ProMinent®

Operating Instructions
for Dulcodes
Compact UV Disinfection System

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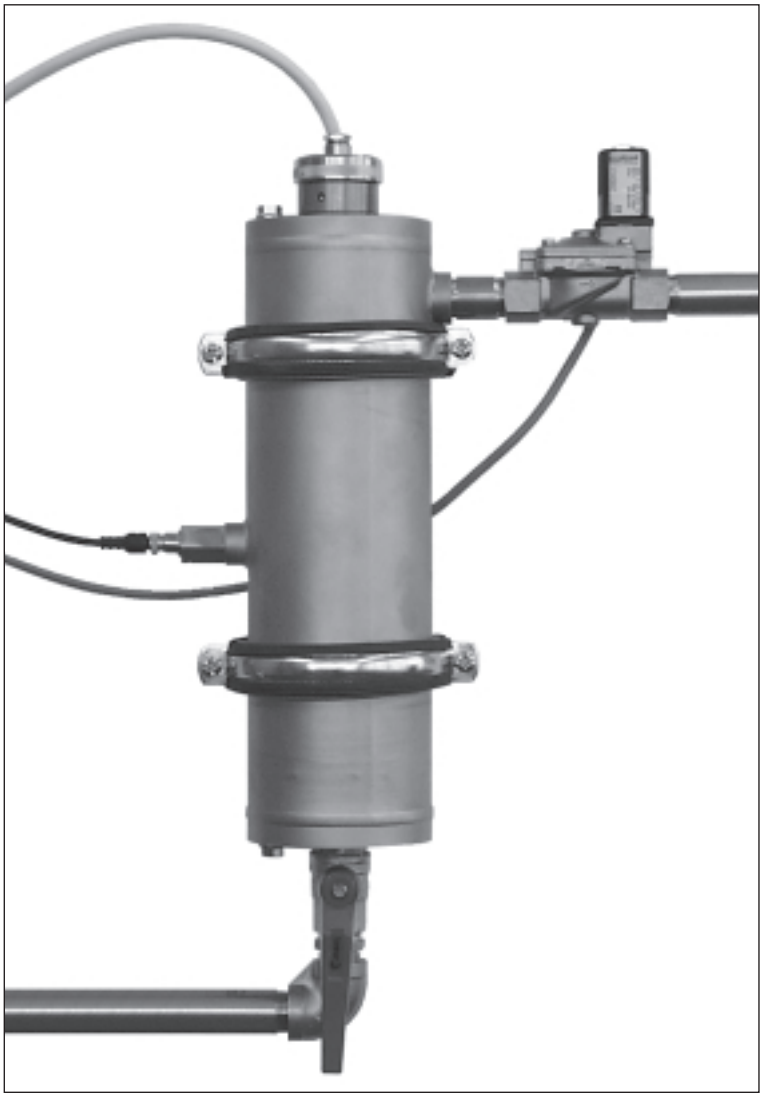

Please affix nameplate label here!

Please read the operating instructions through completely before commissioning this equipment! Do not discard!
Any part which has been subject to misuse is excluded from the warranty!

Instructions for Use

This operating instructions manual contains
the product descriptions in the

main text

- numbered points
- ▶ highlighted points

and safety guidelines indicated with pictograms:

DANGER

Ignoring safety information can endanger life or result in serious injury!

CAUTION

Ignoring safety information can result in injury to persons or damage to machinery or other materials.

WARNING

Ignoring safety information can result in damage to machinery or other materials.

NOTE

Special guidelines.

Publishing Details:
Operating Instructions Manual
Compact UV Disinfection System

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Subject to technical alterations

Table of Content

1 Application

The Dulcodes Compact UV Disinfection System is used to disinfect

- Drinking water and
- Industrial water.

In UV disinfection the water to be treated is exposed to short wave UV light radiation. This UV radiation kills microorganisms both rapidly and effectively.

The Dulcodes Compact UV Disinfection System is delivered fully wired and ready to operate. It is supplied in a range of variants which are specified in the identity code.

Delivery range

- Radiation chamber
- UV lamp with corresponding lamp protection tube
- System controller
- Electronic ballast (either integrated into the controller or in a separate housing, depending upon system variant)
- UV-C sensor
- O-rings
- Key supplied
- Fasteners
- Operating Instructions Manual and data sheet
- Stop valve (optional)
- Bleed and discharge valves (optional)

2 Safety Guidelines

DANGER

- **UV radiation is hazardous for eyes and skin.**
  Switch on lamp only when it is correctly installed!
  Prior to switch on lamp, ensure that the UV disinfection system has been correctly installed!
- **If not calibrated correctly, the UV-C sensor cannot carry out its monitoring function. In some circumstances this may lead to inadequately disinfected water reaching the user.**
- **When using for critical disinfection applications (e.g. disinfection of drinking water) the pipe work downstream must be disinfected before commissioning, e.g. via high chlorination!**
  This is particularly necessary where pipe work has become microbiologically contaminated.
- **To guarantee adequate disinfection ensure that**
  - **the water flow does not exceed maximum admissible value**
  - **the UV transmission is not below the minimum admissible value**

  as adequate disinfection cannot otherwise be guaranteed.
- **When the UV disinfection system is in use for long periods without active water flow, the water temperature must be monitored and if necessary the system should be switched off.**
- **The system should be located in a dry, frost-proof area. It must be protected from chemicals, dyes and fumes.**
- **The ambient temperature and the radiation temperature in the immediate vicinity may not exceed 40°.**
- **If the water to be disinfected contains suspended or dissolved solids, a suitable filter should be installed upstream from the UV disinfection system!**
- **Ensure that the maximum admissible operating pressure given in the data sheet is not exceeded!**
- **Remove mains plug before assembly and connection of the UV lamps!**
- **Do not turn on the system until the radiation chamber is filled with water!**

NOTE

Read through the data sheet supplied with your Dulcodes Compact UV Disinfection System!

3 Function

The water to be disinfected flows through the stainless steel radiation chamber along the UV lamps. The UV radiation effectively kills germs.

The system uses a UV low-pressure lamp which produce a high-output 254 nm UV-C radiation that is particularly effective for disinfection. The lamp is located in high quality quartz lamp protection tube with high level UV transmission.

