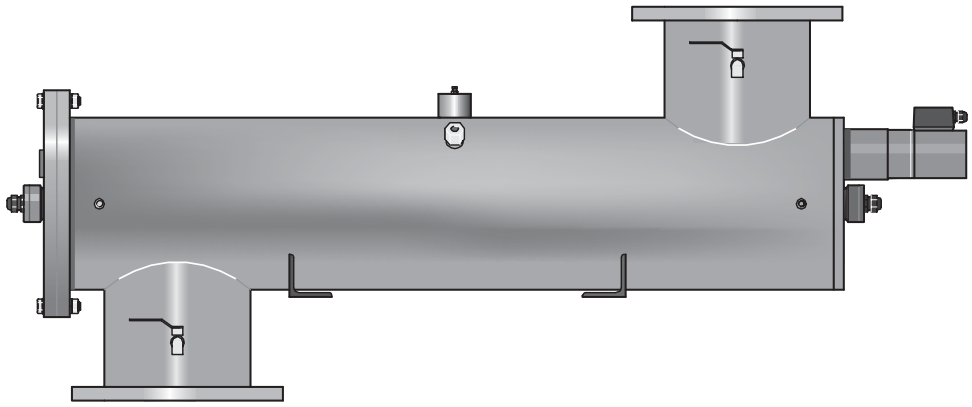
Operating Instructions

Dulcodes M

UV-System



Please affix device 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!

Notes for the User

These operating instructions contain
a description of the product in

continuous text,

- lists
- ▶ instructions

and safety advice with pictograms as follows:

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.

IMPORTANT

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

NOTE

Special guidelines.

Publishing details:
Operating Instructions
Dulcodes M UV-System
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Subject to technical alterations.

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1 Application

Dulcodes M UV systems are used to disinfect and treat

- drinking water,
- process water and
- swimming pool water.

Dulcodes M UV disinfection involves exposing the water to be treated to short-wave ultraviolet light. This so-called UV-C radiation eradicates bacteria quickly and reliably.

UV radiation breaks down the harmful substances in swimming pool water effectively and reliably kills bacteria that even chlorine struggles to eradicate.

Dulcodes M UV systems are supplied ready for connection. There are various models to choose from and each one has a specific identity code.

Performance data is provided in the data sheet that accompanies the Dulcodes M UV system.

Supplied as standard

- Radiation chamber
- UV lamp with protection tube
- Control cabinet containing the ballast and system controller
- Motor-driven wiper
- UV-C sensor
- Operating instructions manual and data sheet

2 Safety Guidelines

DANGER

- **Do not change or block access!**
  UVC radiation is hazardous to the eyes and skin.
  UV radiator only to be commissioned when fully assembled!
  Both the UV lamp and UV disinfection system must be installed as instructed before the lamp can be commissioned.
- **A UVC sensor that has not been calibrated correctly cannot function properly. This may result in the consumer obtaining water that has not been disinfected adequately.**
- **Before commissioning the system, any pipework that transports the treated water should also be disinfected, e.g. with high chlorination, for applications in which high levels of disinfection are required (e.g. the disinfection of drinking water). This is particularly important in pipework where bacterial proliferation already exists.**
- **Ensure that**
  - **the maximum flow is not exceeded and**
  - **UV transmission does not fall below the minimum level**

  otherwise adequate disinfection cannot be guaranteed.
- **The system must not be switched on until the radiation chamber is full of water.**
- **Apart from when the lamp is warming up, ensure that there is sufficient flow through the radiation chamber to prevent the chamber from overheating.**
  If the flow is interrupted, switch off the system.
- **In addition to UV treatment, swimming pool water must also be subjected to a form of disinfection with a repository effect, e.g. chlorination.**
- **The UV disinfection system must be installed in a dry place that is protected from frost, chemicals, dyes and vapours.**
- **The ambient temperature and the heat radiation from hot surfaces in the near environment must not exceed 40 °C.**
- **A suitable filter should be installed in front of the UV disinfection system if there are any suspended solids or dissolved solids in the water to be treated.**
- **Ensure that the maximum operating pressure specified in the accompanying data sheet is not exceeded.**
- **Switch off at the mains before installing and connecting the UV lamp.**

NOTE

Please refer to the technical data sheet that accompanies each Dulcodes M UV system. Please follow the separate operating instructions enclosed for special applications that require the sensor signal to be displayed in W/m².

3 Function

The water to be disinfected flows through the stainless steel radiation chamber alongside the UV lamp.

The Powerline UV lamp is a highly efficient generator of UVC radiation, which is particularly effective at disinfecting water. It is housed in a protection tube made of high-grade quartz through which a high level of UV radiation is able to pass.
The compact design of the radiation chamber and the ideal flow within it enable the water to be radiated evenly.

The control system and UVC sensor monitor the UV disinfection system.

Commissioning

The UV lamp ignites after the UV disinfection system has been switched on. After ignition, the lamp requires approximately 1 minute to reach its operating temperature and full UVC capacity.

The UVC sensor monitors the output of the UVC lamp. About 10 seconds after the safety threshold has been exceeded, the rinsing valve opens and the start rinsing period commences.

If the safety threshold is not exceeded within the maximum warm-up period, two wiper cycles are triggered and the rinsing valve is opened. If the safety threshold is not exceeded within the maximum free rinsing period either, the control system switches off the UV disinfection system and reports a fault.

After the start rinsing period, the stop valve opens and the UV disinfection system commences normal operation.

Normal operation

During normal operation the UVC sensor continues to monitor UVC output:

If UVC output falls below the warning threshold, a warning signal is given. If UVC output falls below the safety threshold, the stop valve closes, two wiper cycles are triggered and the rinsing valve opens. If the safety threshold is not exceeded again within the maximum free rinsing period, the control system switches off the UV disinfection system and reports a fault.

The lamp is monitored to ensure that it is burning correctly. If the lamp fails, the stop valve closes and the control system switches off the UV disinfection system and reports a fault.

Controlled operation

Using controlled operation, automatic regulation of the radiation output maintains the UV probe signal at a predetermined value. The reference value is either entered directly into control drive (operating mode: manual control) or is preset by a variable output signal 0/4-20 mA (operating mode: external mode)

Wiper

An automatic motor-driven wiper removes any impurities that settle on the lamp's protective tube during operation. While the system is running, the wiper moves along the tube at intervals set by the operator.

If output falls below the safety threshold, two wiper cycles are triggered.

If the UV sensor signal does not exceed the safety threshold during the warm-up period, two wiper cycles are triggered at the end of the warm-up period.

Temperature monitoring

The temperature of the water in the radiation chamber is monitored continuously while the lamp is in operation.

As soon as the temperature of the water exceeds the maximum operating temperature, the rinsing valve opens. If the temperature has not dropped within a preset time, i.e. it still exceeds the maximum operating temperature the system will report a fault.

Switching off

If the UV system is switched off, the stop valve closes and the lamp is switched off. If post burning is required, the lamp will not be switched off until the post burning period is complete.

Cooling off

After the system has been switched off, the Powerline UV lamp cannot be re-ignited until it has cooled sufficiently. Therefore, the system moves into cooling mode.

If the START/STOP key is pressed during the cooling period, the system will restart automatically when the remainder of the cooling period has elapsed. Even if the pause status is cancelled during the cooling period, the system will not start until the cooling period is complete. (Only for maintenance: An attempt to ignite the lamp can be made during the cooling period by pressing the enter key).

NOTE

The radiation chamber cannot be emptied in order to carry out maintenance until the cooling period has elapsed.

4 Controller

Version As electronics and software are continuously being improved, the version number has been introduced as a means of identifying the system. This should be given in the event of a query or complaint.

Default setting The controller system of the Dulcodes M UV system is preset at the factory. Unless calibrating the sensor, it is not usually necessary to change the settings.

NOTE

The settings can only be changed if the UV system has been switched off.

Exceptions: sensor calibration, setting the lamp output and triggering a wiper cycle.

4.1 Display

The system has a graphical display.

In operating mode It indicates the operating status.
Flashing arrows and displays are used to issue a warning.
A flashing error message indicates a fault.

In programming mode The numerical values and settings that can be changed are indicated as flashing text.

NOTE

If none of the keys are pressed for 5 minutes, the display returns to the normal operating status display automatically.

4.2 Function Keys

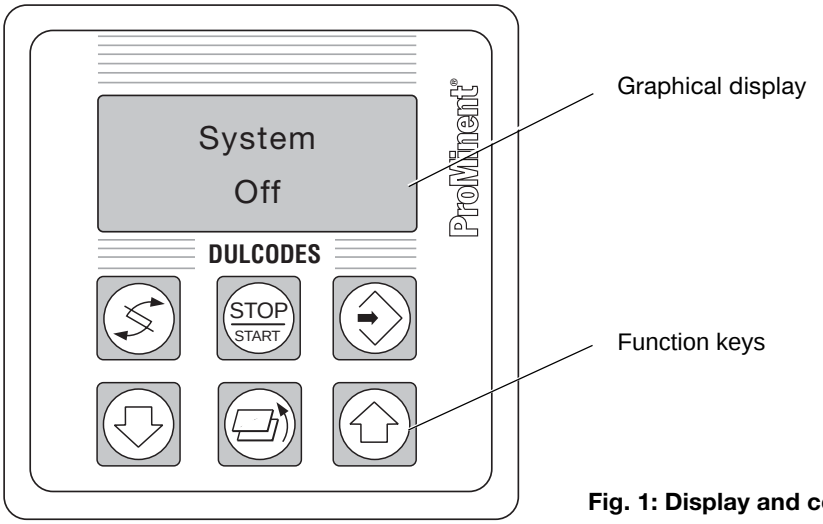


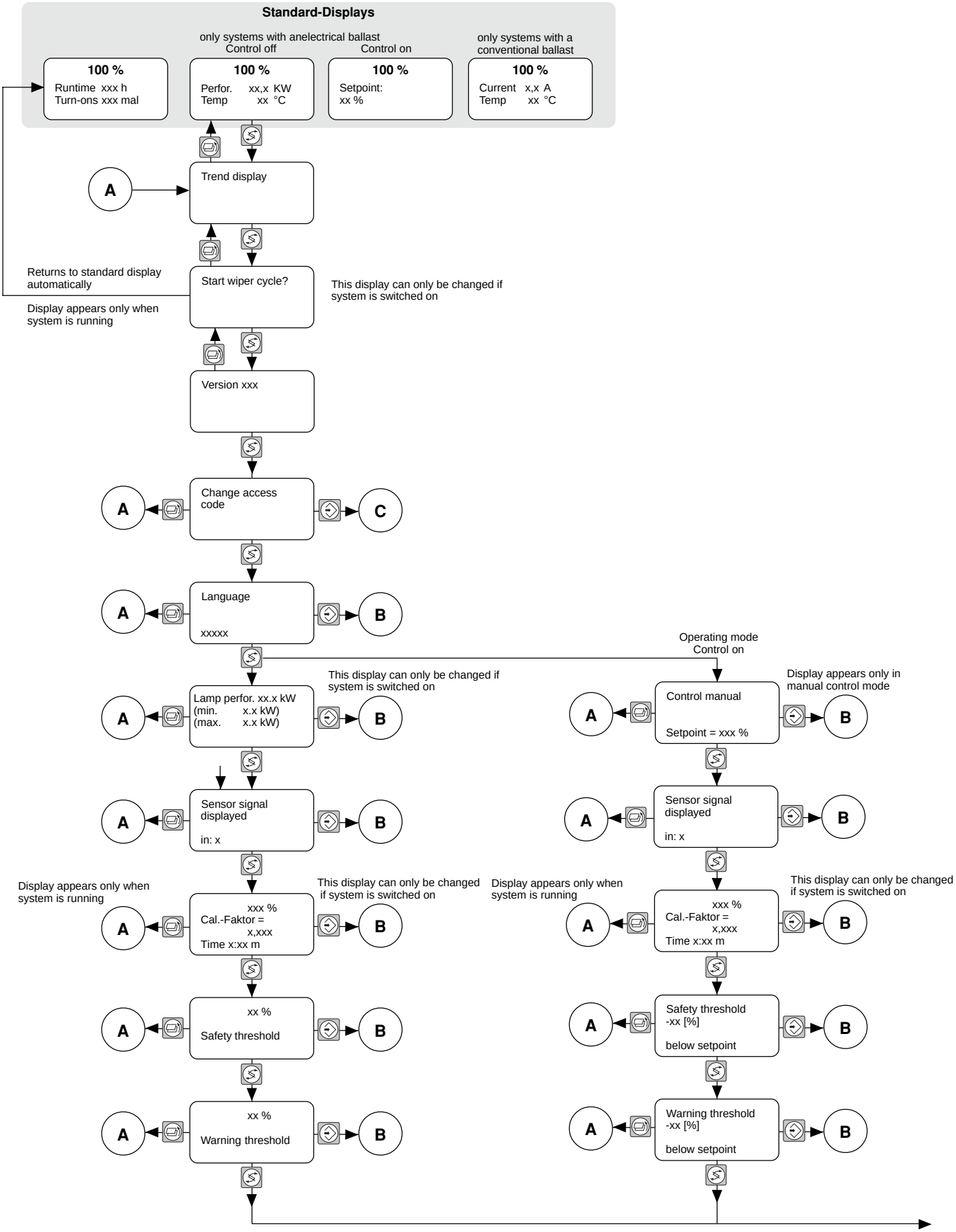
Fig. 1: Display and control unit

STOP/START	START/STOP	Switches the UV system on and off	
	CHANGE	In operating mode:	changes the display window
		In programming mode:	changes the parameter to be set
	BACK	Returns to the previous level in the menu	
	DOWN	In programming mode:	reduces the numerical value displayed and changes a setting
	UP	In programming mode:	increases the numerical value displayed and changes a setting
	ENTER	In operating mode:	changes to programming mode, triggers an attempt to ignite the lamp during the cooling period and acknowledges a fault
		In programming mode:	sets a value or status

