Reset lamp operating hours and switching operations

➤ With the system switched off press the CHANGE key to display the lamp operating hours and switching operations
➤ Confirm by pressing the ENTER key – “Enable Code Query” appears in the display
➤ Enter the enable code and confirm by pressing the ENTER key – “Reset” appears in the display
➤ Confirm by pressing the ENTER key – the display is now reset

7.5 Calibrating UV-C Sensor

The UV-C sensor is calibrated at the factory and does not need recalibration.

IMPORTANT!

- **Observe the supplementary instructions for special applications, in which the sensor signal is displayed in %.**
- **All new UV lamps require a burn-in period of 100 to 200 hours. Therefore, check the safety threshold and the warning threshold approximately 200 operating hours after replacing the UV lamps.**

7.6 Replacing Filter Mats

Replacing the filter mats of the fan and air outlet filter

WARNING!

Soiled filter mats of the fan and of the air outlet filter can cause overheating and irreparable damage to the control cabinet.

The filter mats of the fan and of the air outlet filter should be replaced at least once per year. The filter mats should be replaced at shorter intervals under unfavourable ambient conditions.

➤ Switch off UV system with the START/STOP key
➤ Switch off master switch
➤ Remove fan cover. For this purpose, grab the cover with the fingers in the bottom grip recesses and pull off the cover.
➤ Remove soiled filter mat and fit new filter mat with the white side facing inward (control cabinet side).
➤ Replace filter mat of the air outlet filter as described above.
➤ Switch on master switch

7.7 Troubleshooting

CAUTION!

- **Only authorised electricians are permitted to perform troubleshooting operations on the opened control cabinet and replace components!**

↓ **55.0 W/m²**
10 h Operation
20 ON/OFF

Warning threshold undershot
Indication: Arrow pointing down

↓ ↓ **40.0 W/m²**
Clear flushing
Time 00:11 ■ ■

Safety threshold undershot
Indication: Two flashing arrows pointing down
The remaining clear flushing time is shown
(2 squares flash instead of the seconds)

Fault
UV sensor

Fault: Safety threshold undershot (after maximum clear flushing time has elapsed)
Error message: UV sensor

➤ Confirm error message with ENTER key
➤ Press CHANGE key to assume emergency mode (see 4.3.20)

Emergency mode
UV sensor

Emergency mode: Safety threshold undershot

➤ System continues operating in emergency mode

Possible cause Coating on lamp protective tube
Remedy ➤ Clean lamp protective tube
Possible cause Deterioration of UV transmission of water to be treated
Remedy ➤ Improve water quality
Possible cause UV lamp at end of useful life
Remedy ➤ Install new UV lamps
Possible cause Incorrect lamp current
Remedy ➤ Operate with standard current
Possible cause Sensor not calibrated correctly
Remedy ➤ Recalibrate sensor

Fault
xx lamps defective
Lamp #xx

Fault: Lamp failed
Error message: xx lamp defective

➤ Confirm error message with ENTER key
➤ Press CHANGE key to assume emergency mode (see 4.3.20)

Emergency mode
xx lamps defective
Lamp #xx

Emergency mode: Lamp failed

➤ System continues operating in emergency mode

Possible cause Lamp xx defective
Remedy ➤ Install new UV lamps
Possible cause Incorrect lamp current
Remedy ➤ Operate with standard current
Possible cause Ballast defective
Remedy ➤ Replace ballast

IMPORTANT!

- **The number of failed UV lamps is indicated.**
- **If more than one UV lamp has failed, the individual lamps can be queried by pressing the UP and DOWN key.**

Fault

Other fault

Error message: Other fault

➤ Confirm error message with ENTER key

Possible cause External fault signalling device triggered
Remedy ➤ Rectify external cause of fault
Possible cause No external fault signalling device connected and no jumper is connected across the contacts at the fault input
Remedy ➤ Connect jumper across contact at fault input

Fault

Mains voltage too low

Error message: Mains voltage too low

Cause The supplied voltage is or was lower than the minimum permissible supply voltage
Remedy ➤ Check supply voltage

Fault

Bus fault

Error message: Bus fault

Possible cause Bus connection interrupted
Remedy ➤ Re-establish bus connection (see “Function and Fault Indicators on Ballast Units”)
Possible cause Power supply not sufficient on one or several ballasts
Remedy ➤ Check power supply or fine fuse in ballast (only by authorised electrician!)
Possible cause Ballast defective
Remedy ➤ Replace ballast (only by authorised electrician!)