The compact construction of the radiation chamber, the optimised flow design and the inbuilt turbulence ensure even radiation of the entire water flow.

The controller monitors the UV disinfection system in conjunction with the UV-C sensor.

After switching on the UV disinfection system the UV lamp is ignited. After ignition it will be a few minutes before the lamp reaches its operating temperature and operates at full UV-C radiation performance.

The UV-C sensor monitors the lamp. As soon as UV-C sensor signal exceeds 50 %, the (optional) stop valve opens.

If the UV-C sensor signal has not exceeded 50 % after 5 min the lamp is switched off and the system goes into failure mode.

Monitoring of the UV-C performance continues while the system is in operation. If UV-C sensor signal falls below 55 %, a warning message appears in the display. If it falls below 50 % the (optional) stop valve closes. If UV-C sensor signal does not rise above 50 % within 1 minute, the lamps are switched off. The system goes into failure mode.

For some applications it is necessary to add an oxidant to the water from time to time. If the oxidant is particularly absorbent of UV (e.g. hydrogen peroxide) the sensor signal may fall below 50 %. To prevent the system from going into failure mode you can suppress the failure signal. When the failure signal is suppressed, the lamps will continue to operate even below the 50 % threshold.

4 Controller

Version Because electronics and software are constantly being improved, the version number is used as a means of identification. It should be quoted when making enquiries or complaints. The version number appears in the display for 2 sec after the system has been switched on.

4.1 Display

A graphical display supplies the operating information.

The version number, the controller operating hours and the total number of lamp ignitions appear in the display for 2 sec after the system has been switched on.

The normal display gives the UV-C capacity in percent and the lamp operating hours and the number of lamp ignitions.

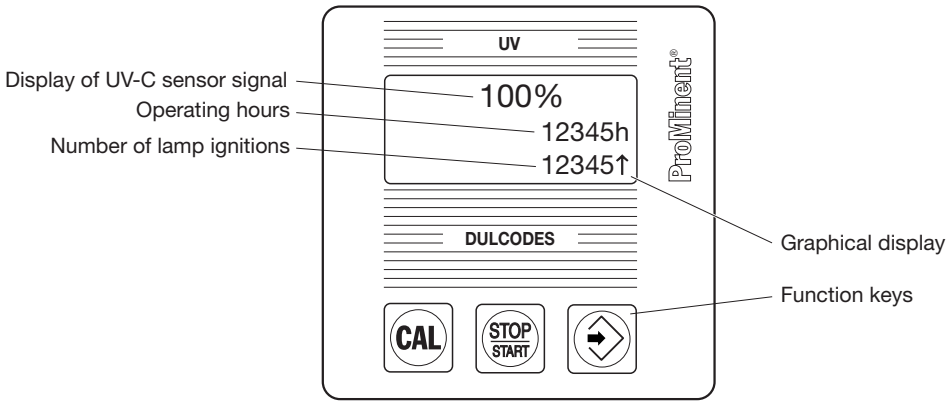


Figure 1: Display and operating unit

4.2 Function Keys

STOP START	START/STOP	Switch UV disinfection system on / off
CAL	CALIBRATION	Change to calibration mode
	ENTER	Confirm calibration Cancel fault signal

NOTE

- Press and hold keys down for at least 2 sec!
- The CALIBRATION key is not released for 1 min after switching on UV disinfection system.

4.3 Sensor Calibration

DANGER

- **Adequate disinfection can be guaranteed only when the UV-C sensor has been correctly calibrated.**
- **There must be an active flow of water through the radiation chamber when calibrating the UV-C sensor**

WARNING

Calibration of the UV-C sensor must be carried out each time the lamp is replaced.

NOTE

See also section 6.2, “Switching On Disinfection System”.

It is necessary to calibrate the UV-C sensor when commissioning the equipment and each time a lamp is replaced.

The UV-C sensor signal is set to 100 % during calibration. The operating hours and the lamp ignition meters are each set to zero.

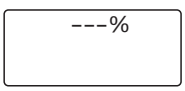
The UV-C sensor signal must not change before commencing calibration. A fluctuating sensor signal shows that the UV lamp has not yet reached its final operating temperature.

NOTE

The CALIBRATION key is released for use 1 minute after switching on the system. Calibration cannot therefore be carried out for at least 1 minute after switching on the UV disinfection system.

Calibration

- ▶ Press and hold down CALIBRATION key CAL for 2 sec:
  The UV-C sensor signal starts to flash.
- ▶ Press the ENTER key within 5 sec. Press and hold down for 2 sec:
  The calibration symbol appears.



After 2 sec the normal display reappears. The sensor signal is now set to 100 %. The operating hours meter and the switch ignitions are set to zero.

Calibration of the UV-C sensor is now complete.

NOTE

Due to small fluctuations in the UV transmission of the water etc. the sensor signal can indicate minor deviations from the calibration value (100 %) even immediately following calibration.

4.4 Connection of an Stop Valve and/or Failure Signalling Device to the Controller

The controller has a switch output to which, depending upon the circuit, an stop valve or failure indicating device can be attached.

For drinking water disinfection and similar applications you must install an automatic stop valve downstream from the UV disinfection system. This ensures that the water that reaches the consumer has been adequately disinfected.

If an stop valve (230 V power supply) is connected to the controller, a cable jumper is required between terminals XQ1 and XR1 on the controller (delivery mode).

The stop valve (normally closed) is connected to terminals XR2 and XQ2 on the controller. As long as the UV-C sensor signal is greater than 50 % the stop valve remains open and water can pass to the consumer.

For applications for which a switch output is required instead of a 230 V output, the cable jumper between terminals XQ1 and XR1 on the controller should be removed.

A failure signal device can be attached to terminals XR1 and XR2 on the controller. As soon as the UV-C signal falls below 50 %, or the system is switched off, the switch contact opens and a failure is signalled.

4.5 External On/Off Switching of the UV Disinfection System

The UV disinfection system is switched on and off by switching on/off the mains power supply.

The system is switched on/off using the START/STOP key. The connection and disconnection of the mains power supply activates and deactivates the system.

5 Assembly and Installation

Please read the following safety guidelines before installing system:

DANGER

To guarantee adequate disinfection, ensure that water

- **does not exceed maximum flow and**
- **falls within permitted UV transmission range**

as adequate disinfection cannot otherwise be guaranteed.