NOTE

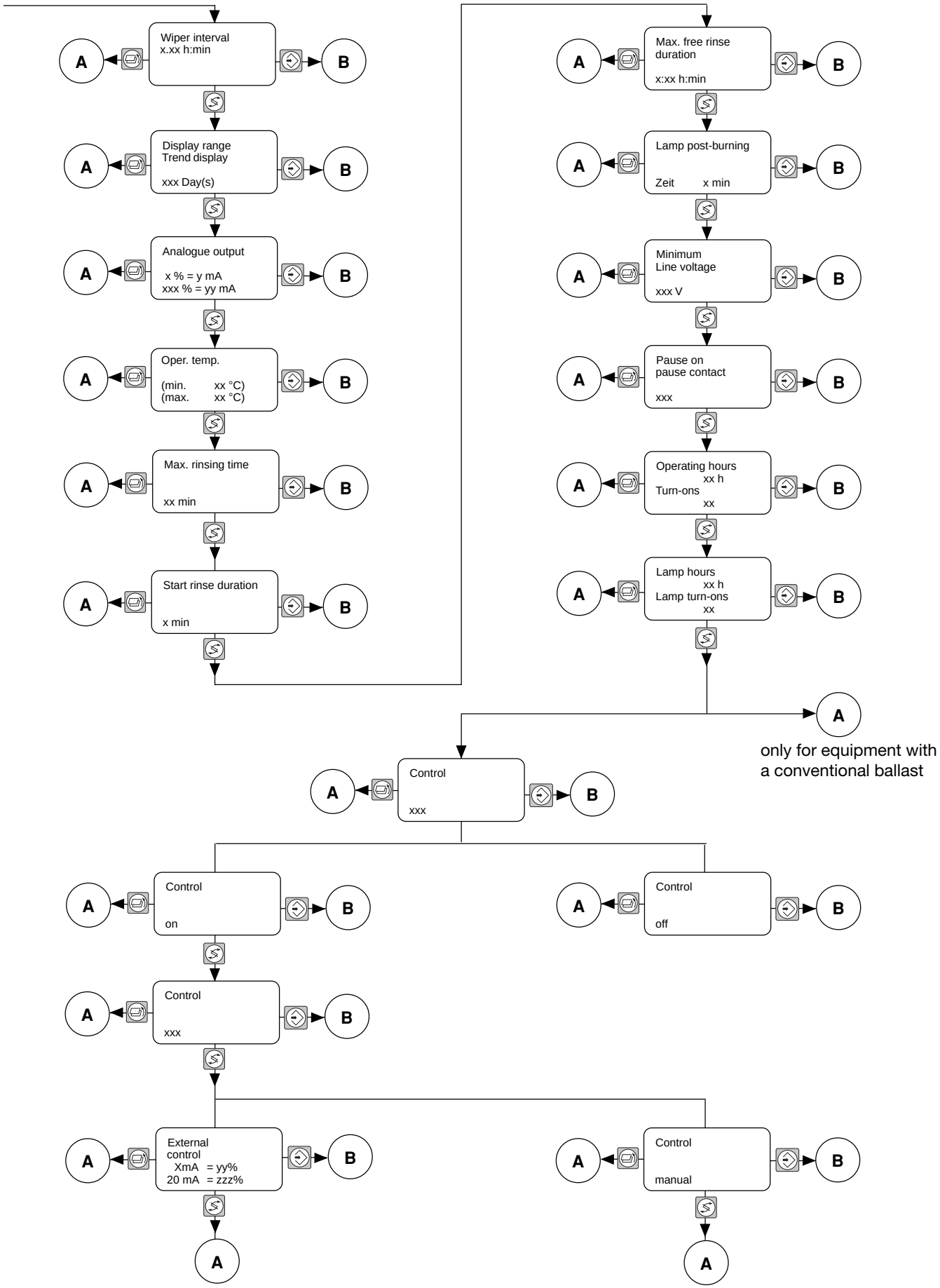
- **Keep the START/STOP key depressed for at least 2 seconds each time.**
- **If none of the keys are pressed for 5 minutes, the display returns to the normal operating status display automatically.**

4.3 Operating Status Display and Parameter Setting

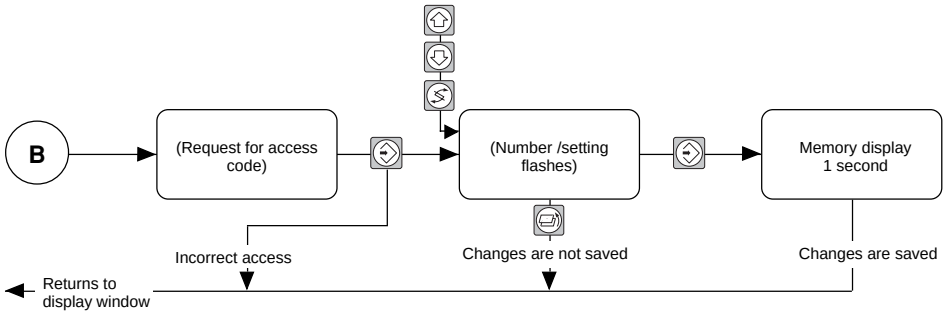


(A) Returns to trend display automatically (B) Jumps to programming mode

(C) Jumps to “Change Access code” mode


Wiper interval
x.xx h:min
Display range
Trend display
xxx Day(s)
Analogue output
x % = y mA
xxx % = yy mA
Oper. temp.
(min. xx °C)
(max. xx °C)
Max. rinsing time
xx min
Start rinse duration
x min
Max. free rinse duration
x:xx h:min
Lamp post-burning
Zeit x min
Minimum Line voltage
xxx V
Pause on pause contact
xxx
Operating hours
xx h
Turn-ons
xx
Lamp hours
xx h
Lamp turn-ons
xx
A
only for equipment with a conventional ballast
Control
xxx
Control
on
Control
xxx
Control
off
External control
XmA = yy%
20 mA = zzz%
Control
manual
A
B

Programming instructions

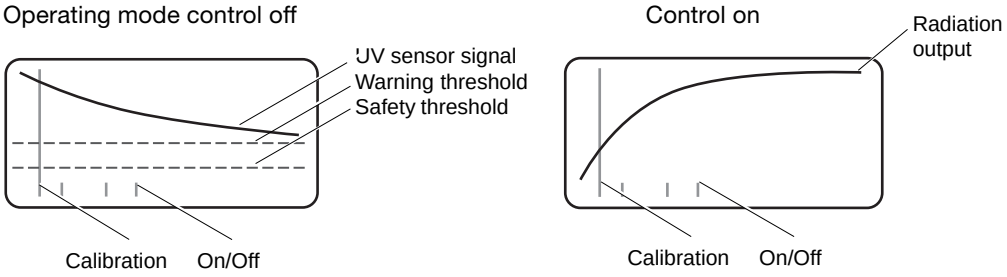


NOTE

If the access code has been entered correctly once, it will not be necessary to enter it again for further programming. When the ENTER key is pressed, the flashing numbers or settings will be displayed immediately.

If none of the keys are pressed for 5 minutes or if the display returns to the trend or standard display, the access code will be cleared automatically.

4.3.1 Trend display



The trend display enables the user to monitor the lamp for signs of ageing or its protective tube for evidence of a coating and highlights any changes in water quality.

It displays the progress of the UV sensor signal in a time window. Horizontal lines indicate the safety threshold and warning threshold. The short vertical lines show the points at which the UV system has been switched on. The UV sensor signal display ranges from 0 % (or W/m²) to the value assigned to the analogue output value of 20 mA (see section 4.3.11). The time window can be adjusted (see section 4.3.8) and ensures a continuous display: after a preset period of time has elapsed, the oldest value is deleted and the new value displayed.

With a controlled system, the radiation output is displayed as the relative value instead of the probe signal.

The warning and safety threshold is not indicated

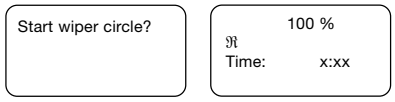
NOTE

A full vertical line is shown in the trend display for each calibration of the UVC sensor.

Default setting

Time window	100 days
Maximum sensor signal value	120 %

4.3.2 Starting a Wiper Cycle



Display during the wiper circle

When the system is in operation and after the preset wiper interval has elapsed, a wiper cycle commences. Additional wiper cycles can be started manually by pressing the enter key.

During the wiper cycle, an arrow indicating the direction of the wiper appears on the display (if the arrow is pointing to the right, the wiper is moving towards the motor, if the arrow is pointing to the left, the wiper is moving away from the motor).

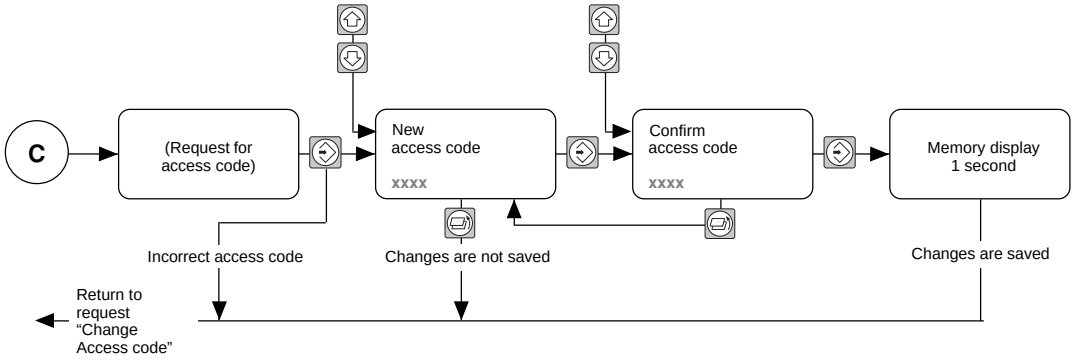
The amount of time that has elapsed since the wiper cycle began is also displayed.

The warning and safety thresholds are not monitored during the wiper cycle. While the wiper is near the UV sensor, a drop in the UV sensor signal should be observed.

If the wiper cycle is not completed within a preset time, a fault is reported. The system will continue to run but no additional wiper cycles will commence.

4.3.3 Changing the Access code

There is an access code for the programming mode to prevent any unauthorized changes to the control system settings. The operator has a free choice of code. After the access code has been changed, access to the programming mode will remain blocked. The new access code must be entered before access can be granted.



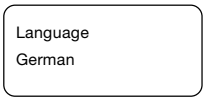
NOTE

Make a note of the access code. The correct access code must be entered before parameters can be set.

The default access code does not guarantee protection against unauthorized changes.

Default setting 5000

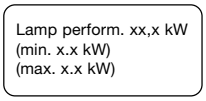
4.3.4 Setting the Language



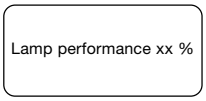
The operator has a choice of various languages: German, English, French and Spanish.

Default setting German

4.3.5 Changing the Lamp Performance



For systems with an electronic ballast



For systems with a conventional ballast

The performance of new lamps and lamps in systems with a flow that is less than the maximum can be reduced to prolong their operating life and conserve electrical energy.

If, during operation, the UV performance of the lamp falls and the UV sensor signal reaches or falls below the warning threshold, the lamp output should be increased gradually to the maximum level.

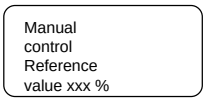
A slight difference between the preset value and actual lamp output is normal.

NOTE

When setting the lamp performance, ensure that the corresponding sensor signal is well above the warning threshold in order to avoid triggering warning messages and system faults.

Default setting This varies according to type of systems

4.3.5.1 Entering the reference value in operating mode “manual control”



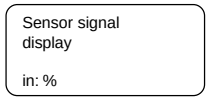
In the operating mode “manual control”, the reference value for the probe signal can be preset. In operation, the radiation output will be controlled so as to maintain the preset UVC probe signal value. This results in the system independently adjusting variable operating conditions, such as radiator weathering, fluctuations in water quality, etc.

NOTE

The control of radiation output should only take place in an area designated for electrical control gear.

Default value 100 %

4.3.6 Sensor Signal System



The UVC sensor monitors UVC output.

A drop in the sensor signal can be caused by:

- the formation of a coating on the lamp's protective tube
- a considerable deterioration in the UV transmission of the water
- a reduction in the UVC output of the lamp due to ageing.

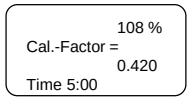
The operator can choose between a relative display of the sensor signal in % or an absolute display in W/m².

NOTE

The sensor signal display will not be correct until calibration has been carried out. It is displayed in % as standard. Please refer to the separate operating instructions for special applications that require the sensor signal to be displayed in W/m².

Default setting %

4.3.7 Sensor Calibration



The sensor must be calibrated before the system is commissioned for the first time and every time the lamp is replaced. It is always calibrated with new lamps that are operated at full capacity (please refer to the sections entitled "Replacing the Lamp" and "Commissioning").

NOTE

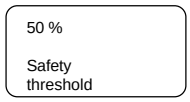
The sensor can only be calibrated when the system is running. If the sensor signal is too weak to ensure correct calibration, a flashing double arrow will replace the sensor signal display in % or W/m² and calibration will not be possible.

