ULTRA VIOLET WATER DISINFECTION SYSTEMS

Operating and installation manual

DaRo
UV SYSTEMS LTD

Models Including Saphir + System:

Saphir 1 System
Saphir 2 System
Saphir 3 System
Saphir 4 System
Saphir 7 System
Saphir 10 System

SAPHIR

THE SPECIALISTS IN ULTRA VIOLET LIGHT
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This document reviews potential operator risks and advises safety practices for the operation and maintenance of a DaRo UV Systems UV unit.

This document also provides current Control of Substances Hazardous to Health (COSHH) information for the safe disposal of UV lamps as used in the described system.

All DaRo UV Systems Saphir units are CE approved.

SECTION A GENERAL AND SAFETY (Including COSHH regulations)

GENERAL

The Saphir range of units comprises of four models with different flow capacities, all of which are available in two versions, the Saphir and Saphir +. The Saphir + has additional lamp status information, an hour counter and a volt free contact facility for remote monitoring of lamp status, via a plug and socket (which is capped when not in use).

The units can be fitted anywhere in a water system provided the maximum pressure and peak flow requirements are less than the maximum ratings (see specifications). The slower the water flow, the more effective the unit will be. The unit must be protected from frost when not operating, and it is wise to fit stopcocks, a bypass pipe and a drain tap with the unit for ease of maintenance.

For single pass applications, it is normally best to install the unit close to the point of use, without storing large volumes of treated water. If a storage tank is used it must be closely covered, and should be cleaned and sterilised when the UV unit is fitted. The tank should ideally store no more than a few hours supply, to ensure the water does not become stagnant.

SAFETY

1. UV light can harm eyes and skin, with effects like snow-blindness and severe sunburn. NEVER operate the lamps outside the unit.

2. Water and electricity are a dangerous combination. Fit a residual current device for maximum protection. It is essential that there are no water leaks in or around the unit that could result in the electrical wiring becoming wet. If such a leak does occur:

   (a) Switch off the power at the mains supply point (DO NOT TOUCH ANYTHING ELECTRICAL WHEN EITHER IT OR YOUR HANDS ARE WET).
   (b) Find and rectify the leak.
   (c) Completely dry the unit and control box inside and out before re-using.

SAFE DISPOSAL AND RISK THROUGH DAMAGE TO LAMPS

Lamps

The lamps used on the described system are constructed and operated with technology similar to that of domestic, fluorescent luminaires.

The lamp is filled with gas and mercury vapour at low pressure and will not explode. However, if broken there will be a risk from mercury contaminated glass.

DaRo UV Systems provide a lamp replacement service for all their customers, which includes the safe disposal of the used lamp. Please contact the factory for more information.

SECTION B FILTRATION

Ultraviolet light penetrates cloudy or coloured water much less than clear water, so it is essential to ensure the water is as clear as possible before UV treatment.

Dissolved organic matter and metallic salts (chiefly iron) will also absorb UV light and reduce the unit's efficiency. If any such parameters exceed the EEC maximum admissible concentrations, suitable pre-treatment should be used to ensure effective UV treatment.

Please contact DaRo UV Systems for advice regarding a suitable pre-filtration package.

SECTION C CONSTRUCTION

The water chamber is made of 316 grade stainless steel throughout.

The lamps are isolated from the water chamber by a quartz sleeve - an O-ring and plastic shim provides a seal at the top end of the chamber.

A separate control box houses the lamp control gear and monitoring equipment.

A splashproof cover provides protection to the lampholder connections at the chamber.

SECTION D INSTALLATION

The unit can be mounted horizontally or vertically, but consideration should be given to the following points:

Chamber:

Before installing the unit, check the tightness of the quartz clamp. Using the key provided, ensure the clamp is tightened to 4Nm torque setting. (This is equivalent to a firm hand tight.)