Fault

Memory error

Error message: Memory error

Cause The control determined an error in the memory as part of the self-test
Remedy ➤ Replace control unit (only by authorised electrician!)

Fault

Basic setting

Error message: Basic setting

Cause The control determined an error as part of the self-test
Remedy ➤ Replace control unit (only by authorised electrician!)

Fault

Lamp current

Error message: Lamp current

Cause Lamp current set outside the permissible limits
Remedy ➤ Set lamp current within permissible limits (see datasheet)

Function and Fault Indicators on Ballast Units

The three red LEDs on the ballasts serve the purpose of checking function and troubleshooting. All three LEDs light up for approx. 1 second when the supply voltage is applied.

LED “Power Supply” (identification on pc-board “Power”)

ON Ballast power supply is OK

OFF Although the master switch is on and the power plug is connected
➤ Check power supply (only by authorised electrician!)
➤ Check fine fuse

LED “Lamp” (identification on pc-board “Error”)

Flashes for approx. 1 to 15 sec Lamp electrodes are preheated before ignition

ON UV lamp inoperative
The LED goes out by switching the power supply off and on again and comes on again after a renewed ignition attempt
➤ Check lamps

LED “Bus” (identification on pc-board “Tx”)

Lights up every 0.1 to 3 sec The ballast is addressed by the control.

Does not light up Although the system is switched on:
The bus connection to the ballast is interrupted or the ballast is defective

IMPORTANT!

Since the data bus is designed as a bus with ring structure, the ballasts following a defective ballast or interrupted data line can no longer be addressed.

8 Technical Data

ATTENTION!

These technical data supplement the supplied datasheet!
In the case of doubt, the data specified on the datasheet shall apply!

8.1 Performance Data

Type	Number of lamps	Lamp output (kW)	Connected load (kW)	Minimum clearance for lamp change (mm)	Empty weight / operating weight of radiation chamber (kg)	Max. flow rate (98 %/cm transm., 400 J/m²) (m³/h)	Nominal connection diameter
1*300R	1	0.3	0.32	3000	45 / 67	30	DN 80
2*300R	2	0.6	0.65	3070	75 / 134	95	DN 150
3*300R	3	0.9	1.0	3075	90 / 182	179	DN 200
4*300R	4	1.2	1.3	3089	120 / 253	274	DN 250