The warning and safety thresholds are not monitored during calibration.

DANGER

A sensor that has not been calibrated correctly cannot function properly.
This may result in the consumer obtaining water that has not been disinfected adequately.

4.3.8 Setting the safety threshold in operating mode "control off"



If the UVC output falls so low that the sensor signal falls below the safety threshold, reliable disinfection can no longer be ensured. Should this be the case, the stop valve, if there is one, will close. Two flashing arrows on the display indicate that the signal has fallen below the safety threshold.

An indicator can be connected to the SAFETY THRESHOLD relay of the control system. The relay closes when the signal falls below the safety threshold.

Default setting The safety threshold is normally set at 50 % but it can be changed for special applications.

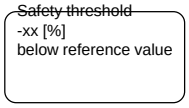
DANGER

Adequate disinfection or water treatment can only be ensured if the safety threshold has been set correctly.

NOTE

The safety threshold must be below the warning threshold. It is not possible to set it above the warning threshold. Please refer to the separate operating instructions for special applications that require the sensor signal to be displayed in W/m².

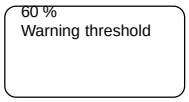
4.3.8.1 Setting the safety threshold in operating mode “control on”



Default value The safety threshold is normally set at 10 percentage points – 10 [%] below the reference value (operating mode “control on”)

E.g.: with a reference value of 60 % and a safety threshold of -10 [%] the system will shut down if a probe signal falls to 50 %.

4.3.9 Setting the warning threshold in operating mode “control off”



If the UVC output falls so low that the sensor signal falls below the warning threshold, a warning is issued. In order to prevent the signal from falling below the safety threshold, clean the lamp’s protective tube or replace the lamp and/or improve the quality of the water using a suitable treatment method. A flashing arrow on the display indicates that the signal has fallen below the warning threshold.

An indicator can be connected to the WARNING THRESHOLD relay of the control system. The relay closes when the signal falls below the warning threshold.

The warning threshold is normally set at 60 % but it can be changed for special applications.

Default setting 60 %

NOTE

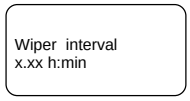
The warning threshold must be above the safety threshold. It is not possible to set it below the safety threshold. Please refer to the separate operating instructions for special applications that require the sensor signal to be displayed in W/m².

4.3.9.1 Setting the warning threshold in operating mode “control on”

similar! The warning threshold is normally set at 5 percentage points -5 [%] below the reference value (operating mode “control on”).

E.g.: with a reference value of 60 % and a warning threshold of -5 [%] the system will issue a warning if a probe signal falls to 55 %.

4.3.10 Setting the Wiper Interval



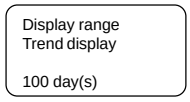
When the system is in operation, a new wiper cycle is triggered after the wiper interval has elapsed. The length of the interval will depend on the contamination level and the chemical composition of the water to be treated. A wiper interval of one hour is ideal for the majority of applications.

Significantly shorter wiper intervals are usually only required for sewage applications. However, the wiper can be expected to wear out more quickly in these applications.

Please also refer to section 4.3.2, “Starting a Wiper Cycle”.

Defaultsetting 2 h

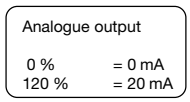
4.3.11 Setting the Display range of the Trend Display



It is possible to set the length of time for which the sensor signal is recorded for the trend display. The value (in days) is interpreted as a time window and ensures a continuous display: after the preset period has elapsed, the oldest value is deleted and the new value displayed.

Default setting 100 days

4.3.12 Sensor Signal Analogue Output: Setting the Output Signal



The UVC sensor signal can be recorded. The recorder should be connected to the standard output of the control system.

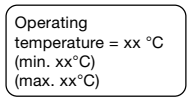
The operator has a choice of output signal: 0-20 mA or 4-20 mA: 0 and 4 mA correspond to the sensor signal 0 % (W/m^2) and 20 mA can be assigned any value.

NOTE

The sensor signal value assigned to the 20 mA output is also the maximum value of the trend display.

Default setting 0 % = 0 mA 120 % = 20 mA

4.3.13 Setting the Maximum Operating Temperature



If there is no flow through the system or it is too low, e.g. when the stop valve is closed, the flushing valve is opened when the maximum water temperature is reached to prevent the system from overheating.

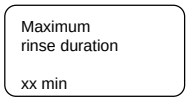
If the maximum water temperature does not fall by approximately 5 °C during the maximum flushing period (please refer to 4.3.14) and/or the water temperature increases to the maximum level, the control system switches off the lamp and reports a fault.

NOTE

The rinsing valve should be large enough to ensure adequate rinsing of the system. Set the maximum water temperature in the display sufficiently lower than the maximum value, displayed at the bottom line to prevent the maximum temperature from being reached during the rinsing process.

Default setting Displayed as max. value in the display depending on the system design.

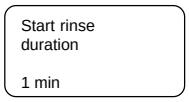
4.3.14 Maximum Rinse Duration Following a Temperature Rise



If the maximum water temperature does not fall by approximately 5 °C during the rinsing period, the control system switches the lamp off and reports a fault. Please also refer to section 4.3.13.

Default setting 1 minute

4.3.15 Setting the Start Rinse Duration



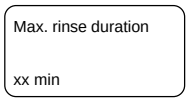
The start rinse duration is designed to ensure that the consumer receives only perfect water. After ignition, as soon as the UV lamps have reached the operating temperature and the sensor signal has exceeded the safety threshold, the automatic rinsing valve (if there is one) opens for the start rinse duration. The stop valve does not open until after that.

NOTE

A start rinse duration of 1 minute is usually adequate. If the system does not have a rinsing valve, the duration of the start rinse duration can be set to 0 minutes.

Default setting 1 minute

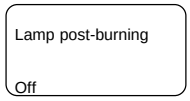
4.3.16 Setting the Maximum Free Rinse Duration



The free rinsing phase is used primarily for the disinfection of drinking water. A maximum free rinsing period of over 10 hours is often used in this application. If there is such deterioration in the UV transmission when using water that has low natural filtering properties, after heavy rainfall for example, that the UVC sensor signal falls below the safety threshold, the stop valve closes and the flushing valve opens. When the water quality improves, the UV disinfection system returns to normal operation. If the UVC sensor signal does not rise above the safety threshold during the maximum free rinse duration, the UV disinfection system reports a fault.

Default setting 1 minute

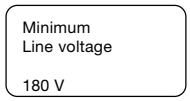
4.3.17 Activating Lamp Post-Burn



In large UV disinfection systems used for the disinfection of drinking water, it can take some time to stop the flow, either by closing the stop valve or by an alternative method. In this case, allowing the lamp to stay on prevents water that has not been disinfected properly from reaching the consumer while the UV disinfection system is being switched off. A post-burn phase of 1 minute is usually adequate.

Default setting Off

4.3.18 Setting the Minimum Line Voltage



Line voltage monitoring prevents a drop in the line voltage from causing uncontrolled failure of the UV system and lamps. If the line voltage falls to the minimum value, the control system goes into undervoltage mode and the system is switched off. If the line voltage rises above the minimum value again, the system recommences operation automatically.

NOTE

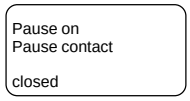
For systems that are supplied with 3 x 400 V, only one phase is monitored. If the voltage drops during one of the two phases that are not monitored, the lamp may fail without the control system reporting the undervoltage.

IMPORTANT

The appropriate customer service department must be consulted before the minimum supply voltage can be changed.

Default setting 180 V

4.3.19 Pause Function

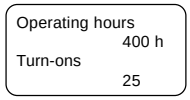


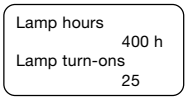
The UV system can be switched on and off by opening and closing an external contact that is connected to the pause input of the control system.

The operator has a choice of whether the UV system should commence operation when the pause contact is open or closed.

Default setting Pause when pause contact closed. The UV system will commence operation when the pause contact is open.

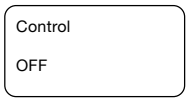
4.3.20 Displaying/Resetting the Counters





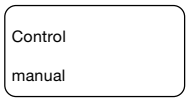
The OPERATING HOURS and TURN-ONS counters cannot be reset.
The LAMP HOURS and LAMP TURN-ONS counters can be reset.

4.3.21 Switching the control on/off (only for systems with electronic control gear)



For systems with electronic control gear, the operating mode “control ON” can be switched on here.

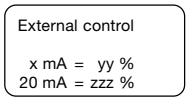
4.3.21.1 Switching between manual and external control



With manual control the probe signal is controlled at a set reference value (s.4.3.5.1).

With external control the reference value is set by a 0/4-20 mA output signal.

4.3.21.2 Allocating the external output signal



You can select to adjust the reference value for the probe signal with an external output signal of 0-20 mA and 4-20mA. 0/4-20 mA can be allocated to a probe signal of 20-100 %. The 20 mA value must always be greater than the 0/4 mA value.

4.3.22 Alarm Relay

An indicator can be connected to the ALARM relay. In the event of a fault or voltage failure, the relay opens.

4.3.23 Booster Pump Relay

The BOOSTER PUMP relay can be used to activate a booster or circulating pump. The relay closes as soon as the UVC output of the lamp exceeds the warning threshold. The relay opens if the UVC output falls below the safety threshold or the system is switched off.

An external fault indicator, e.g. a flow detector, can be connected to the FAULT switch input.

4.3.24 Fault Switch Input

An external fault input is supplied jumpered, e.g. a flow detector, can be connected to the Fault switch input.

NOTE

The FAULT switch input is supplied jumpered. If the jumper is removed and a fault indicator is not connected, the control system reports a fault and the UV disinfection system can no longer be operated.

IMPORTANT

Remove the jumper when connecting a fault indicator. If you do not, faults will not be reported.

5 Assembly and Installation

Please take the following safety precautions prior to installation:

DANGER

Ensure that

- **water is continually flowing through the radiation chamber during operation**
- **the maximum flow is not exceeded and**
- **the UV transmission does not fall below the minimum level otherwise adequate disinfection cannot be guaranteed.**

Please refer to the accompanying data sheet for the maximum flow. The maximum flow is a function of the radiation dose required and the minimum UV transmission of the water to be disinfected.

IMPORTANT

- **The site for installation must be dry and frost-free and ensure protection of the UV disinfectant system from chemicals, dyes and corrosive vapours.**
- **The ambient temperature and heat radiated from hot surfaces must not exceed 40 °C.**
- **A suitable filter should be installed upstream from the UV system if there are any suspended solids or dissolved solids in the water to be disinfected.**
- **Ensure that the maximum operating pressure specified in the accompanying data sheet is not exceeded.**

NOTE

Although the UV system contains modern lamp ballasts with gentle lamp ignition, avoid switching the lamps on and off too frequently.

5.1 Radiation Chamber

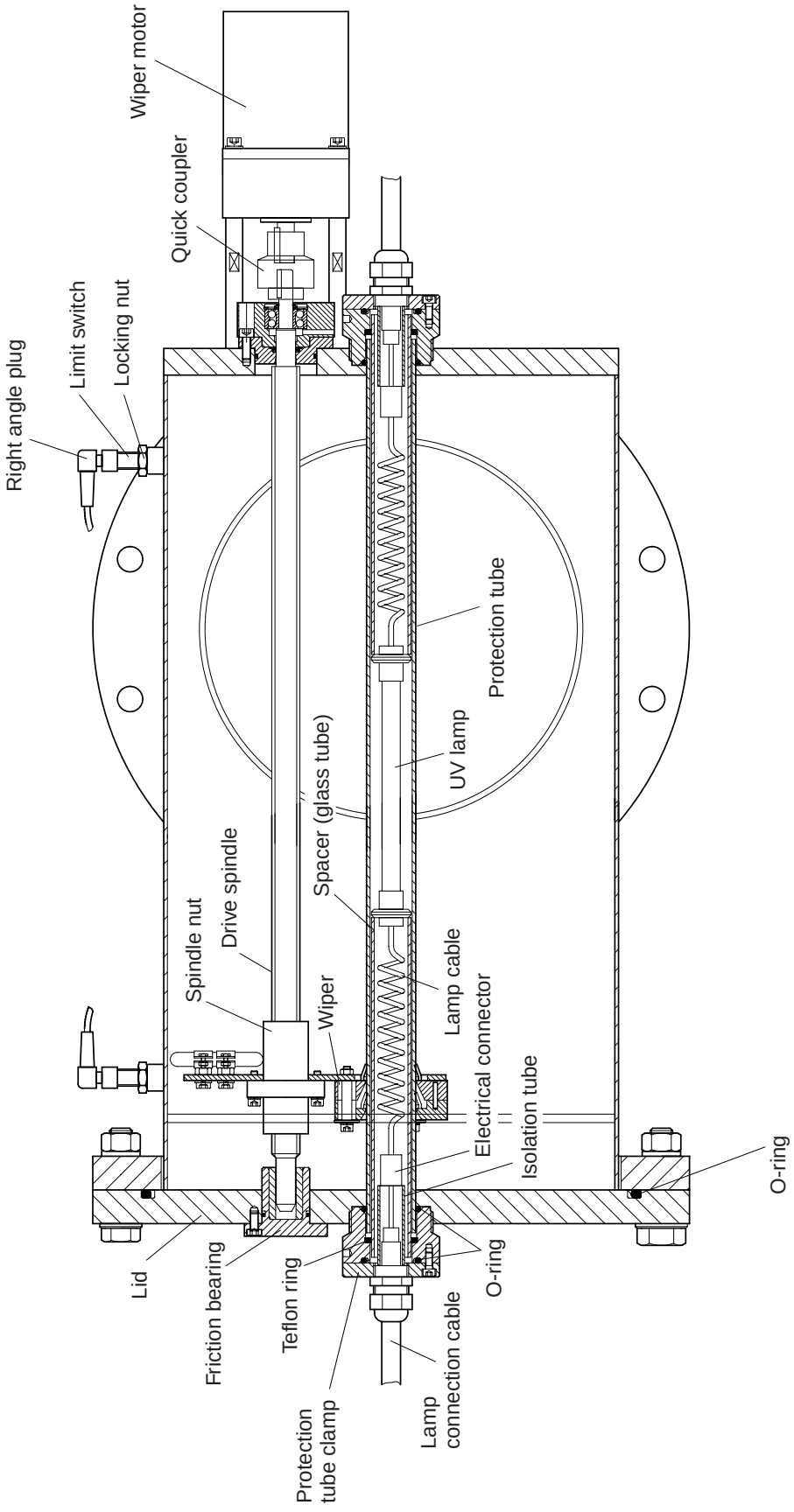
Please refer to the accompanying data sheet for an explanation of the radiation chamber.