For vertical mounting:

Water should enter at the bottom and exit at the top. Lamp access should be uppermost with a clear space equal to the length of the chamber at the end to allow the removal of lamp or quartz during routine maintenance.

Horizontal mounting:

Again, water should exit at the top. If this is not possible, it may be necessary to fit a non-return valve or an automatic bleed valve to prevent air pockets, as a significant air space in the chamber will reduce its effectiveness. A clear space equal to the length of the chamber should be left at the end to allow the removal of lamp or quartz during routine maintenance.

Control Box:

The control box can be mounted either to the UV chamber or to the wall directly. If it is chamber mounted horizontally, arrange the wall brackets to be approximately central to the chamber. In all cases ensure it is positioned so that the lamp cable is not stressed.

Type 1, 2 & 4

- Fit the 2 wall mount brackets (C) to the wall, spaced apart by about ¾ of the length of the chamber, with the slots uppermost, using the correct screws for your wall type (screws not included).

- Open the worm drive clips to their maximum and fit over the chamber. Offer the chamber to the wall brackets, slip the clips into the slots on the brackets and tighten.

- For chamber mounting of the control box, loosen the worm drive clip by the lampholder, locate the slot in the control box foot over the drive strap and tighten.

- Secure the other end of the control box to the chamber with the third worm drive clip.

- For remote control box mounting, mount the chamber as above. Locate the control box wall brackets through the slot in the control box feet and screw directly to the wall.

Type 3 & 7

- Fit the 2 wall mount brackets (C) to the wall, spaced apart by about ¾ of the length of the chamber, with the slots uppermost, using the correct screws for your wall type (screws not included).

- Open the worm drive clips to their maximum and fit over the chamber. Offer the chamber to the wall brackets, slip the clips into the slots on the brackets and tighten.

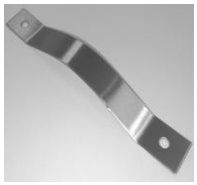
- For remote control box mounting, drill 4 holes on a grid of 180mm x 140mm (depending on the orientation desired) and fit 4 off No. 6 Screws. Use the keyholes to mount the control box.

- For control box mounted on the chamber, undo the third worm drive clip and thread it through the two slots on the rear of the control box. Re-engage the clip around the chamber and tighten.

Type 10

- Use the pipe clips provided to secure the Saphir 10 to the wall. Fit the control box as type 3 & 7.

Mounting Accessories



Control box wall mount brackets (A)

Chamber wall mount bracket (C)

Worm drive Clip (E)

Saphir10 wall mount brackets (F)

- The accessory pack will contain the following items:

Model	Control Box Bracket (A)	Wall Mount Bracket (C)	Worm Clip (small – E)	Worm Clip (large - E)	Wall Bracket Saphir10 (F)	Quartz Clamp Key
Saphir 1	2	2	3	0	0	1
Saphir 2	2	2	3	0	0	1
Saphir 3	0	2	3	0	0	1
Saphir 4	2	2	3	0	0	1
Saphir 7	0	2	3	0	0	1
Saphir 10	0	0	0	1	2	1

- All Saphir Plus models are supplied with a cable/plug assembly for remote connection of the volt free contact facility.

Note:

- **CONTROL BOX MUST BE EARTHED TO CHAMBER USING EARTH STRAP PROVIDED**.
- Saphir10 system is supplied with large pipe clips to enable the unit to be wall mounted

SECTION E ELECTRICAL

Electrical Connections:

THIS UNIT MUST BE INSTALLED BY A COMPETENT ELECTRICIAN

The Saphir range should be connected to an earthed 220-240V, 50-60Hz, single phase and neutral supply, via a 3A fused switchbox:

The supply to the unit is connected via the 3 core mains cable.
Connect the brown core to live
Connect the blue core to neutral
Connect the green and yellow core to earth

A stud is provided on the chamber to enable it to be bonded to the supply earth. If installing the chamber has interrupted a water pipe used as an electrical earth, be sure to bond these together again.