The maximum permitted flow is given in the accompanying data sheet. It is a function of the required radiation dose and the minimum permitted UV transmission of the water to be disinfected.

WARNING

- **The system should be located in a dry, frost proof area. It must be protected against chemicals, dyes and fumes.**
- **The ambient temperature and the radiation temperature in the immediate vicinity must not exceed 40 °C!**

- **If the water to be disinfected contains suspended or dissolved solids, a suitable filter must be installed upstream from the disinfection system.**
- **Ensure that the maximum permissible operating pressure given in the accompanying data sheet is not exceeded!**

NOTE

Even though systems are fitted with modern electronic ballasts, which protect lamps during the ignition phase, avoid switching the UV system on/off frequently.

5.1 Radiation Chamber

The accompanying data sheet describes the radiation chamber as one of the following: vertical wall-mounted, horizontal or freestanding.

5.1.1 Assembly

WARNING

- **The radiation chamber must be mounted only as shown in the data sheet!**
- **Allow room for maintenance access!**
  Details given in accompanying data sheet.

Vertical, wall mounted
▶ Mount radiation chamber vertically to the wall or to a suitable structure using the fasteners supplied.

Horizontal
▶ Mount radiation chamber horizontally to the wall or to a suitable structure using the fasteners supplied.

Free standing
▶ Place radiation chamber on the floor.

5.1.2 Attaching the Warning Sign

NOTE

The inclosed self-adhesive warning sign should be attached such that it is well visible on the radiation chamber.

5.1.3 Hydraulic Connections

DANGER

When used for critical disinfection applications, (e.g. drinking water disinfection) where there is no means of halting the water supply in the event of system failure (e.g. switching off booster pump):
Fit an automatic stop valve downstream from the radiation chamber and connect to controller!
The automatic stop valve must operate automatically to halt the water flow in the event of power failure.

WARNING

- **Observe all general international directives and national installation directives when carrying out hydraulic connection of the radiation chamber.**
- **Use UV-resistant material for all hydraulic connections!**
  PVC will fade at connection points, and may become brittle under extreme conditions.

NOTE

- Fit stop valves up- and downstream from the radiation chamber to enable maintenance work to be carried out.
- Fit suitable flameproof taps up and downstream from the radiation chamber for microbiological sampling.

5.2 Control Cabinet and Controller

5.2.1 Assembly

▶ Mount controler to wall or suitable structure so that the lamp and the sensor can be connected using the cables supplied (cable length approx. 1.5 m for most systems).

WARNING

Do not increase the length of the lamp connection cable and the sensor cable!

5.2.2 Electrical Connectors

The electrical installation must be carried out by an authorised electrical engineer in accordance with the circuit diagrams provided.

DANGER

- **Observe all international guidelines and national installation regulations!**
- **Carry out electrical work only when machine is disconnected from the power supply.**
- **Connect earth lead to radiation chamber!**
- **Do not lengthen lamp connection cable or sensor cable!**

5.2.3 Opening Controller

Opening the controller is necessary only if a not preassembled stop valve or a failure signalling device needs to be connected or to select a software version (see 5.2.5).

DANGER

Disconnect from power prior to opening control cabinet!

Opening controller

▶ Remove the 4 screws from upper section of housing

▶ Open the housing: (see fig. 2)
Place the forefinger on the front edge of the housing, press and ease forward: this releases the catches

▶ Gently pull the top section forward and away from the lower part (take care, they are connected with a ribbon cable!)

▶ Insert the upper section with both guide-rails into the aperture, approx. 80 mm

Now all electrical terminals are accessible. There are closed cable apertures on the underside of the controller. Break these tabs in order to insert connection cables.
The 5 back row of apertures are for PG-11 threaded connectors.
The 4 apertures in the front row are for PG-7 threaded connectors.

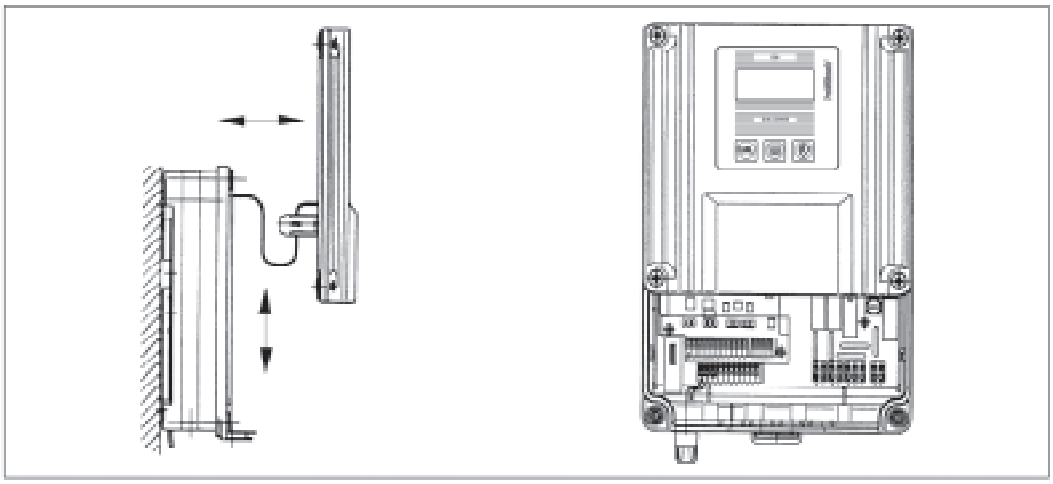


Figure 2: Opening controller

WARNING

Use correct tool to break open cable apertures on the underside of the controller to prevent damage to the circuit boards and threads.