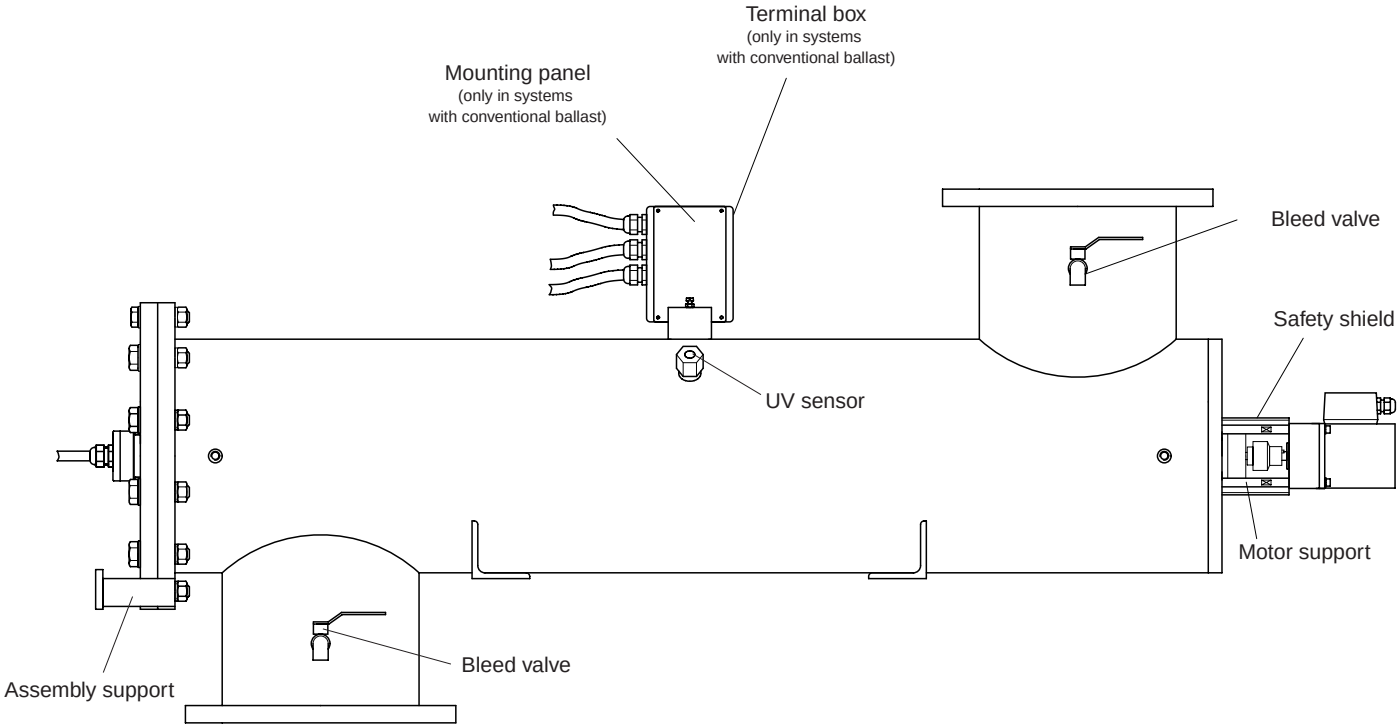
5.1.1 Preparation for Assembly

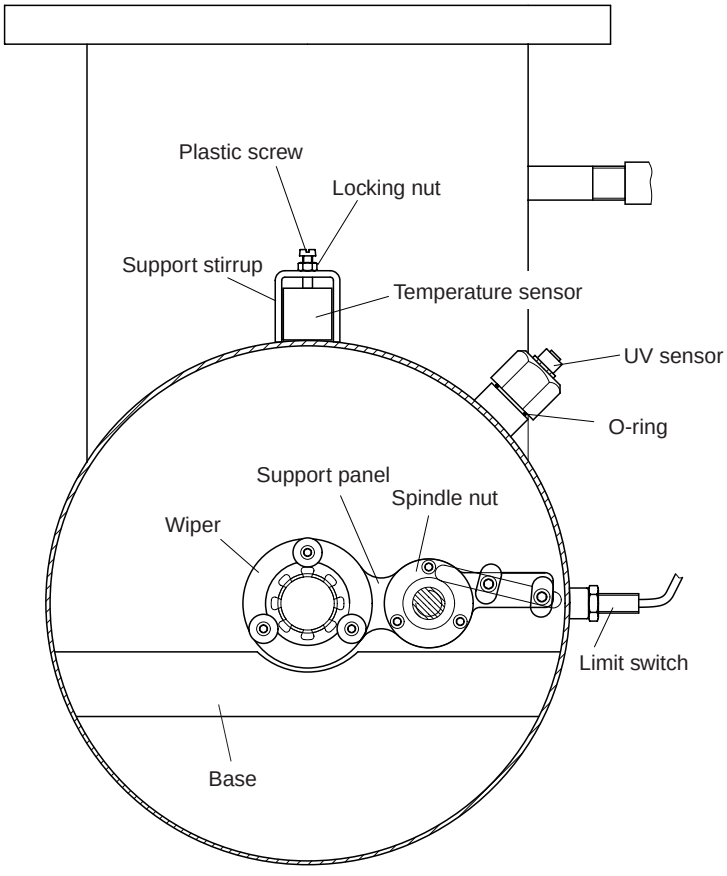
NOTE

Depending on the model, the wiper and an auxiliary tube may also be fitted already in the chamber.

- Position the radiation chamber so that the opening opposite the wiper motor is horizontal or in an upright position.
- If the protective tube clamps were screwed into the radiation chamber during transport, these should be unscrewed. If necessary, use the hook spanner provided.
- Screw auxiliary fitting into the radiation chamber on the side of the motor, if this has not already been done.
- Insert the auxiliary assembly tube (PVC tube) into the radiation chamber from the lid end and clamp it gently in the assembly aid.


Wiper motor
Quick coupler
Limit switch
Locking nut
Right angle plug
Protection tube
UV lamp
Spacer (glass tube)
Drive spindle
Spindle nut
Wiper
Lamp cable
Electrical connector
Isolation tube
O-ring
Lid
Friction bearing
Teflon ring
O-ring
Lamp connection cable
Protection tube clamp


Terminal box
(only in systems
with conventional ballast)
Mounting panel
(only in systems
with conventional ballast)
Bleed valve
Safety shield
UV sensor
Motor support
Assembly support
Bleed valve


Plastic screw
Locking nut
Support stirrup
Temperature sensor
UV sensor
O-ring
Support panel
Spindle nut
Wiper
Limit switch
Base

5.1.2 Assembly

IMPORTANT

- **The system must be assembled according to the accompanying data sheet.**
- **Leave sufficient space to carry out maintenance work.**
  Please refer to the accompanying data sheet for the amount of space required.

► Use the mounting materials provided to secure the radiation chamber to the wall or a suitable frame in a horizontal position.

5.1.3 Attaching the Warning Sign

NOTE

Stick the self-adhesive warning sign provided onto the radiation chamber so that it is clearly visible.

5.1.4 Hydraulic Connections

IMPORTANT

- **Hydraulic connection of the radiation chamber should be carried out in accordance with current general guidelines and the installation regulations in your country.**
- **Use UV-resistant material for hydraulic connection. PVC installation material may only be used at a safe distance from the radiation chamber.**
- **For applications in which high levels of disinfection are required (e.g. the disinfection of drinking water) there must be no interruption of the flow in the event of a fault (e.g. booster pump disconnection):**
  Install an automatic stop valve after the radiation chamber and connect it to the control system.
  The stop valve must close automatically to ensure that the flow is interrupted in the event of a supply voltage failure.

NOTE

- **Valves should be fitted before and after the radiation chamber so that it can be shut off for maintenance purposes.**
- **Fireproof taps suitable for taking microbiological samples should be fitted upstream and downstream from the radiation chamber.**

5.2 Control Cabinet

5.2.1 Installation

The control cabinet should be installed so that the lamp and sensors can be connected using the cables provided.

- Use the clamp to secure the cable conduit containing the lamp connection cable, the earth wires, the sensor connection cables and the wiper motor in the middle of the radiation chamber.

NOTE

To prevent water from dripping into the end of the cable conduit, if necessary, provide appropriate protection for the end of the conduit and/or install it so that the opening is facing downwards.

IMPORTANT

The lamp connection cable and sensor cable must not be extended.

5.2.2 Electrical Connections

Electrical installation should be carried out by an authorized skilled electrician using the documentation provided (circuit diagram).

DANGER

- **Please comply with current general guidelines and the installation regulations in your country.**
- **The power supply must be switched off while the system is assembled.**
- **Connect the earth lead to the radiation chamber.**
- **Do not extend the lamp connection cable or the sensor cable.**

Connecting the two earth leads to the radiation chamber and radiation chamber lid.

▶ Screw the ring cable lugs into the appropriate holes using the screws and toothed washers provided.

5.2.3 Attaching the Temperature Sensor

DANGER

- **The radiation chamber may overheat if the temperature sensor is not installed correctly.**

The temperature sensor monitors the temperature of the water and should be attached to the radiation chamber.

▶ Insert the temperature sensor into the support stirrup provided in the middle of the radiation chamber.

▶ Secure it gently using the plastic screw provided.

▶ Tighten the locking nut slightly.

5.2.4 Positioning and Connecting the Limit Switches

The two limit switches control the wiper motor.

▶ Screw the two limit switches into the threaded pipe sockets provided at both ends of the radiation chamber.

▶ Tighten the locking nuts slightly.

▶ Connect the limit switches to the right angle plugs. Please note the designation of the cables and threaded pipe sockets.

IMPORTANT

If the limit switch connections are confused the wiper motor will not recognize the end positions. This will cause wiper failure.

5.2.5 Connecting the UV Sensor

- Guide the O-ring over the sensor thread as far as the seal groove.
- Screw the sensor into the sensor connection and tighten gently.
- Connect the UV sensor using the black sensor connection cable.

5.2.6 Attaching the Wiper Motor

- Loosen and remove the nuts on the four inserted screws. Make sure that the gears do not become detached from the motor.
- Push the wiper motor carefully onto the quick coupler and secure it using the four screws.

NOTE

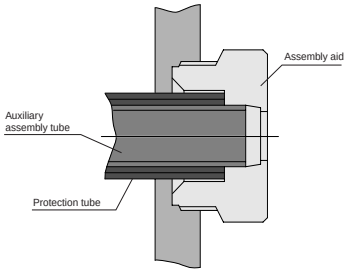
Do not cover the bayonet coupler with the safety shield until the lamp and its protection tube have been installed.

5.2.7 Installing the Terminal Box

A terminal box containing the ignition device must be installed on the radiation chamber of systems with a conventional ballast.

- Unscrew the terminal box and remove the lid.
- Secure the terminal box to the mounting panel on the support stirrup of the temperature gauge using the screws provided.
- Place the lid on the terminal box and screw it down.

5.3 Installing the Lamp Protection Tube



IMPORTANT

Examine the protection tube for damage prior to installation. Damaged tubes must not be installed.

NOTE

The protection tube is inserted into the radiation chamber from the lid end as standard. If there is more space on the motor side, making it easier to insert it from this side, a special assembly aid is required (optional), see also 5.1.2 “Preparation for Assembly”.

- Push the protective tube carefully over the auxiliary assembly tube from the lid end until it locks into place. The protective tube should now protrude by approximately 1 cm.
- Push the O-ring provided over the lid end of the protection tube.
- Check whether the Teflon ring is in the correct groove on the clamp. If not, push the Teflon ring into the clamp until it jumps into the correct groove.
- Push the O-ring provided over the protection tube.
- Push the clamp over the protection tube and screw it into the radiation chamber; tighten it by hand.
- Remove the auxiliary assembly tube and unscrew the assembly aid.
- Push the O-ring provided over the motor side of the protection tube.
- Push the clamp over the protection tube on the motor side and screw it into the radiation chamber; tighten it by hand.
- Use the hook spanner to tighten the tube clamp on both sides. Only a small amount of force is required.