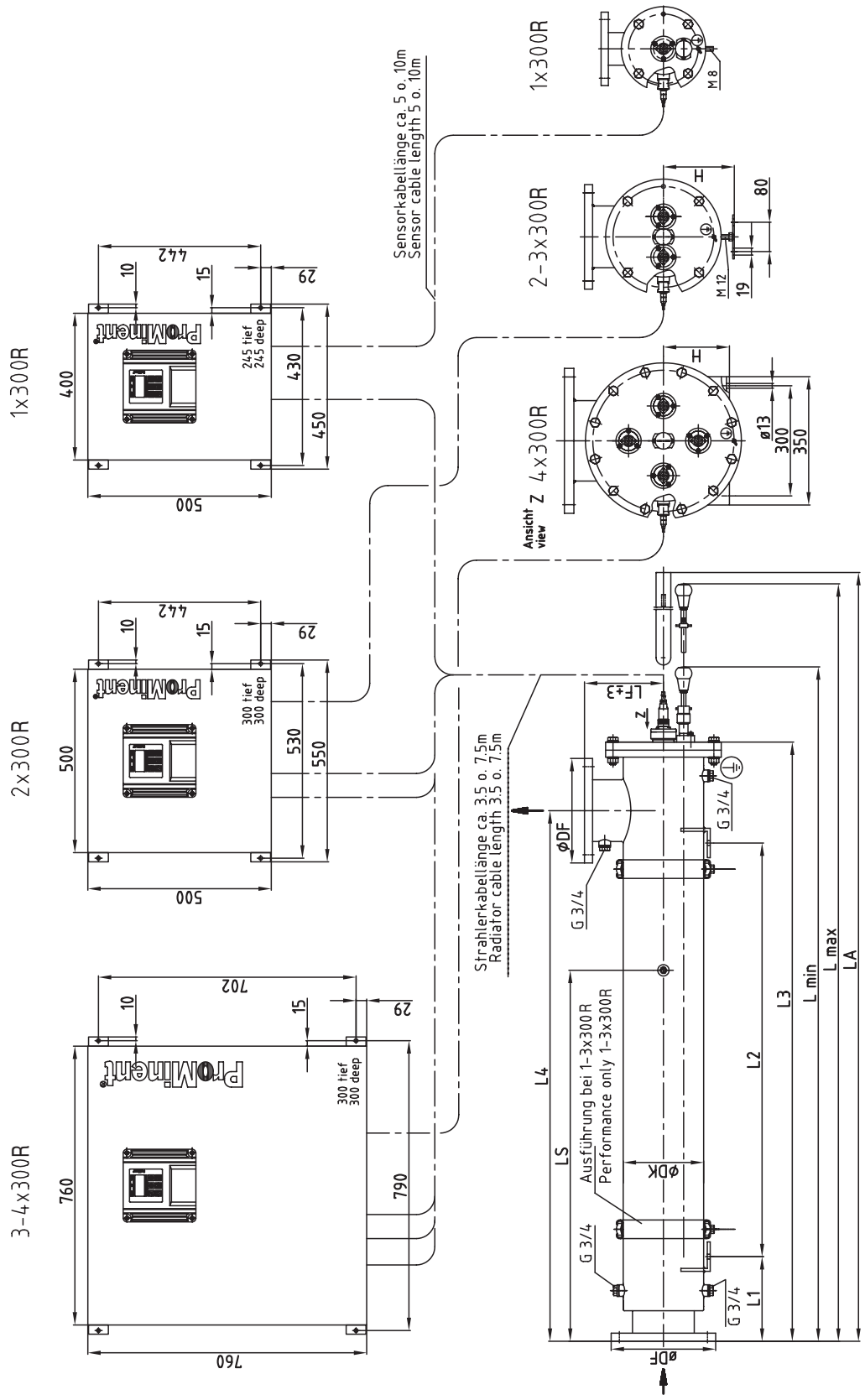
Permissible operating temperatures:
- Water temperature: 5 ... 40 °C
- Ambient temperature: 5 ... 40 °C

Requirements relating to water to be treated:
- Maximum temperature: 40 °C
- Maximum operating pressure: 10 bar*)
- No corrosive or abrasive properties, chloride level < 250 ppm
- No propensity to precipitation

ATTENTION! *)

The maximum permissible operating pressure may be lower in special-application systems!

8.2 Dimensions



Dimensions – Dulcodes R (in mm)

Type	L1	L2	L3	L4	LS	Lmin	Lmax	LA	LF	H	DF	DK	Flange	Volume (l)
1*300R	-	-	1562	1450	940	1767	2370	3000	180	-	200	139.7	DN 80x88.9	22
2*300R	-	-	1633	1446	1011	1838	2441	3070	215	193	285	219.1	DN 150x168.3	59
3*300R	-	-	1638	1431	1016	1843	2446	3075	250	220	340	273	DN 200x219.1	92
4*300R	261	1154	1652	1415	1030	1857	2460	3089	280	180	395	329.9	DN 250x273	133

8.3 Electrical Data

Radiation chamber

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

Control

Nominal voltage: 230 V AC, 50/60 Hz

Fuses: Fine fuse 5 x 20 mm (250 V AC):
Upper fuse (control power supply):
0.16 A slow-blow, Order No. 712048
Lower fuse (switched power outputs (XR1-XR3)):
2.5 A slow-blow, Order No. 712033

NOTE

The fuses are located in fuse holders with bayonet catches on the right in the terminal box of the control system.