Assembling cables

- ▶ Break open cable apertures on underside of the controller
- ▶ Attach cables on the back row first: (see fig. 3)
  Push PG-11 threaded connector (1), metal ring (2) and rubber washer (3) (from the accompanying fixtures set) onto the cable. Screw into threaded aperture and tighten by hand.
- ▶ Then attach cables on the front row: (see fig. 4)
  Insert cable through PG-7 threaded connectors (4) and screw on the locking nut (5)
- ▶ Connect leads to terminals as shown on circuit diagram
- ▶ Plug unused terminals onto corresponding pin terminals
- ▶ Close controller

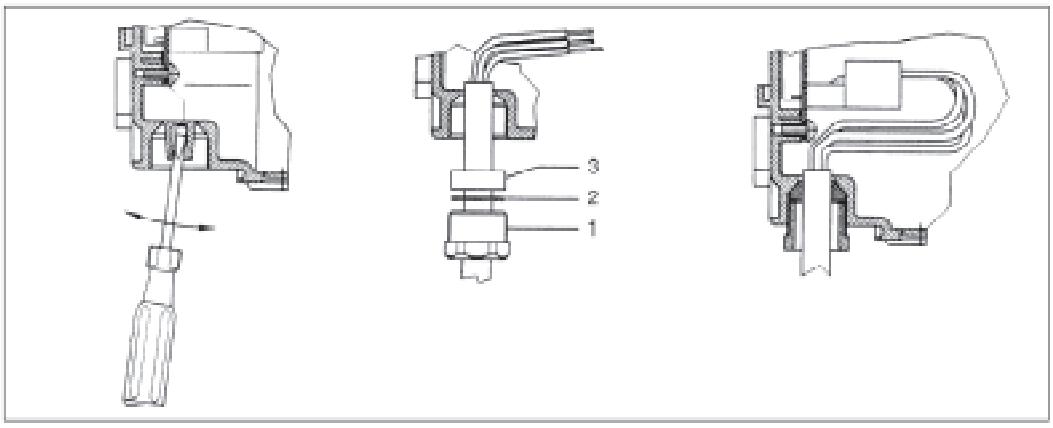


Figure 3: Cable inserts on back row

1 PG-11 threaded connector
2 Metal ring
3 Rubber washer

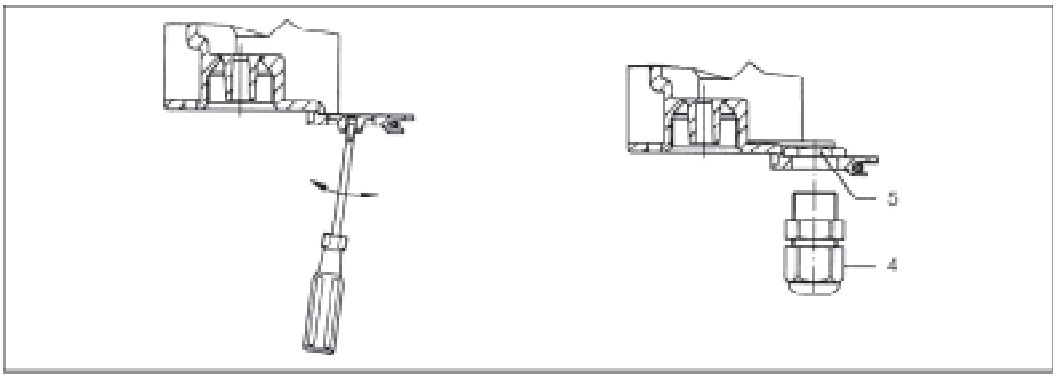


Figure 4: Cable inserts on front row

4 PG-7 threaded connector
5 Locking nut

5.2.4 Connection of Fitted Stop Valve to Controller (Optional)

If the system is fitted with an stop valve, this must be connected to the controller. Attach the stop valve mains plug to the valve and screw tight.

5.2.5 Selecting Software Version “Suppression of Failure Signal”

For some applications it is necessary to add an oxidant to the water from time to time. If the oxidant is particularly absorbent of UV (e.g. hydrogen peroxide) the sensor signal may fall below 50 %. To prevent the system from going into failure mode you can suppress the failure signal. If the failure signal is suppressed the lamps will continue to operate even below the 50 % threshold.

To select the software version “suppression of failure signal”, open the controller (see 5.2.3). Remove the short circuit jumper as shown in fig. 5 and close the controller once more.

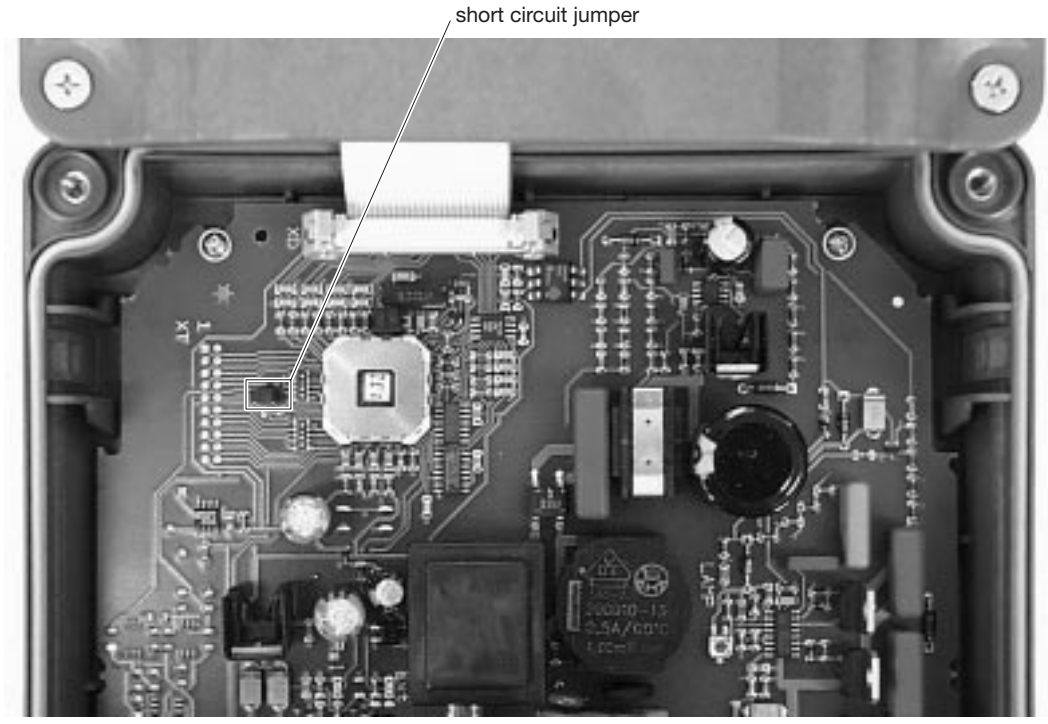


Figure 5: Section of controller circuit board with short circuit jumper

5.3 Assembly of Lamp Protection Tube

WARNING

Examine lamp protection tube for damage prior to assembly!
Do not use damaged protection tube!