5.4 Installing and Connecting the Lamp

DANGER

- **Switch off at the mains before installing and connecting the lamp.**
- **The lamp must be installed before it can be commissioned. UVC radiation is damaging to the eyes and skin.**
  The UV system must be installed as instructed before the lamp can be commissioned.
- **Do not make any unauthorized changes to the lamp connection cable already installed.**

IMPORTANT

- **Protective gloves (cotton gloves) should be worn when installing the lamp.**
- **Do not touch the lamp with your bare hands.**
  Fingerprints become etched in the glass and may lead to premature failure. Remove any fingerprints prior to installation using a cloth that has been soaked in alcohol.

- ▶ Insert the O-rings provided in the correct grooves on the tube clamps.
- ▶ Remove the lamp from its packaging.
- ▶ Extend the lamp cables on both sides of the lamp slightly so that the connections lie at the ends of the radiation chamber ready for installation later.
- ▶ Clean the lamp using the cloth provided.
- ▶ Insert the lamp into the protective tube from the lid end. Allow approximately 5 cm of the lamp cable to protrude.
- ▶ At the lid end, push the spacer (glass tube) over the lamp cable until it locks into place on the lamp. The lamp cable must protrude by approximately 3 cm. If necessary, use tweezers or small pliers to pull the lamp cable out slightly.
- ▶ Connect the lamp cable to the connection terminal of the lamp connection cable.
- ▶ Push the lamp connection cable carefully into the spacer holding onto the spacer for as long as possible.
- ▶ Push the lamp cover onto the tube clamp and secure it.
- ▶ On the motor side, push the spacer (glass tube) over the lamp cable until it locks into place on the lamp. The lamp cable must protrude by approximately 3 cm. If necessary, use tweezers or small pliers to pull the lamp cable out slightly.
- ▶ Connect the lamp cable to the connection terminal of the lamp connection cable.
- ▶ Push the lamp connection cable carefully into the spacer.
- ▶ Push the lamp cover onto the tube clamp and secure it.

5.4.1 Mounting the Safety Shield on the Wiper Motor

After the lamp has been installed, the safety shield should be mounted on the wiper motor.

- ▶ Pull the safety shield (split tube made of transparent plastic) apart at the split carefully and push it down over the motor supports.

  The safety shield must be flush against the radiation chamber. The hole in the safety shield is for the protection tube clamp.

6 Commissioning

DANGER

Before commissioning the system, any pipework that transports the treated water should be disinfected, e.g. with high chlorination, for applications in which high levels of disinfection are required (e.g. the disinfection of drinking water). This is particularly important in pipework where bacterial proliferation already exists.

6.1 Checking the Seals and Bleeding the Radiation Chamber

- ▶ Open the bleed valve on the radiation chamber.
- ▶ Open the stop valve in front of the radiation chamber slowly.
- ▶ Fill the radiation chamber until water escapes from the bleed valve.
- ▶ Close the bleed valve.
- ▶ Check that the radiation chamber is sealed properly.
- ▶ Open the stop valve after the radiation chamber (only necessary if it is a manual stop valve).

6.2 Switching on the UV System

IMPORTANT

The system must not be switched on until the radiation chamber is full of water.

- ▶ Switch on at the mains.
- ▶ Check the parameters in the programming mode of the control system and change them if necessary (please refer to section 4.3 “Operating Status Displays”)

IMPORTANT

Ensure that the UV lamp is operated at full capacity.

- ▶ Press the START/STOP key to switch on the UV system. The START/STOP key must be held down for at least 2 seconds.
- ▶ If the control system adopts PAUSE status, activate the pause contact.

After the lamp has ignited, it takes approximately 1 minute to reach full capacity.

As the UVC sensor has not yet been calibrated, the safety threshold may not be exceeded within the commissioning period and the maximum free flushing period causing the control system to report a fault. In this case, carry out temporary calibration:

DANGER

Temporary calibration of the UVC sensor does not replace correct calibration after commissioning.

Temporary calibration

- ▶ Press the START/STOP key to switch on the system.
- ▶ Calibrate the UVC sensor to 100 % within the commissioning period as described in section 6.3. It is not necessary to wait for a stable sensor value.

NOTE

Please follow the separate operating instructions enclosed for special applications that require the sensor signal to be displayed in W/m².

6.3 Calibrating the UVC Sensor

DANGER

- **The UVC sensor must be calibrated correctly to ensure adequate treatment.**
- **The water to be disinfected must be flowing through the radiation chamber during calibration of the UVC sensor.**
- **The sensor must always be calibrated with new lamps.**
- **The lamp should be operated at full capacity during calibration of the sensor.**

The safety and warning thresholds are not monitored during calibration. As a safety precaution, calibration stops automatically after 5 minutes without saving the changes made. The display indicates how much time remains.

Before commencing calibration, the sensor signal must be constant. A fluctuating sensor signal means that the lamp is not yet warm enough (it takes 5 to 10 minutes to warm up).

6.3.1 Calibrating the Sensor

▶ Use the CHANGE key to access the LAMP PERFORMANCE display.

If the maximum lamp performance has been set, calibration can commence. Otherwise, the lamp performance should be increased to the maximum level as follows:

▶ Press the ENTER key to confirm and ACCESS CODE REQUEST will be displayed.

▶ Enter the access code and confirm it by pressing the ENTER key. LAMP PERFORMANCE will reappear and the values that can be adjusted will flash.

▶ Press the UP key to set the maximum lamp output.

▶ Press the ENTER key to confirm this and the message “Data is being saved” will appear briefly.

▶ Wait until the sensor signal remains constant.

Calibration

▶ Use the CHANGE key to locate the SENSOR CALIBRATION display.

▶ Press the ENTER key to confirm and ACCESS CODE REQUEST will be displayed.

▶ Enter the access code and confirm it by pressing the ENTER key. SENSOR CALIBRATION will reappear and the values that can be adjusted will flash.

▶ Use the UP and DOWN keys to set the sensor value to 100 %.

▶ Press ENTER to confirm this and the message “Data is being saved” will appear briefly. The sensor is now calibrated.

▶ Press the BACK key to exit the programming mode.

The Dulcodes UV disinfection system is now ready for operation.

NOTE

Please follow the separate operating instructions enclosed for special applications that require the sensor signal to be displayed in W/m². All new UV lamps need a run-in period of 100-200 hours. Therefore, the UVC sensor should be recalibrated approximately 200 hours after commissioning.

6.3.2 Setting the radiation output in operating mode “control off”

The output of new lamps and lamps in systems with a flow that is less than the maximum can be reduced in order to prolong their operating life and conserve electrical energy.

If, during operation, the UV output of the lamp falls and the UV sensor signal reaches or falls below the warning threshold, the lamp output should be increased gradually to the maximum level.

A slight difference between the preset value and actual lamp output is normal.

NOTE

When setting the lamp output, ensure that the corresponding sensor signal is well above the warning threshold in order to avoid triggering warning messages and system faults.

- ▶ Use the CHANGE key to locate the LAMP PERFORMANCE display.
- ▶ Press the ENTER key to confirm and ACCESS CODE REQUEST will be displayed.
- ▶ Enter the access code and confirm it by pressing the ENTER key. LAMP PERFORMANCE will reappear and the values that can be adjusted will flash.
- ▶ Use the UP and DOWN keys to set the required lamp output.
- ▶ Press the ENTER key to confirm this and the message “Data is being saved” will appear briefly.
- ▶ Press the RETURN key twice to return to the normal display.
- ▶ Wait for approximately 1 minute until the required UV sensor signal is set. If necessary, change the lamp output slightly.

6.3.3 Setting the radiation output in operating mode “control on”

In the operating mode “control on” there are two control options for the radiation output:

- the operating mode “manual control” is used where there is a reduced radiation output to automatically compensate for the e.g. loss of UV output caused by weathering of the radiator.
- with the operating mode “external control”, the radiation output is also regulated by an external command signal (e.g. signal from a flow meter).

NOTE

- **Calibration of the sensor (s.6.3.1) should only be done with new radiators and at full radiation capacity.**
- **Radiation should not fall below the minimum radiation output setting of 20 %.**
- **The following instructions assume that the water has a virtually constant UV transmission. Special settings for water with a fluctuating UV transmission are available on request.**

6.3.3.1 Setting the radiation output in operating mode “control manual”

- ▶ Press the CHANGE button to go to the CONTROL display.
- ▶ Confirm by pressing ENTER, REQUEST RELEASE CODE appears.
- ▶ Enter the release code and confirm by pressing ENTER; CONTROL re-appears; the setting to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set to OFF and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Set the radiation output in accordance with 6.3.2 to the maximum possible value.
- ▶ Calibrate the sensor in accordance with 6.3.1.
- ▶ Use the STOP/START button to switch to SYSTEM OFF.
- ▶ Press the CHANGE button to go to the CONTROL display.
- ▶ Confirm by pressing ENTER, REQUEST RELEASE CODE appears.
- ▶ Enter the release code and confirm by pressing ENTER; CONTROL re-appears; the setting to be adjusted now flashes.

- ▶ Use the UP or DOWN button to set to ON and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the “MANUAL or EXTERNAL CONTROL” display.
- ▶ Confirm by pressing ENTER, the setting to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set to MANUAL and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the MANUAL CONTROL display.
- ▶ Confirm by pressing ENTER, the reference value to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set the required reference value and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the SAFETY THRESHOLD display.
- ▶ Confirm by pressing ENTER, the safety threshold value to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set the required safety threshold and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the WARNING THRESHOLD display.
- ▶ Confirm by pressing ENTER, the warning threshold value to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set the required warning threshold and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Use the START/STOP button to re-start the system.

E.g.:

UV treatment is based on operating data for the end of the lifetime of the radiator, which is indicated by a 50 % radiation output. In order to achieve a constant radiation output greater than 50 %, the reference value must be set at 60 %, the safety threshold at –10 [%] and the warning threshold at –5 [%]. Regardless of the lifetime of the radiator, the radiation output is now automatically readjusted so as to constantly obtain a probe signal equal to 60 % of the original value. If the signal falls short of this value by 5 per cent, a warning message will be issued. With a 10 per cent shortfall an alarm message is issued and the system shuts down, as now the minimum radiation output has fallen to 50 %, which was the level defined when designing the system.

6.3.3.2 Setting the radiation output in operating mode “external control”

Before commissioning the operating mode “external control ”, a definitive reference value zzz needs to be calculated for the system:

zzz = reference value x F/F_{max}	Reference value:	as a % of the maximum radiation output
	F	maximum flow rate anticipated at the flow meter, to which the 20mA signal needs to be allocated
	F_{max}	maximum permitted flow rate for the Dulcodes M according to the data sheet depending on UV transmission and required dose of radiation

- ▶ Press the CHANGE button to go to the CONTROL display.
- ▶ Confirm by pressing ENTER, REQUEST RELEASE CODE appears.
- ▶ Enter the release code and confirm by pressing ENTER; CONTROL re-appears; the setting to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set to OFF and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Set the radiation output in accordance with 6.3.2 to the maximum possible value.
- ▶ Calibrate the sensor in accordance with 6.3.1.
- ▶ Use the STOP/START button to switch to SYSTEM OFF.
- ▶ Press the CHANGE button to go to the CONTROL display.
- ▶ Confirm by pressing ENTER, REQUEST RELEASE CODE appears.

- ▶ Enter the release code and confirm by pressing ENTER; CONTROL re-appears; the setting to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set to ON and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the “MANUAL CONTROL or EXTERNAL” display.
- ▶ Confirm by pressing ENTER, the term to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set to EXTERNAL and press the CHANGE button to go to the input field for the lower output signal x.
- ▶ Use the UP or DOWN button to set to 0 or 4 mA and press the CHANGE button to go to the input field for the corresponding % value yy.
- ▶ Use the UP or DOWN button to set a value > 20% and press the CHANGE button to go to the input field for the definitive reference value zzz.
- ▶ Use the UP or DOWN button to set the upper value calculated and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the SAFETY THRESHOLD display.
- ▶ Confirm by pressing ENTER, the safety threshold value to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set the required safety threshold and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Press the CHANGE button to go to the WARNING THRESHOLD display.
- ▶ Confirm by pressing ENTER, the warning threshold value to be adjusted now flashes.
- ▶ Use the UP or DOWN button to set the required warning threshold and confirm by pressing ENTER. The message appears “Data has been saved”.
- ▶ Use the START/STOP button to re-start the system.

E.g.:

UV treatment is based on operating data for the end of the lifetime of the radiator, which is indicated by a 50 % radiation output. According to the data sheet, the system is suitable for a maximum of 200 m^3/h but is only operated at a maximum of 150 m^3/h. The 20 mA signal is allocated to this 150 m^3/h. The definitive reference value zzz = 60 % x 150 / 200 = 45 %. It therefore follows from this calculation that there should be a minimum radiation output of zzz’ = 50 % x 150/200 = 38 %. The safety threshold is therefore set at -7 [%] and the warning threshold e.g. at -3 [%]. In this way the radiation output is controlled not only depending on the radiator weathering but also depending on the flow of water, to achieve a constant dose of radiation.

7 Maintenance

The following maintenance work should be carried out at regular intervals:

- The UV lamp should be replaced at the end of its useful life.
- The protection tube should be cleaned and inspected (usually only necessary when the lamp is replaced).
- The UV sensor should be cleaned (usually only necessary when the lamp is replaced).
- Check the wiper mechanism (annually)
- Replacement of expendable parts on the wiper mechanism by trained customer service support (usually every 2 years)
- Replacement of wiper mechanism by trained customer service support (usually every 4 years)
- The fan filter mats and the air exit filter on the control cabinet should be replaced (usually once a year).

Keep a log of all maintenance work carried out. There is a template for this in the appendix.