If the UV lamp does not light when the system is switched on, switch it off and wait for approximately 1 minute for the electronics to discharge before switching it back on.

Volt Free Contact Connections (Saphir + Only):

A 3m length of three core plus earth control cable is connected via a locking plug and socket to an internal changeover relay. No voltages are connected internally to the relay – this must be done via the cable plug.
The relay drives when the lamp is working correctly.
The socket is capped if this feature is not used.

Connections:
Core 1 or brown – relay common. Supply input.
Core 2 or black – relay normally closed. Supply output when lamp failed.
Core 3 or grey – relay normally open. Supply output when lamp OK

SECTION F INDICATORS / CONTROLS

1 Saphir Range:

The control box has a blue "lamp running" indicator on the front panel display, which is on if and only if lamp is running correctly.

Saphir + Range has the following features:

Switch to reset the internal hour counter (Section G, Maintenance, Lamp replacement)
Three way indicator display showing the status of the system
Volt Free Contact output for remote display of lamp on indicator (Section H, Specification)

System Status	Power On	Lamp On	Lamp Status
System operating correctly, lamp less than 11 months old	Green	Blue	Green
System operating correctly, lamp between 11 and 12 months old	Green	Blue	Alternating Green & Red
Lamp still operating, but more than 12 months old	Green	Blue	Red
Lamp failed	Green	Off	Red

The lamp will continue to operate after 12 months of running time, but the UV output will be reduced, and it will be more likely to fail as it ages further.
It should be replaced after 12 months' use.

The display gives a hidden indication of the age of the lamp. The "Lamp On" and "Lamp Status" indicators will blink off for a half second period once every minute. The number of blinks show how many year quarters (three months) have passed, before the "Lamp Status" indicator alternates from green to red in the twelfth month:

Age of Lamp	Number of blinks
One to three months (first quarter)	1
Four to six months (second quarter)	2
Seven to nine months (third quarter)	3
Ten to eleven months (fourth quarter)	4
Twelve months and above	No blinks

SECTION G MAINTENANCE

The lamp gradually deteriorates in use, and must be changed at regular intervals. It is not possible to tell the amount of UV being produced by the lamp merely by visual inspection, so a REGULAR routine of lamp replacement is the only simple way to ensure effective performance. (See specification for lamp life.)
Remember to reset the hour counter when a new lamp is fitted.

To replace the lamp:

1. Turn off electrical supply at the unit.
2. Remove the bayonet lampholder cap and carefully partially withdraw the lamp, still connected to the lampholder, from the chamber.
3. Whilst supporting the lamp disconnect the lampholder from the lamp and *GENTLY* slide the lamp straight out of the quartz sleeve *WITHOUT APPLYING ANY SIDE-PRESSURE*.

WARNING: *Levering the lamp against the quartz will result in damage to the sleeve*.

4. Reverse the above to fit new lamp.
5. To reset the hour counter:
   - i) Turn the unit on.
   - ii) Press and hold the reset button for 4 seconds to activate the reset function. The "Lamp On" and "Lamp Status" indicators will flash 4 times to show the reset has been successful. (Once the indicators start to flash, the switch can be released.)

Cleaning:
The quartz sleeve may occasionally need cleaning if sediments or scales build up on its surface. This will depend on the nature of the water supply and its pre-treatment, so no firm guidelines can be given. Less sediment may deposit if the unit is vertical. The unit should be inspected after a few months use to give a guide to the necessity of quartz cleaning. It may be possible to look into the unit with a torch through the sleeve after removing the lamp, but if not the quartz sleeve must be removed as follows:

1. Turn off the power and remove lamp as above.
2. Turn off the water supply, isolate the input and output and drain the unit. (Draining will not be necessary in vertical installation, but the water must be isolated.)
3. Unscrew the end seal using the spanner provided; remove the shim and O-ring seal and withdraw the quartz sleeve.