- Remove lamp protection tube holders using key supplied
- Remove lamp protection tube holders from the radiation chamber
- Push O-ring supplied approx. 40 mm over the open end of lamp protection tube
- Insert lamp protection tube into radiation chamber

WARNING

- **Make sure lamp protection tube is in correct position!**
  The lamp protection tube should protrude a maximum of 40 mm and should be not be protruding at an angle.
- **Check wether the Teflon ring is fitted in the corresponding groove of the lamp protection tube holder (see fig. 7). If not press the Teflon ring in the lamp protection tube holder until it snaps into the groove.**

- Push lamp protection tube holder over lamp protection tube. Screw into radiation chamber. Tighten by hand
- Fasten lamp protection tube holder in place using key supplied

5.4 Assembly and Connection of UV-Lamp

DANGER

- **Unplug before assembly and connection of UV-lamps!**
- **UV radiation is hazardous to eyes and skin.**
  Switch on lamp only when it is correctly installed!
  Prior to switch on lamp, ensure that the UV disinfection system has been correctly installed!
- **Do not change existing lamp connection cable without authorisation!**
- **Do not alter distance between plug and lamp end cap. This can result in lamp not making contact with closed end of lamp protection tube. This is a prerequisite for effective disinfection!**

WARNING

Do not touch the glass of the UV lamp with bare hands!
Fingerprints eat into the glass and can lead to premature lamp failure.
Remove fingerprints before assembly with a cloth soaked in alcohol!

NOTE

When disinfecting water with a temperature of more than 25 °C (e.g. bathing water disinfection), note the following:
Where lamps are fitted with O-rings for inserting into lamp protection tube, these rings must be removed before installing the lamp to prevent the lamp overheating when commissioned.

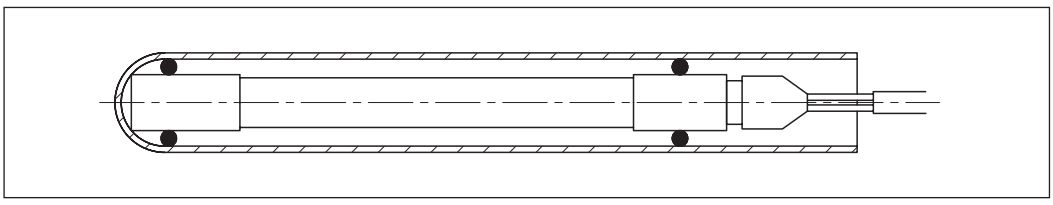


Figure 6: Lamp with O-rings to assist insertion into lamp protection tube

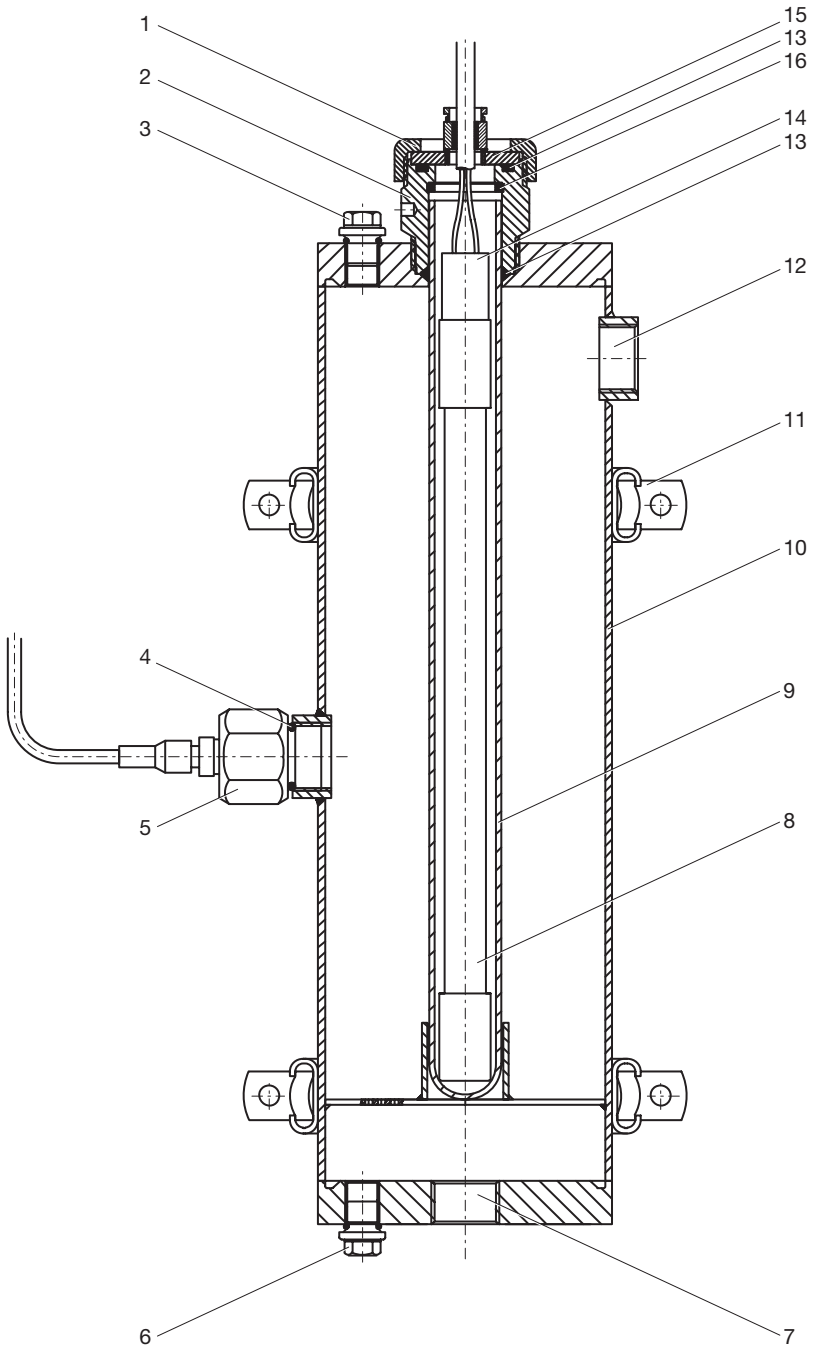


Figure 7: Diagram of radiation chamber

1 Milled nut
2 Lamp protection tube holder
3 Bleed screw with O-ring*
4 O-ring
5 UV-C sensor
6 Water drainage screw with O-ring*
7 Water inlet
8 UV lamp
9 Lamp protection tube
10 Radiation chamber
11 Mounting bracket
12 Water outlet
13 O-ring
14 Plug
15 Lamp end cap
16 Teflon ring

* Manual valves are also available in place of bleed screw and water discharge screw.