NOTE

The X ring for sealing the wiper drive spindle must be changed at least once every two years. Any slight leakage which may occur beforehand (slight dripping) will not impair system performance.

DANGER

- **The UVC lamp must be replaced before it exceeds its maximum life time. If it is not, reliable operation of the UV disinfection system is no longer ensured.**
- **Switch off at the mains before commencing any maintenance work.**
- **Depressurise the radiation chamber before commencing any maintenance work.**
- **UVC radiation is damaging to the eyes and skin.**

  The lamp must be installed before it can be commissioned.

  The UV disinfection system must be installed as instructed before the lamp can be commissioned.
- **If the fan filter mats or the air exit filter become clogged, the control cabinet may overheat and be destroyed.**

7.1 Replacing the Lamp

DANGER

UV lamps should be replaced if

- **the sensor signal approaches the safety threshold and possible causes, e.g. a coating has formed on the protection tube or the UV transmission has deteriorated considerably, have been ruled out.**
- **their operating life approaches or exceeds the maximum life time.**
- **Switch off at the mains before installing and connecting the lamp.**
- **UVC radiation is damaging to the eyes and skin.**
  The lamp must be installed before it can be commissioned.
  The UV disinfection system must be installed as instructed before the lamp can be commissioned.
- **Do not make any unauthorized changes to the lamp connection cable already installed.**

IMPORTANT

Do not touch the glass of the lamp with your bare hands. Fingerprints become etched in the glass and may lead to premature failure. Remove any fingerprints prior to installation using a cloth that has been soaked in alcohol.

NOTE

Clean the protective tube each time the lamp is changed.

- ▶ Press the START/STOP key to switch off the UV disinfection system.
- ▶ Switch off at the mains and unplug the system.
- ▶ Close the stop valves before and after the radiation chamber.
- ▶ Pull the wiper motor safety shield apart at the split carefully and remove it.
- ▶ Loosen and remove the screws on the motor side of the lamp cover.
- ▶ Remove the lamp cover carefully until the connection terminal is exposed. If necessary, hold the spacer (glass tube) with one hand.
- ▶ Loosen the lamp cable on the connection terminal and remove the lamp cover with the lamp connection cable.
- ▶ Remove the spacer.
- ▶ Loosen and remove the screws on the lid side of the lamp cover.
- ▶ Remove the lamp cover carefully until the connection terminal is exposed. If necessary, hold the spacer (glass tube) with one hand.
- ▶ Loosen the lamp cable on the connection terminal and remove the lamp cover with the lamp connection cable.
- ▶ Remove the spacer.
- ▶ Remove the lamp.

Before inserting the new lamp, check the protective tube and sensor and if necessary, clean them (see sections 7.2 and 7.3). The new lamp can then be replaced.

- Remove the lamp from its packaging.
- Extend the lamp cables on both sides of the lamp slightly so that the connections lie at the ends of the radiation chamber ready for installation later.
- Wipe the lamp using the cleaning cloth provided.
- Insert the lamp into the protective tube from the lid end. Allow approximately 5 cm of the lamp cable to protrude.
- At the lid end, push the spacer (glass tube) over the lamp cable until it locks into place on the lamp. The lamp cable must protrude by approximately 3 cm. If necessary, use tweezers or small pliers to pull the lamp cable out slightly.
- Connect the lamp cable to the connection terminal of the lamp connection cable.
- Push the lamp connection cable carefully into the spacer holding onto the spacer for as long as possible.
- Push the lamp cover onto the tube clamp and secure it.
- On the motor side, push the spacer (glass tube) over the lamp cable until it locks into place on the lamp. The lamp cable must protrude by approximately 3 cm. If necessary, use tweezers or small pliers to pull the lamp cable out slightly.
- Connect the lamp cable to the connection terminal of the lamp connection cable.
- Push the lamp connection cable carefully into the spacer holding onto the spacer for as long as possible.
- Push the lamp cover onto the tube clamp and secure it.
- Pull the safety shield (split tube made of transparent plastic) apart at the split carefully and push it over the motor supports from above. The safety shield must be flush against the radiation chamber. The hole in the safety shield is for the protective tube clamp.
- Close the outlet valve (this is only necessary if the protective tube and/or the UV sensor have been cleaned).
- Open the stop valve before the radiation chamber slowly.
- Fill the radiation chamber until water escapes from the bleed valve. Close the bleed valve (this is only necessary if the protective tube and/or the UV sensor have been cleaned).
- Check that the radiation chamber is sealed properly.
- Open the stop valve after the radiation chamber (only necessary if it is a manual stop valve).
- Switch on at the mains.

NOTE

Comply with current guidelines and regulations when disposing of the old lamp.

7.2 Cleaning the Lamp Protection Tube

During operation, deposits may form on the protective tube that cannot be removed completely by the wiper. As these deposits absorb UV radiation, they should be removed at regular intervals.

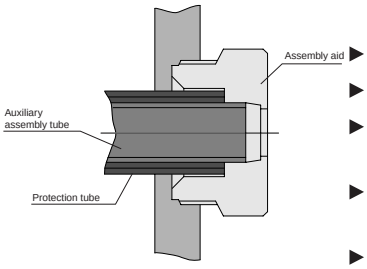
NOTE

The protective tube must be cleaned if the sensor signal falls below the warning threshold and possible causes, e.g. reduced lamp output, the lamp is reaching the end of it useful life, a coating has formed on the sensor or the UV transmission has deteriorated considerably, have been ruled out.

For most applications, it is sufficient to clean the protective tube when the lamp is replaced. Acids such as dilute phosphoric acid, citric acid or dilute nitric acid are particularly suitable cleaning agents.

IMPORTANT

- **If, after cleaning, the radiator protection tube appears even more discoloured and dull or if it is damaged, it must be replaced!**
- **Do not use acids that will lead to corrosion or stress facture, e.g. hydrochloric acid.**
- **Read the safety information provided with the cleaning agent selected.**
- **Wear appropriate safety clothing when cleaning (safety goggles, gloves, etc.).**
- **Make sure that the cleaning agent does not get into the protective tube.**
- **When cleaning UV disinfection systems, ensure that the cleaning agent does not get into the pipe network. This particularly applies to the disinfection of drinking water and other similar applications.**



- ► Use the hook spanner provided to loosen and unscrew the protection tube clamp on the motor side.
- ► Use a small screwdriver or tweezers to remove the O-ring from the protection tube carefully.
- ► Screw the assembly aid into the radiation chamber on the motor side.
- ► Insert the auxiliary assembly tube (PVC tube) into the radiation chamber from the lid end and clamp it gently in the assembly aid.
- ► Use the hook spanner provided to loosen and unscrew the protection tube clamp on the lid end.
- ► Remove the protection tube on the lid end.
- ► Carefully remove the O-ring from the protection tube.
- ► Check the protection tube for damage. If it is damaged, it must be replaced.
- ► Wipe the protection tube using a sponge or cloth that has been soaked in the cleaning solution. The cleaning solution must not get into the protection tube.
- ► Rinse the remainder of the cleaning solution off the protection tube using clarified water. Do not allow any moisture to get into the tube.
- ► Rub the protection tube dry.
- ► Check the O-rings that seal the protection tube and the O-rings in the groove of the tube clamp for damage or malformation. O-rings that are damaged or malformed must be replaced.
- ► Push the protective tube carefully over the auxiliary assembly tube from the lid end until it locks into place. The protection tube should now protrude by approximately 1 cm.
- ► Push the O-ring over the lid end of the protection tube.
- ► Push the tube clamp over the protection tube and screw it into the radiation chamber; tighten it by hand.
- ► Remove the auxiliary assembly tube and unscrew the assembly aid.
- ► Push the O-ring over the motor side of the protection tube.
- ► Push the tube clamp on the motor side over the protection tube and screw it into the radiation chamber; tighten it by hand.
- ► Use the hook spanner to tighten the tube clamp on both sides. Only a small amount of force is required.
- ► Clean the UV sensor as described in section 7.3.
- ► Finally, install the UV lamp and fill and bleed the radiation chamber (see section 7.1).

NOTE

Comply with current guidelines and regulations when disposing of the cleaning solution.

7.3 Cleaning the UVC Sensor

Each time the protective tube is cleaned, the UVC sensor should also be cleaned:

- Loosen the sensor connection cable from the UVC sensor.
- Unscrew the UVC sensor from the radiation chamber.
- Clean the quartz window using a cloth or sponge that has been soaked in cleaning solution until the coating has been removed completely.
- Rinse the quartz window in clarified water and dry it using a soft cloth.
- Examine the O-ring for damage and replace it if necessary.
- Screw the UVC sensor back in and tighten it. Only a small amount of force is required.
- Connect the sensor connection cable to the UVC sensor.

7.3.1 Calibrating the Sensor

- Change to operating mode CONTROL OFF
- Use the CHANGE key to access the LAMP PERFORMANCE display.

If the maximum lamp output has been set, calibration can commence. Otherwise, the lamp output should be increased to the maximum level as follows:

- Press the ENTER key to confirm and ACCESS CODE REQUEST will be displayed.
- Enter the access code and confirm it by pressing the ENTER key. LAMP PERFORMANCE will reappear and the values that can be adjusted will flash.
- Press the UP key to set the maximum lamp output.
- Press the ENTER key to confirm.
- Wait until the sensor signal remains constant.

Calibration

- Use the CHANGE key to locate the SENSOR CALIBRATION display.
- Press the ENTER key to confirm and ACCESS CODE REQUEST will be displayed.
- Enter the access code and confirm it by pressing the ENTER key. SENSOR CALIBRATION will reappear and the values that can be adjusted will flash.
- Use the UP and DOWN keys to set the sensor value to 100 %.
- Press ENTER to confirm this and the message “Data is being saved” will appear briefly. The sensor is now calibrated.
- Press the BACK key to exit the programming mode.

The Dulcodes UV disinfection system is now ready for operation.

NOTE

Please follow the separate operating instructions enclosed for special applications that require the sensor signal to be displayed in W/m². All new UV lamps need a run-in period of 100-200 hours. Therefore, the UVC sensor should be recalibrated approximately 200 hours after commissioning.
For systems in operating mode “control on” refer to notices in 6.3.3

7.4 Wiper Maintenance

The wiper and the wiper drive mechanism should be checked once a year. Worn expendable parts should be replaced at the latest after 2 years. After 4 years, the entire wiper mechanism should be replaced.

IMPORTANT

- **The drive spindle may be damaged if the drive nut is damaged or worn.**
- **The drive spindle may be damaged if the friction bearing is damaged or worn.**

7.5 Replacing the Fan Filter Mats and Air Exit Filter

DANGER

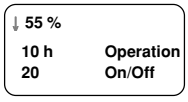
- **If the filter mats in the fan or the air exit filter become clogged, the control cabinet may overheat and be destroyed.**
- **The fan filter mats and air exit filter should be replaced at least once a year. They must be replaced more frequently under unfavourable environmental conditions.**

- ▶ Press the START/STOP key to switch off the system.
- ▶ Switch off at the mains.
- ▶ Remove the fan cover. Take hold of the recessed grips at the bottom of the cover and remove it.
- ▶ Remove the clogged filter mats and insert new ones with the white side facing inwards (control cabinet side).
- ▶ Replace the air exit filter mat as described above.
- ▶ Switch on at the mains.

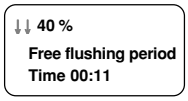
8 Troubleshooting

IMPORTANT

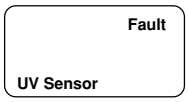
- **Troubleshooting with the control cabinet open and replacement of components may only be carried out by an authorized skilled electrician.**



Value fallen below warning threshold
Message: flashing arrow pointing downwards



Value fallen below safety threshold
Message: flashing double arrow pointing downwards The amount of free flushing time that remains is displayed
(Instead of the seconds, two squares flash)



Value fallen below safety threshold
Message: UV sensor (when the maximum free flushing period has elapsed)

- ▶ Press the ENTER key to acknowledge the fault message

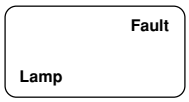
Possible cause Insufficient lamp output.
Remedy
- ▶ Increase lamp output

Possible cause A coating has formed on the protective tube and/or UVC sensor.
Remedy
- ▶ Clean the protective tube and UVC sensor

Possible cause The UV transmission of the water to be disinfected has deteriorated.
Remedy
- ▶ Improve the water quality

Possible cause The UV lamp is at the end of its useful life.
Remedy
- ▶ Insert a new UV lamp

Possible cause Sensor not calibrated.
Remedy
- ▶ Calibrate the sensor



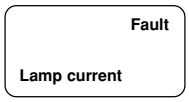
Message: lamp
(only in systems with an electronic ballast)

▶ Press the ENTER key to acknowledge the fault message

Possible cause Faulty lamp.
Remedy ▶ Insert a new lamp

Possible cause Faulty ballast.
Remedy ▶ Replace the ballast

Possible cause Interruption of least one phase in the power supply
Remedy ▶ Check the power supply

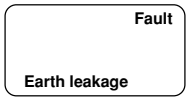


Message: lamp current
(only in systems with a conventional ballast)

▶ Press the ENTER key to acknowledge the fault mess

Possible cause Faulty lamp.
Remedy ▶ Lamp

Possible cause Faulty ignition device.
Remedy ▶ Replace ignition device

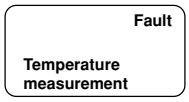


Message: earth leakage
(only in systems with an electronic ballast)

▶ Press the ENTER key to acknowledge the fault message

Possible cause Moisture in the lamp's protective tube.
Remedy ▶ Dry the lamp and protective tube and check the seals

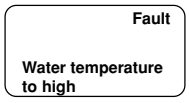
Possible cause Lamp cable damaged.
Remedy ▶ Replace lamp cable



Message: temperature measurement

▶ Press the ENTER key to acknowledge the fault message

Possible cause Faulty temperature gauge.
Remedy ▶ Replace temperature gauge



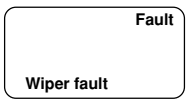
Message: water temperature too high

▶ Press the ENTER key to acknowledge the fault message

Possible cause Inadequate water flow.
Remedy ▶ Increase water flow

Possible cause Flushing valve does not open.
Remedy ▶ Replace flushing valve

Possible cause Flushing valve too small.
Remedy ▶ Replace flushing valve



Message: wiper fault

Possible cause Limit switch connected incorrectly.