Control cabinet

Inputs

- Contact inputs (-X3:1 ... -X3.6):
  for contacts or switching transistors:
  No-load voltage: 5V ± 0.5 V
  Input resistance: 10 kOhm

Outputs

- Voltage outputs (-X1:1 ... -X1.10):
  Type of contact: Normally open contact
  Load capacity: 250 V AC / 3 A / 100 VA
  Provide RC protective circuits for inductive loads!

- Relay outputs (-X4:1 ... -X4.6):
  Type of contact: Normally open contact
  Load capacity: 250 V AC / 3 A / 100 VA
  Provide RC protective circuits for inductive loads!

- Alarm relays (-X4:7 ... -X4.9):
  Type of contact: Changeover contact
  Load capacity: 250 V AC / 3 A / 100 VA
  Provide RC protective circuits for inductive loads!

- Standard signal output mA (-X3:7 ... -X3.8):
  0/4...20 mA, floating
  Maximum load: 600 Ohm

Annex

Spare Part Drawings

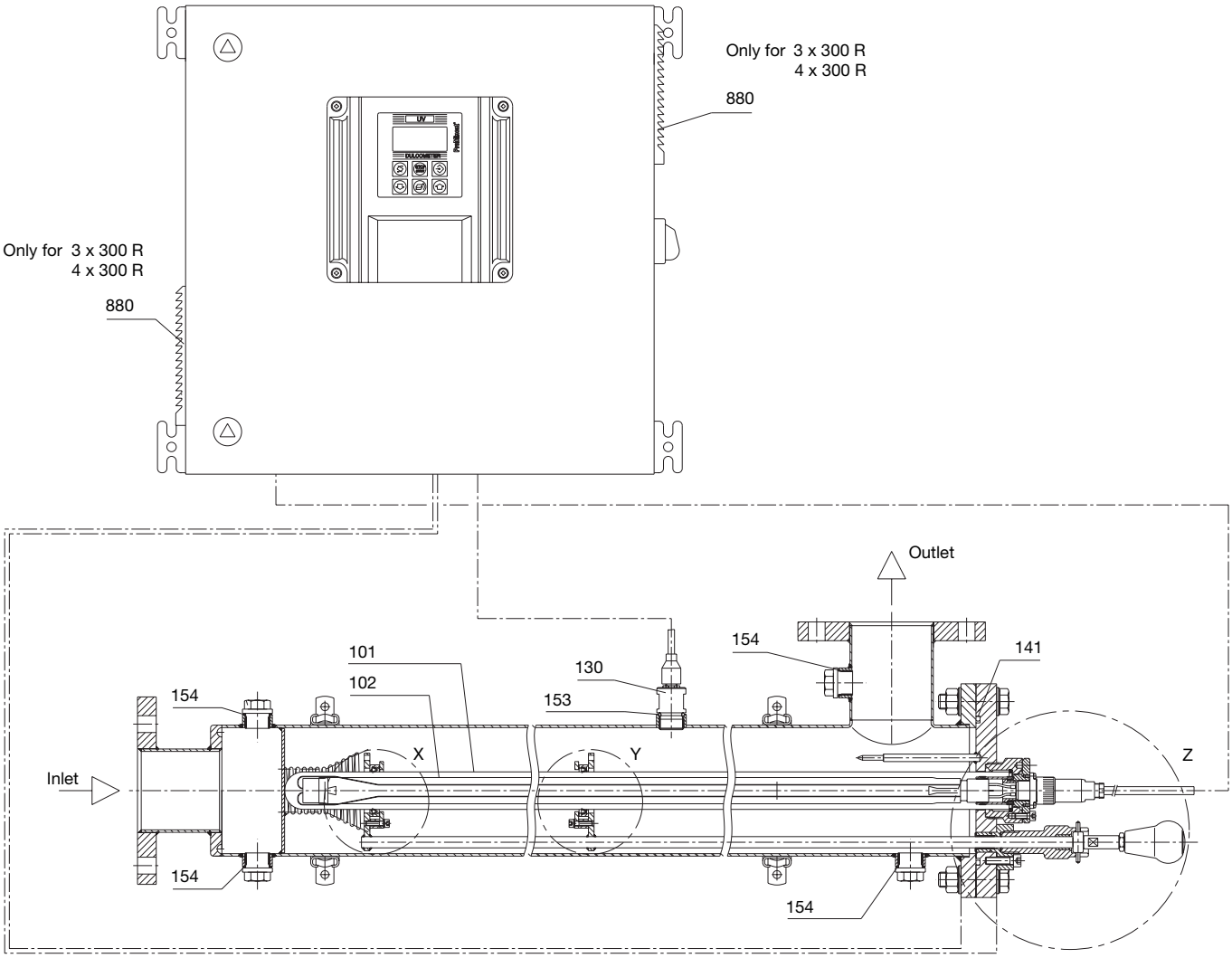


Fig. 12: Dulcodes R

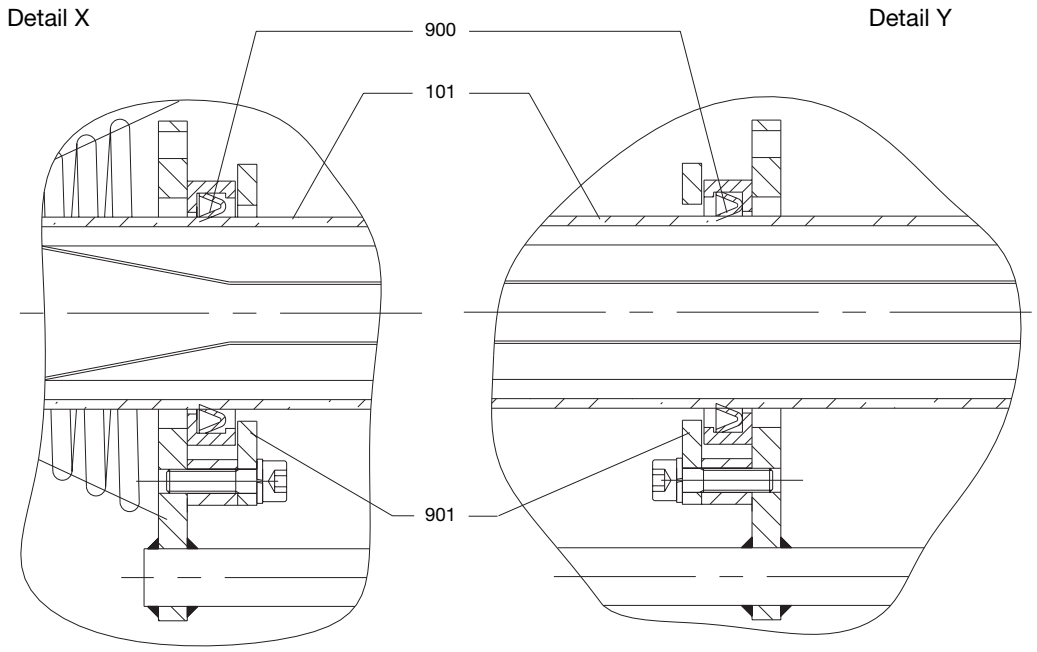


Fig. 13: Detail views of wiper (see Fig. 12)