- Locate the O-ring in the groove provided in the lamp protection tube holder
- insert the lamp into the lamp protection tube leaving approx. 100 mm protruding
- Connect plug to lamp

NOTE

The plug may require 90° rotation before it locates correctly

- Insert lamp completely into lamp protection tube
- Fix lamp end cap using nut. Apply only light pressure

6 Commissioning

DANGER

When used in critical disinfection applications (e.g. drinking water disinfection), disinfect downstream pipe work before commissioning e.g. by high chlorination! This is vital for pipe work which has become micro-biologically contaminated.

6.1 Checking Radiation Chamber Seals and Bleed Function

- Open bleed screw / bleed valve on radiation chamber
- Slowly open stop valve upstream from radiation chamber
- Fill radiation chamber until water leaks through bleed screw / bleed valve
- Close bleed screw or bleed valve
- Check chamber is watertight
- Open stop valve downstream from radiation chamber (manual stop valves only)

6.2 Switching On Disinfection System

WARNING

Switch on system only when filled with water!

Switching on

- Plug in at mains
- To start the system, press and hold down the START/STOP key for 2 sec.

After ignition it will be a few minutes before the lamp reaches its operating temperature and operates at full UV-C radiation capacity.

If the UV-C sensor signal has not exceeded 50 % after 5 min, the lamp is switched off. The system goes into failure mode. In this case proceed as follows:

- To cancel the failure signal, press and hold down the ENTER key for 2 sec
- To switch on system once more; press and hold down the START/STOP key for 2 sec
- Carry out a preliminary calibration of the UV-C sensor within 5 min as described under 6.3

NOTE

If failure signals have been suppressed (see 5.2.5), the lamp will not switch off when the UV-C sensor signal is below 50 % for 5 minutes. It is not possible to calibrate the UV-C sensor after this 5 minute period has elapsed.

DANGER

A preliminary calibration of the UV-C sensor does not replace the final calibration of the UV-C sensor with a UV lamp which has reached operating temperature.

6.3 UV-C Sensor Calibration

DANGER

- **Adequate disinfection can be guaranteed only when the UV-C sensor has been correctly calibrated.**
- **There must be an active flow of water through the radiation chamber when calibrating the UV-C sensor**

The UV-C sensor signal is set to 100 % during calibration. The operating hours meter and the switch ignitions meter are set to zero.

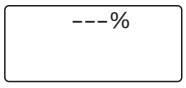
The sensor signal should not change again before starting calibration. A changing sensor signal indicates that the lamp has not yet reached operating temperature.

NOTE

The CALIBRATION key is released 1 min after switching on UV disinfection system. It is therefore not possible to carry out calibration until 1 min after the system has been switched on.

Calibration

- ▶ Press and hold down the CALIBRATION key [CAL] for 2 sec:
  The UV-C sensor signal starts to flash.
- ▶ Within 5 sec, press and hold down the ENTER key [⏎] for 2 sec:
  The calibration symbol will appear.



After 2 sec the normal display reappears. The sensor signal is now set to 100 %. The operating hours meter and the switch ignitions meter are set to zero.

Calibration of the UV-C sensor is now complete.

NOTE

Due to small fluctuations in the UV transmission of the water etc. the sensor signal may indicate minor deviations from the calibration value (100 %) even immediately after calibration.

7 Maintenance

Maintenance of the UV disinfection system is limited to cleaning the lamp protection tube and to replacing lamp at the end of its maximum permissible operating period.

A daily operating log should also be kept: A pro forma sheet is included in the appendix.

DANGER

- **Replace the UV-C lamp at the latest after the maximum permissible operating period has elapsed!**
  Operating relaiability cannot otherwise be guaranteed.
- **The maximum admissible operating period is given in the data sheet accompanying the UV disinfection system.**
- **Unplug before commencing any maintenance work!**
- **Radiation chamber must be depressurised before all maintenance work!**
- **UV-C radiation is hazardous to eyes and skin!**
  Switch on lamp only when it is correctly installed!
  Prior to switch on lamp, ensure that the UV disinfection system has been correctly installed!

7.1 Cleaning Lamp Protection Tube

Deposits, e.g. iron, manganese or lime, can build up on the lamp protection tube. As these deposits absorb UV-C radiation they must be removed at regular intervals.

NOTE

Carry out cleaning at the latest when the sensor signal falls below the warning threshold, unless this is caused by lamp ageing or significant decrease in UV transmission.

For many UV disinfection systems, cleaning lamp protection tubes once annually (when replacing the lamp) is sufficient. For UV systems used to disinfect wastewater, cleaning may be required every one to two months. The lamp protection tubes can be cleaned either separately from the system, or by filling the radiation chamber with a cleaning solution. Suitable solutions include dilute phosphoric acid, citric acid or dilute nitric acid.

CAUTION

- **Do not use acids corrosive or stress crack forming acids, e.g. hydrochloric acid!**
- **Read the safety data sheet for the selected cleaning solution!**
- **Wear appropriate protective clothing during cleaning (protective goggles, protective gloves)!**
- **Make sure no cleaning fluid enters the lamp protection tube!**
- **Take care when cleaning UV disinfection systems that no cleaning fluid enters the pipe work! This is particularly important for drinking water disinfection or similar systems.**

NOTE

Observe applicable guidelines and regulations when disposing of cleaning fluids!