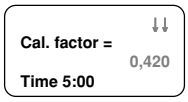
Remedy ▶ Change the two limit switch connections around

Possible cause Faulty limit switch.

Remedy ▶ Replace limit switch

Possible cause Faulty wiper motor.

Remedy ▶ Replace wiper motor



Flashing double arrow appears during calibration

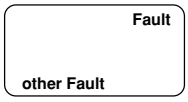
If a flashing double arrow appears in the calibration display instead of the sensor signal, the sensor signal is too weak for correct calibration. Calibration cannot be carried out.

Possible cause The protective tube and/or UV sensor are contaminated.

Remedy ▶ Clean the protective tube and/or UV sensor

Possible cause Faulty UV sensor.

Remedy ▶ Use a new UV sensor



Fault message: other fault

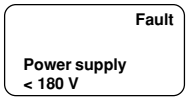
▶ Press the ENTER key to acknowledge the fault message

Possible cause External fault indicator triggered.

Remedy ▶ Correct external fault

Possible cause External fault indicator not connected and contacts at fault input not jumpered.

Remedy ▶ Jumper contacts at fault input



Fault message: power supply less than XXX V

Cause The supply voltage has fallen below the minimum.

Remedy ▶ Check supply voltage

Fault message: bus error

Possible cause Bus connection interrupted.

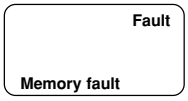
Remedy ▶ Restore bus connection (see “Function and Fault Displays on the Ballasts”)

Possible cause Supply voltage too low on one or more of the ballasts.

Remedy ▶ Check supply voltage and fine-wire fuse in the ballast (skilled electricians only)

Possible cause Faulty ballast.

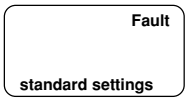
Remedy ▶ Replace ballast (skilled electricians only)



Fault message: memory fault

Cause The control system detected a fault in the memory.

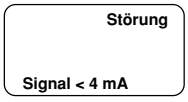
Remedy
- ▶ Replace the control system (skilled electricians only)



Fault message: standard settings

Cause The control system detected a fault in the memory.

Remedy
- ▶ Replace the control system (skilled electricians only)



Fault indication: signal < 4 mA

Cause Input signal in external control setting 4-20 mA is < 4 mA

Remedy
- ▶ check signal cable, check control signal

Operating Log for the Dulcodes M UV System

No.	Date	Lamp Hours	Lamp Switched On	Sensor Signal Display [%]	UV-Transmission [%/1 cm]	Flow [m^3/h]	Maintenance Work Carried Out	Signature

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.

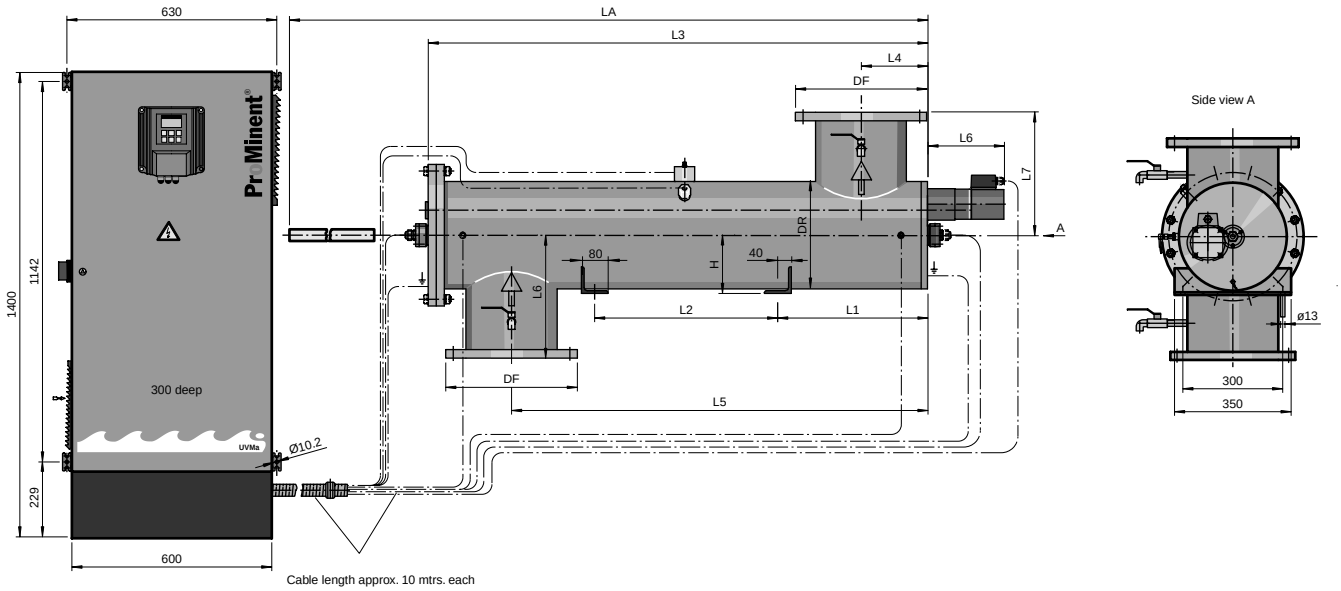
Product description :	***disinfection plant Dulcodes and Dulcodes compact***
Product type :	***UVCa***
Serial number :	***see type identification plate on device***
Relevant EC regulations :	***EC - machine regulation (98/37/EEC)*** ***EC - low voltage regulation (73/23/EEC)*** ***EC - EMC - regulation (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 :	***December 23, 1999***
The undersigned :	*Dr. Rainer V. Dulger, Executive Vice President R&D and Production*

Data sheet

IMPORTANT

This data sheet only applies to standard systems!
Subject to amendments!

TYPE	Number of radiators	Radiator capacity (kW)	Power connection (kW)	Length of radiation chamber	Minimum clearance for changing the lamp (mm)	Diameter	Curb weight	Nominal width of connection
1*2ML/22/DN100	1	2	2.3	850	900	220	146	DN 100
1*3ML/22/DN150	1	3	3.3	850	900	220	150	DN 150
1*4ML/27/DN200	1	4	4.2	1200	1250	270	190	DN 200
1*6ML/32/DN250	1	6	6.2	1200	1250	320	230	DN 250
1*8ML/32/DN250	1	8	8.2	1500	1550	320	240	DN 250
1*10ML/32/DN260	1	10	10.2	1500	1550	320	240	DN 250
1*10ML/4O/DN300	1	10	10.2	1500	1550	400	283	DN 300



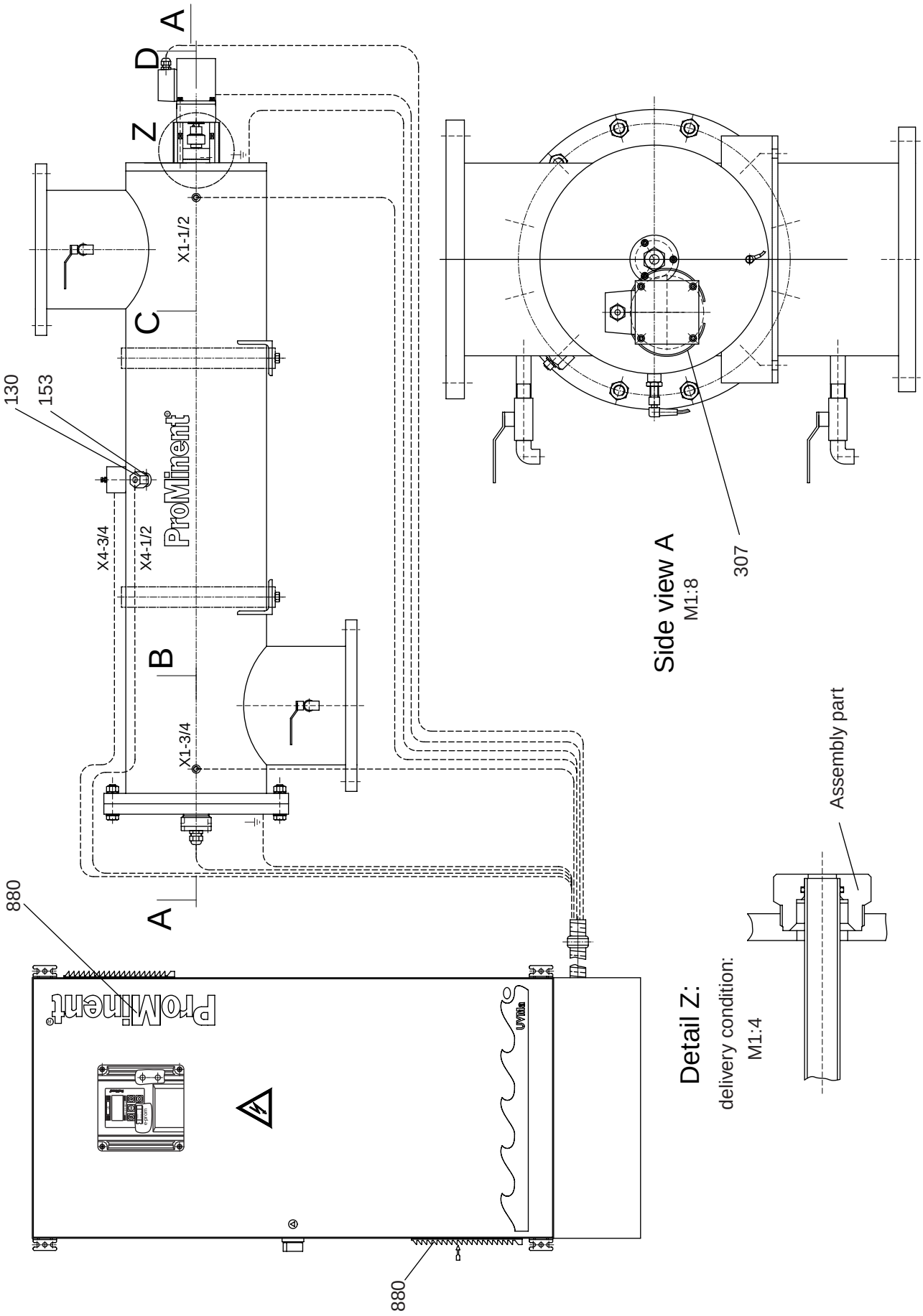
Type	LI (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	LA (mm)	ØDF (mm)	DR (mm)	H (mm)	Flange DIN 2576 PN 10
1x2ML/22/DN100	-	-	850	130	690	250	250	1750	220	219.1	-	DN100x114.3
1x3ML/22/DN150	120	350	850	145	665	250	250	1750	220	219.1	125	DN150x168.3
1x4ML/27/DN200	-	-	1200	175	990	325	240	2460	340	273	-	DN200x219.1
1x6ML/32/DN250	250	450	1200	200	950	370	240	2450	395	323.9	175	DN250x273
1x8ML/32/DN250	350	630	1500	200	1250	370	240	3050	395	323.9	175	DN250x273
1x10ML/32/DN250	350	630	1500	200	1250	370	240	3050	395	323.9	175	DN250x273
1x10ML/40/DN300	350	630	1500	225	1225	400	240	3050	445	416.4	215	DN300x323.9