Note: *care must be taken when removing the quartz sleeve from horizontal installations; insert a piece of dowel into the sleeve to keep it horizontal as it is removed.*

4. Clean the quartz of any deposits with wire wool or domestic Scotchbrite (These materials will not scratch the sleeve, but DO NOT use an industrial Scotchbrite, which may.) An acidic, domestic descaler will help remove hard scale. The sleeve will feel much more slippery when all the deposits have been removed. Do not clean the inside of the sleeve – if it does get wet, be sure to dry it completely before replacing. Do not insert anything into the sleeve to do this – blow warm air from a fan heater over the tube with the open end uppermost. Rinse and dry it thoroughly and replace centrally in the unit.
5. Replace the O-ring and shim washer and, using the special spanner provided, tighten until resistance is felt and then tighten approximately a further ¼ turn to effect a seal.
6. Dry the unit. Turn on the water and check for leaks.
7. Replace the lamp and switch on.

Note: *quartz sleeves are expensive items. Please take care while handling them*.

SECTION H SPECIFICATION

Chamber material		316 Stainless Steel throughout					
Flow	(Litres/Min)*	18	25.5	45	60	90	160
Lamps	GER15SE	1	-	-	-	-	-
	GER25SE	-	1	-	-	-	-
	GER25XOSE	-	-	1	-	-	-
	GER36SE	-	-	-	1	-	-
	GER36XOSE	-	-	-	-	1	1
Lamp Life		8760 Hours or 1 year					
Connections: BSP Male Thread		¾″	¾″	¾″	1″	1″	1.5″
Pressure Rating steady		10 Bar					
Control Box		Extruded Aluminium	Extruded Aluminium	Painted Steel	Extruded Aluminium	Painted Steel	Painted Steel
Power Supply		220-240VAC 50-60Hz Single Phase					
Power Rating (VA)		16.5	30	38.5	42	68	
Fuse		External 3A HBC					
Mains Cable Length		Standard 3.0m					
Standard Fittings		Lamp Running Indicator					
Saphir Plus Only		Lamp Life Clock, Lamp status indicator, Remote lamp on indicator via internal volt free contacts. Plug & Socket Connection (capped if not used).					
Volt Free Contact - Ratings		3A @ 240VAC, 0.5A @ 24VDC					
Volt Free Contact – External Cable Length		3m					

*Flow rates based on 30mJ/cm² UV dose applied at 98% per 1cm at end of lamp life

Warranty

One year warranty for Water Disinfection Unit:
DaRo UV Systems will grant a one (1) year warranty from the date of purchase for this ultraviolet water disinfection unit, provided that it is installed and maintained in accordance with our instructions. Faults regarding the material and workmanship of this unit will be repaired or replaced free of charge.

Warranty terms

This warranty will become void if the units are not installed and operated according to the instructions in the manual. It will not be valid for damage(s) which has (have) been caused by misuse, accidents, negligence, frost, fire, flood, or Acts of God. This warranty will not be applicable to parts from which the sticker with the original manufacturing date code has been removed or made illegible. This warranty will only be valid if approved DaRo UV Systems spare parts are used. All models are to be operated and maintained in accordance with the owner's operating instructions. This warranty will become void if the ultraviolet system is removed from its original place of installation, or if the operating pressure exceeds 10 bar, or if the temperature of the fed water exceeds 25° C or falls below the freezing point. Make sure to return all faulty parts to DaRo UV Systems for inspection and repair or replacement. DaRo UV Systems will check and test the faulty parts and identify the reason for the defect. Faulty parts are to be returned free of charge. DaRo UV Systems will not be liable for any labour costs but only for repairs which have been carried out according to the works standards. Collateral or consequential damage(s) will not be covered by this warranty. All complaints will be notified in writing to DaRo UV Systems within thirty (30) days from identifying any damage. The receipt of the plant is to be presented to ensure the validity of this warranty.

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