Version 1: Dismantling lamp protection tube

- ▶ Press and hold down START/STOP key (STOP/RESET) for 2 sec to switch off system
- ▶ Unplug
- ▶ Close stop valves up- and downstream from radiation chamber
- ▶ Open water drainage and bleed screws or drainage and bleed valves
- ▶ Empty radiation chamber
- ▶ Unfasten nut on lamp protection tube holder manually

- Pull out lamp end cap so that the cable connection plug can be removed from the lamp
- Remove lamp completely and put to one side
- Unfasten lamp protection tube holder with key supplied
- Unscrew and remove lamp protection tube holder from radiation chamber. Unscrew and remove lamp protection tube holder from radiation chamber
- Remove lamp protection tube
- Remove O-ring from lamp protection tube
- Rinse lamp protection tube in cleaning fluid or dip in cleaning fluid until deposits have been completely removed
- Rinse lamp protection tube in clean water and dry with a soft cloth

WARNING

Examine lamp protection tube for damage prior to replacing!
Do not reinstall a damaged lamp protection tube.

- Examine O-ring for damage. Replace worn O-rings
- Insert O-ring into open end of lamp protection tube so that approx. 40 mm is protruding
- Insert lamp protection tube into radiation chamber

WARNING

The lamp protection tube should protrude a maximum of 40 mm and should be not be protruding at an angle.

- Push lamp protection tube holder over lamp protection tube. Screw into radiation chamber. Tighten by hand
- Fix lamp protection tube holder in place using key supplied.
- Assemble and install UV lamp as described in section 5.4

Cleaning UV-C sensor

The UV-C sensor should be cleaned each time you clean lamp protection tubes:

- Unfasten sensor cable from UV-C sensor
- Unscrew UV-C sensor from radiation chamber
- Clean quartz window with a cloth soaked in cleaning fluid until deposits are completely removed
- Rinse quartz window in clean water and dry with a soft cloth
- Examine O-ring for damage. Replace damaged O-rings
- Screw UV-C sensor back in place. Do not over-tighten
- Connect sensor cable to UV-C sensor
- Close water drainage screw / drainage valve and tighten.
- Slowly open stop valve upstream from the radiation chamber
- Fill radiation chamber until water leaks out of bleed screw / bleed valve
- Close bleed screw / bleed valve
- Open stop valve downstream from radiation chamber (manual stop valves only)
- Check radiation chamber is watertight
- Plug in

The UV disinfection system is ready to operate.

Version 2: Adding cleaning fluid to radiation chamber

Cleaning lamp protection tube by filling radiation chamber with cleaning fluid:

- Press and hold down START/STOP key for 2 sec to switch off system
- Unplug
- Close stop valves up- and downstream from radiation chamber
- Open water drainage and bleed screw or drainage and bleed valve
- Empty radiation chamber
- Close water drainage screw / drainage valve
- Fill radiation chamber via bleed outlet with cleaning fluid

- ▶ Leave for at least 20 minutes
- ▶ Open water drainage screw / drainage valve
- ▶ Empty radiation chamber and carefully dispose of cleaning fluid
- ▶ Rinse radiation chamber thoroughly with clean water until all traces of cleaning fluid have been removed
- ▶ Close water drainage screw/drainage valve. Do not over-tighten
- ▶ Slowly open stop valve upstream from radiation chamber
- ▶ Fill radiation chamber until water leaks out of bleed screw / bleed valve
- ▶ Close bleed screw / bleed valve
- ▶ Open stop valve downstream from radiation chamber (manual stop valves only)
- ▶ Check radiation chamber is watertight
- ▶ Plug in

The UV disinfection system is ready to operate.

NOTE

- For radiation chambers which are regularly cleaned by filling with cleaning fluid we recommend that the water drainage screw and also the bleed screw are replaced with appropriate valves.
- For large radiation chambers we recommend filling via the water drainage outlet with a suitable acid-resistant pump.
  If the radiation chamber is filled using a pump it is wise to circulate the cleaning fluid via the bleed outlet. This reduces the cleaning time and gives better results.

7.2 Changing UV Lamp

DANGER

- **The UV lamps should be replaced at the latest**
  - **when the sensor signal nears the safety threshold, unless this is caused by deposits on lamp protection tube or significant decrease in UV transmission;**
  - **when the lamp has been in operation for close to, or more than, the maximum admissible period.**
- **Prior to removing and assembling lamp remove UV disinfection system main plug!**
- **UV-C radiation is hazardous to eyes and skin!**
  Switch on lamp only when it is correctly installed!
  Prior to switch on lamp, ensure that the UV disinfection system has been correctly installed!
- **Do not change existing lamp connection cable without authorisation!**
- **Do not alter distance between plug and lamp end cap. This can result in lamp not making contact with closed end of lamp protection tube. This is a prerequisite for effective disinfection!**

WARNING

Do not touch lamp glass with bare hands!
Fingerprints eat into the glass and can lead to premature failure.
Remove fingerprints before assembly with a cloth soaked in alcohol!

NOTE

- When disinfecting water with a temperature of more than 25 °C (e.g. bathing water disinfection), note the following:
  Where lamps are fitted with O-rings for inserting into lamp protection tube, these rings must be removed before installing the lamp to prevent the lamp overheating when commissioned.
- The lamp protection tube should be cleaned each time a lamp is changed!

- Press and hold down START/STOP key for 2 sec to switch off system
- Unplug
- Close stop valves up- and downstream from radiation chamber
- Unfasten nut on lamp protection tube holder by hand
- Pull out lamp end cap so that the cable connection plug can be removed from the lamp
- Remove lamp completely and put to one side
- Check that the O-ring on the lamp protection tube holder is located correctly in the groove provided, and is not damaged. Replace O-ring if damaged
- Insert new lamp into lamp protection tube. Leave approx. 100 mm protruding
- Plug connector to lamp

NOTE

The plug may require 90° rotation before it locates correctly.

- Insert lamp fully into lamp protection tube
- Fasten lamp end cap to lamp protection tube with the nut. (Do not over tighten)
- Slowly open stop valve upstream from radiation chamber
- Open Stop valve downstream from radiation chamber (manual Stop valves only)
- Plug in

DANGER

Re-calibrate UV-C sensor after replacing UV lamps!
Reliable disinfection is only guaranteed after sensor has been re-calibrated.