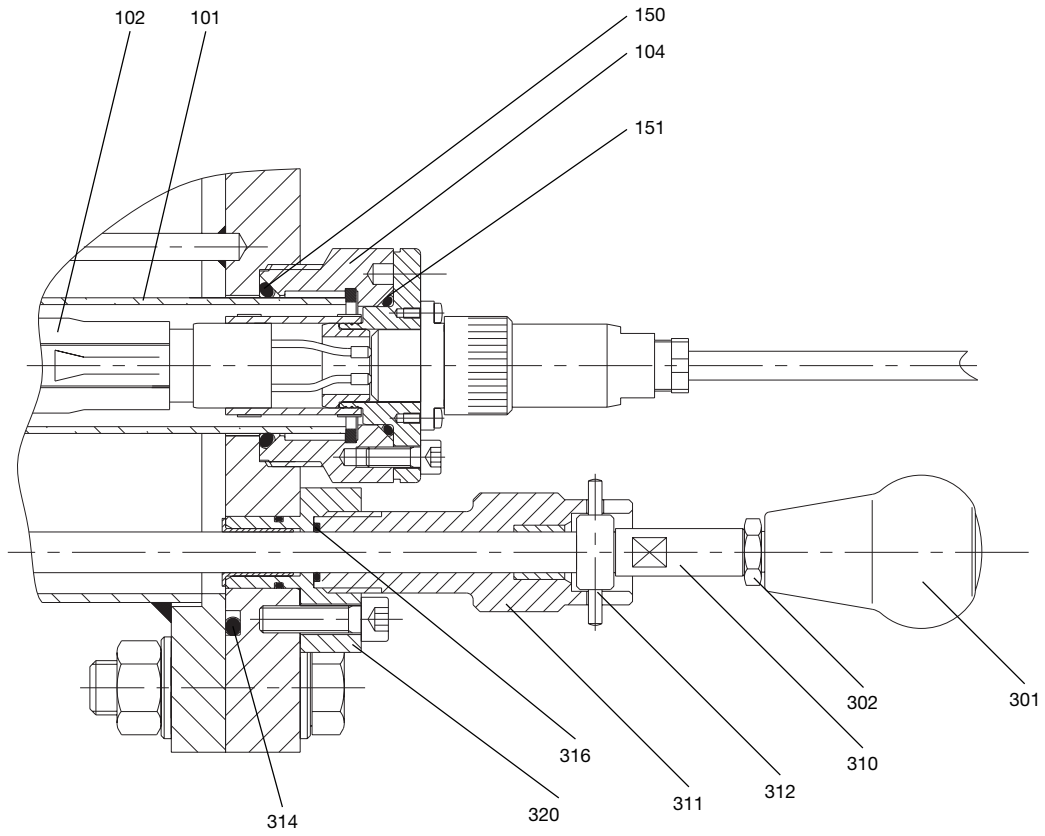
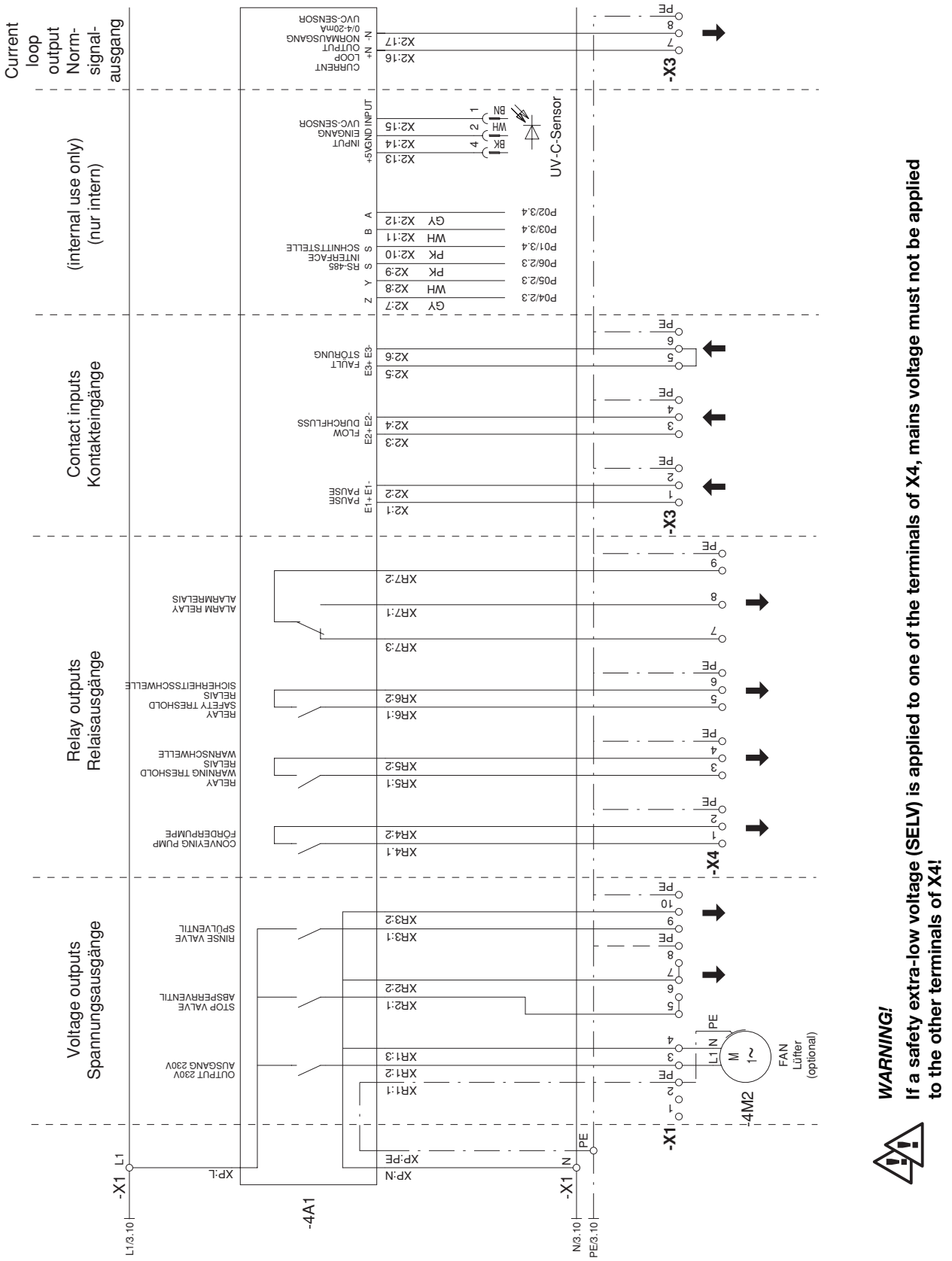