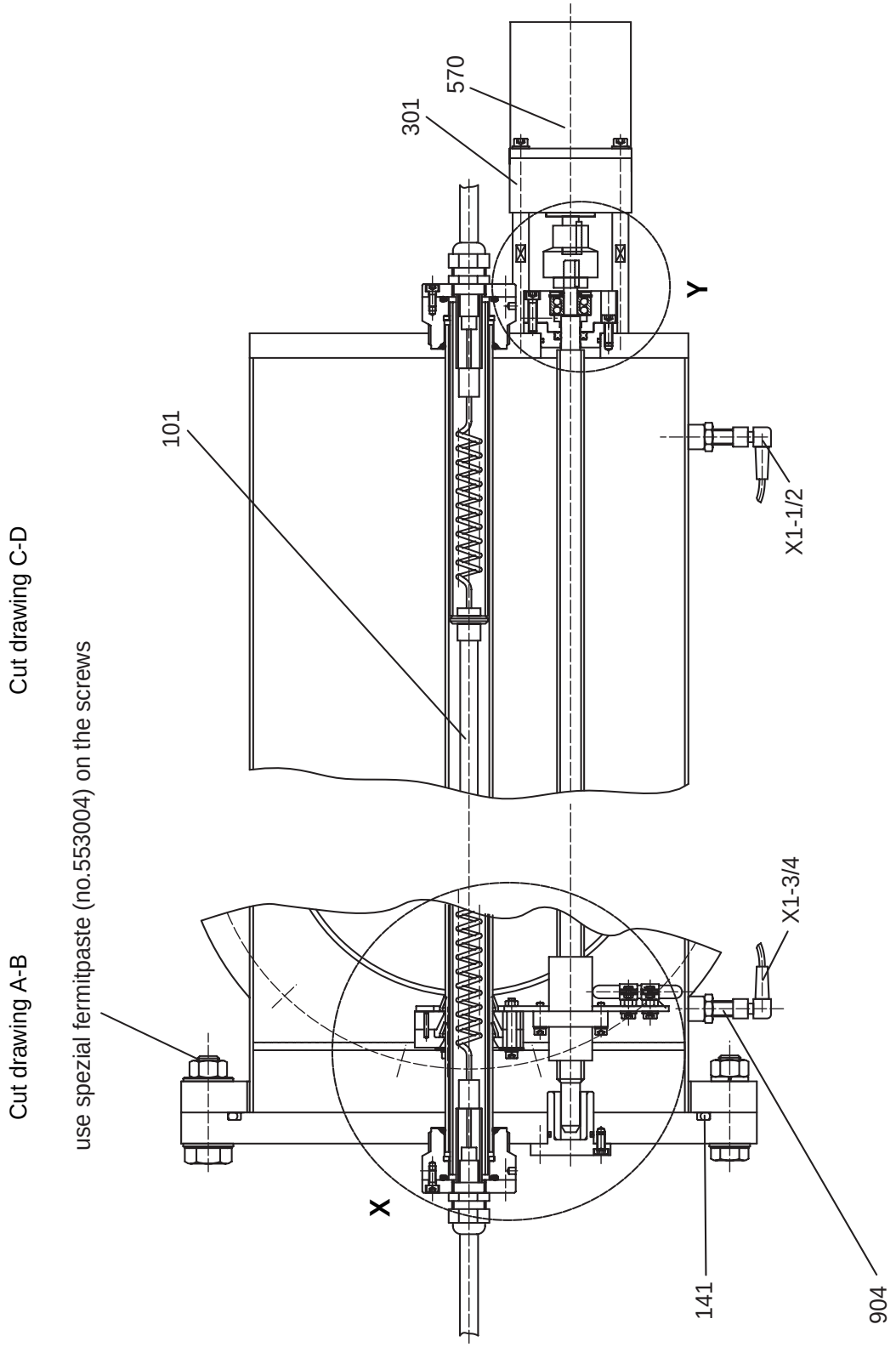
Requirements for the water to be treated:

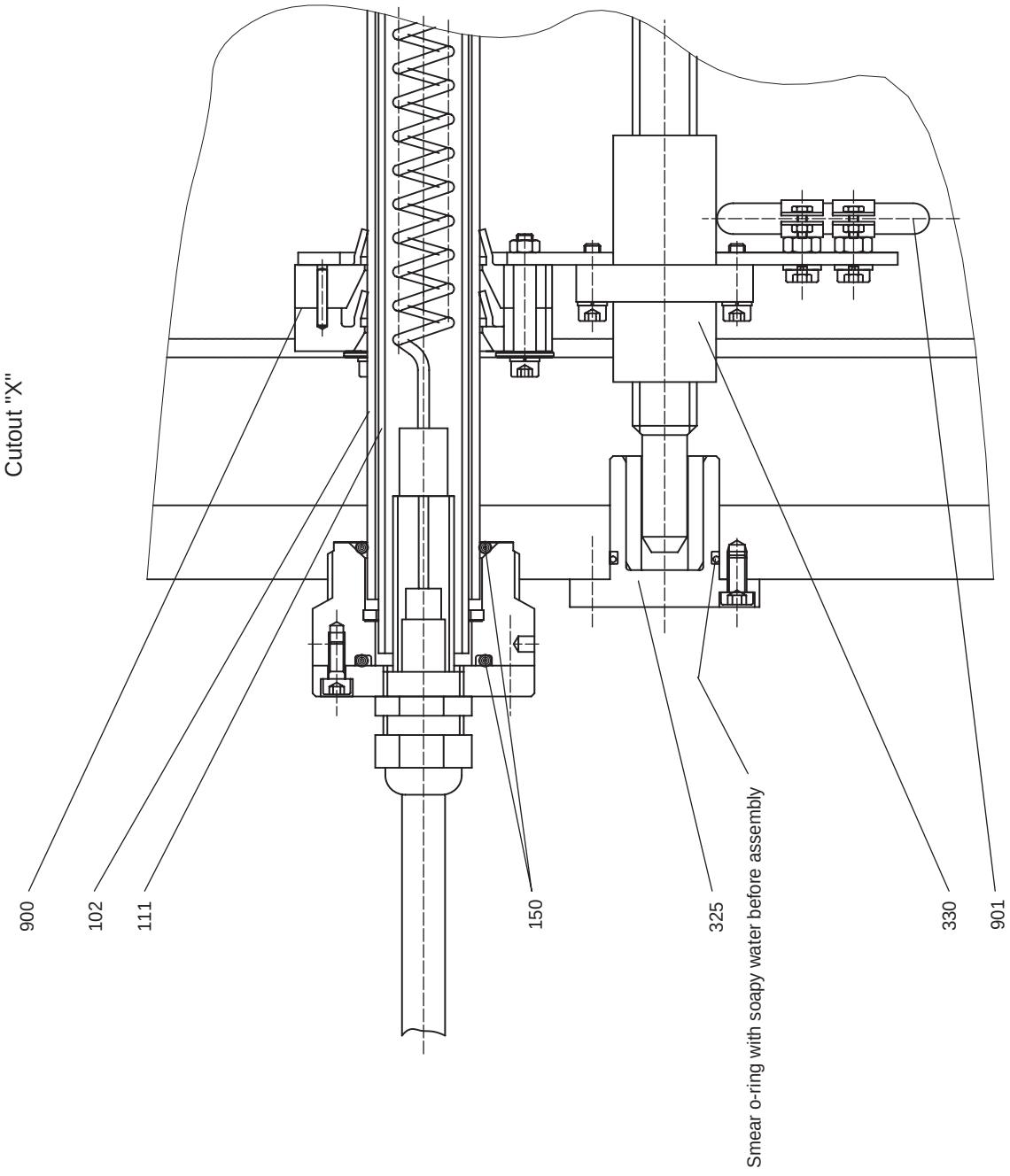
- maximum temperature: 40 °C
- maximum operating pressure: 10 bar*)
- no corrosive or abrasive properties, chloride content < 250 ppm
- not liable to sediments

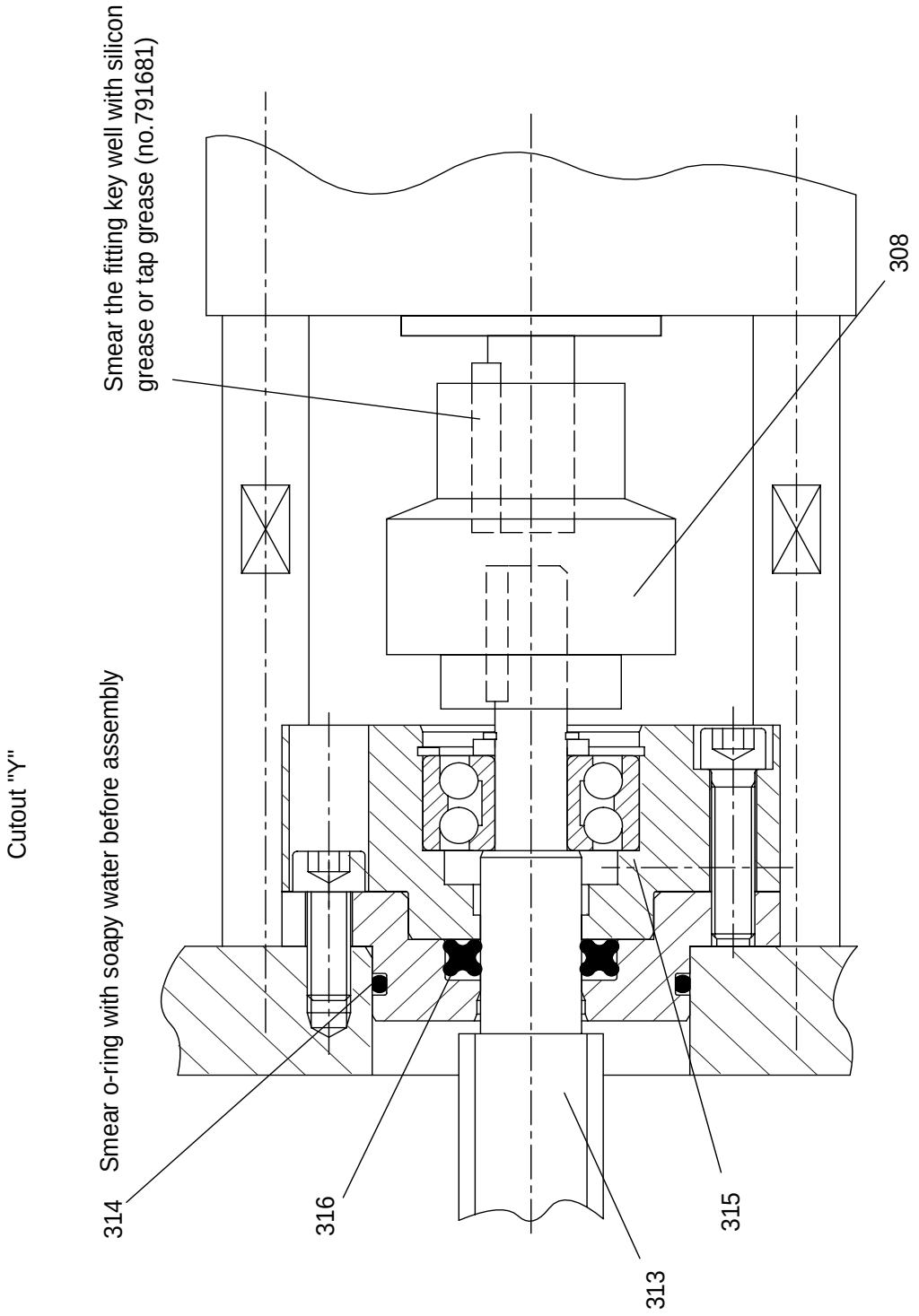
*) lower operating pressures are possible for specially designed systems!

No.	Description	Part number	Replacement Interval	Pieces
101	Powerline 2/3 kW radiator	1009385	approx. 8.000 h	1
101	Powerline 4 kW radiator	1009386	approx. 8.000 h	1
101	Powerline 6 kW radiator	1009387	approx. 8.000 h	1
101	Powerline 8 kW, 10 kW radiator	1009388	approx. 8.000 h	1
102	Radiator protection tube 863 mm long, 1*2/3ML	1009214	as required	1
102	Radiator protection tube 1213 mm long, 1*4ML, 1*6ML	1009215	as required	1
102	Radiator protection tube 1513 mm long, 1*8ML, 1*10ML	1009216	as required	1
111	Spacer (glass tube)	1009642	as required	1
130	UVC sensor M 1.4539 silicone free	1025685	as required	1
141	O-ring 234.32 – 5.33, f. flange 1*2/3ML/22/DN100	1009036	after	1
141	O-ring 291.47 – 6.99, f. flange 1*4ML/27/DN200	1009037	every	1
141	O-ring 342.27 – 6.99, f. flange 1*6ML, 1*8ML, 1*10ML/32/DN250	1009038	open the radiation	1
141	O-ring 417.96 – 6.99 , f. flange 1 *10M L/40/DN300	1009039	chamber	1
150	O-ring 35 - 4, radiator protection tube seal	1027553	as required	2
153	O-ring 22 -3, probe seal	1002175	as required	1
301	mechanism	1009400	as required	1
307	Protective cover	1010385	as required	1
308	In-line rapid coupling	1009187	as required	1
313	Spindle 907 lg., 1*2/3ML	1010041	4 years	1
313	Spindle 1247 lg., 1*4ML, 1*6ML	1010042	4 years	1
313	Spindle 1547 lg., 1*8ML, 1*10ML	1010096	4 years	1
314	O-ring 40.00-2.50 EPDM/P	1005850	as required	1
316	X-ring seal drive spindle	1010384	1-2 years	1
320	Ball bearing complete with receptacle	1010040	4 years	1
325	Friction bearing compl.	1009953	4 years	1
330	Drive nut	1010116	2 years	1
570	Wiper motor	1009399	as required	1
880	Filter mat SK3172/100, control cabinet ventilation	791038	1/2 - 1 year	2
900	Wiper compl.	1009976	2 years	1
901	Magnet	1009654	as required	1
904	Stop position switch	1009357	as required	2
	Spanner for d68-75 with pivot d6	1009515	as required	1
	Sealing cement Neofermit	553004	as required	1
	Tap grease OKS 477	791681	as required	1


A
D
Z
X1-1/2
C
130
153
ProMinent
X4-3/4
X4-1/2
B
X1-3/4
A
880
880
307
Side view A
M1:8
Assembly part
Detail Z:
delivery condition:
M1:4


Cut drawing A-B
Cut drawing C-D
use spezial fermitpaste (no.553004) on the screws
570
301
101
Y
X
X1-1/2
X1-3/4
141
904


Cutout "X"
900
102
111
150
325
Smear o-ring with soapy water before assembly
330
901


Cutout "Y"
Smear the fitting key well with silicon grease or tap grease (no.791681)
Smear o-ring with soapy water before assembly
308
314
316
315
313