7.3 Calibrating UV-C Sensor

DANGER

- **Adequate disinfection can be guaranteed only when the UV-C sensor has been correctly calibrated.**
- **There must be an active flow of water through the radiation chamber when calibrating the UV-C sensor.**

WARNING

Calibration of the UV-C sensor must be carried out each time the lamp is replaced.

NOTE

See also section 6.2 “Switching on Disinfection System”.

Recalibrate UV-C sensor each time a lamp is replaced!

During calibration the UV-C sensor signal is set to 100 %. The operating hours and the lamp ignition meters are each set to zero.

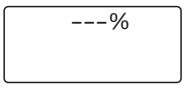
Before commencing calibration, the UV-C sensor signal must not change. A fluctuating sensor signal shows that the UV lamp has not yet reached the operating temperature.

NOTE

The CALIBRATION key is released for use 1 minute after switching on the system. Calibration cannot therefore be carried out for at least 1 minute after switching on the UV disinfection system.

Calibration

- ▶ Press and hold down CALIBRATION key (CAL) for 2 sec:
  The UV-C sensor signal starts to flash.
- ▶ Within 5 sec, press and hold down the ENTER key for 2 sec:
  The calibration symbol appears.



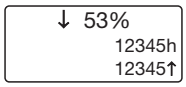
After 2 sec the normal display reappears. The sensor signal is now set to 100 %. The operating hours meter and the switch ignitions are set to zero.

Calibration of the UV-C sensor is now complete.

NOTE

Due to small fluctuations in the UV transmission of the water etc. the sensor signal may indicate minor deviations from the calibration value (100 %) even straight after calibration.

8 Troubleshooting



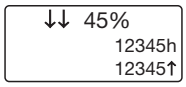
UV-C signal below 55 %
Signal: flashing arrow pointing downwards

Possible cause Deposits on lamp protection tube and/or UV-C sensor
Remedy ▶ Clean lamp protection tube and/or UV-C sensor

Possible cause Decrease in UV transmission of water to be disinfected
Remedy ▶ Improve water quality

Possible cause UV lamp at end of operating period
Remedy ▶ Replace with new UV lamp

Possible cause Sensor incorrectly calibrated
Remedy ▶ Re-calibrate sensor



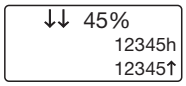
UV-C signal below 50 %
Signal: double flashing arrow pointing downwards

Possible cause The UV lamp has not yet reached operating temperature
Remedy ▶ Wait until the UV lamp has reached operating temperature

For applications requiring that the controller software failure message is suppressed, the message “UV-C sensor signal lower than 50 %” may be due to the following:

Possible cause Dosing of highly UV-absorbent oxidant
Remedy ▶ Wait until oxidant has broken down

Possible cause A failure has occurred
Remedy ▶ See following section “System in failure mode”



System in failure mode
Signal: display flashing

Possible cause Deposition on lamp protection tube and/or UV-C sensor
Remedy ▶ Clean lamp protection tube and/or UV-C sensor

Possible cause Decrease in UV transmission of water to be disinfected
Remedy ▶ Improve water quality

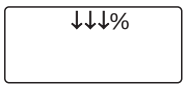
Possible cause UV lamp at end of operating period
Remedy ▶ Replace with new UV lamp

Possible cause UV lamp defective
Remedy ▶ Install new UV lamp

Possible cause UV-C sensor incorrectly calibrated
Remedy ▶ Recalibrate UV-C sensor

Possible cause UV-C sensor defective
Remedy ▶ Install new UV-C sensor

Possible cause Ballast defective
Remedy ▶ Install new ballast



UV-C sensor cannot be calibrated
Signal: flashing downward arrows

Possible cause UV lamp defective
Remedy ▶ Install new UV lamp

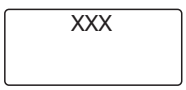
Possible cause UV-C sensor defective
Remedy ▶ Install new UV-C sensor

Possible cause Ballast defective
Remedy ▶ Install new ballast

UV-C sensor cannot be calibrated
Controller does not respond to CALIBRATION key

Possible cause The system has been switched for less than a minute
Remedy ▶ Wait until the system has been switched for a minute

Possible cause The sensor signal is lower than 50 % and the system was switched on more than 5 minutes ago
Remedy ▶ Carry out preliminary calibration in accordance with section 6.3



Controller
Signal: three flashing Xs

Cause The controller has determined a failure during self-analysis
Remedy ▶ Replace controller

Stop valve does not open

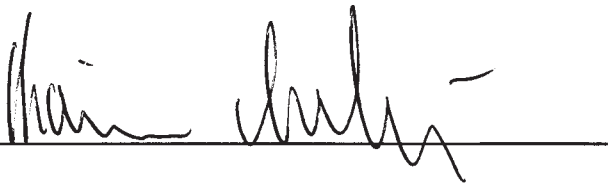
Possible cause Fuse has blown
Remedy ▶ Open controller (see 5.2.3) and check fuse F2
▶ Check valve before inserting new fuse (2.5 A)

EC Declaration of Conformity

We,

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5 - 11
D - 69123 Heidelberg

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation 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 :	***disinfection plant Dulcodes and Dulcodes compact***
Product type :	***UVCa***
Serial number :	***see type identification plate on device***
Relevant EC regulations :	***EC - machine regulation (98/37/EEC)*** ***EC - low voltage regulation (73/23/EEC)*** ***EC - EMC - regulation (89/336/EEC subsequently 92/31 EEC)***
Harmonised standards used, in particular :	***DIN EN 292-1, DIN EN 292-2*** ***DIN EN 60204-1, DIN EN 60335-1, DIN EN 50106*** ***DIN EN 50081-1/2, DIN EN 50082-1/2*** ***DIN EN 61000-3-2, DIN EN 61000-4-2/4/5***
National standards and other technical specifications used, in particular :	
Date/manufacturer´s signature :	***23.12.1999*** 
The undersigned :	*Dr.- Ing. R. Dulger, President*

Daily Operating Log for Dulcodes Compact UV Disinfection System

No.	Date	Lamp hours	Lamp ignitions	Sensor signal display [%]	UV transmission [% / 1 cm]	Flow [m³ / h]	Maintenance work carried out	Signed