Fig. 14: Sectional view through lamp connection and manual wiper

Spare Parts List

No.	Description	Part number	Change interval	Qty.
101	Lamp protective tube d40x2x1400mmQ	1020846	As required	1
102	UV lamp 300 W	1020929	max. 12 000 h	1 - 4
104	Retaining fixture for lamp protective tube (mount d40 - G 2 - d69)	1026728	As required	1
130	UVC-U sensor P/D/W/R G 3/4	1028115	As required	1
141	O-ring 149.2 - 5.34 EPDM for 1x300 R	1027463	Every time	1
141	O-ring 234.32 - 5.33 EPDM for 2x300 R	1009036	the radiation	1
141	O-ring 291.47 - 6.99 EPDM for 3x300 R	1009037	chamber is	1
141	O-ring 342.27 - 6.99 EPDM for 4x300 R	1009038	opened	1
150	O-ring/M 40.00 - 5.00 EPDM/P	1023569	As required	1
151	O-ring 34.5 - 3.5 EPDM DN2	1009836	As required	1
153	O-ring/M 22.00 - 3.00 EPDM/P	1002175	As required	1
154	O-ring/M 25.00 - 2.00 EPDM/P for plug	792872	As required	1
301	Rotary knob GN 597-45-M1	1027877	As required	1
302	Hexagon nut DIN 439 M10	1017585	As required	1
310	Guide pin M8/M10x65 for UVR	1027931	As required	1
311	Clamping screw for wiper rod	1027975	As required	1
312	Fixing bush with pins for UVR	1027930	As required	1
314	O-ring/M 18.00 - 2.00 EPDM/P	1002279	As required	1
316	O-ring 11.91 - 2.62 EPDM	790410	1 year	1
320	Bearing flange for wiper rod	1027944	As required	1
860	Pin-type face spanner for d.14-100	409805	As required	1
880	Filter mat SK 3322/700, control cabinet ventilation	1004212	1/2 - 1 year	2
900	Wiper element for UVR	1027879	As required	2-8
901	Retaining ring d62/45x4 for UVR PTF	1028100	As required	2-8

Terminal Connection Diagram – Dulcodes R



WARNING!

If a safety extra-low voltage (SELV) is applied to one of the terminals of X4, mains voltage must not be applied to the other terminals of X4!

Operation Log for Dulcodes UV Disinfection System

No.	Date	Lamp operating hours	Lamp switching operations	Sensor signal display [W/m²]	UV transmission [%/1 cm]	Flow rate [m³/h]	Executed maintenance work	Signature