Saphir Range

Installation, Operating and Maintenance Manual

For Models

Saphir 1

Saphir 2

Saphir 3

Saphir 4

Saphir 7

Saphir 10

(Saphir, Saphir+ and Saphir Pro Systems)

Designed & Manufactured in the UK

Saphir Range

Range Features

The Saphir range of systems is available with three different levels of technical features, Standard, Plus(+) and Pro. The features for each system are detailed below.

Saphir Systems	Standard	Plus (+)	Pro
UK designed and manufactured	●	●	●
Electro-polished 316 stainless steel disinfection chamber	●	●	●
Low pressure UV lamp	●	●	●
High efficiency electronic ballast power supply	●	●	●
Lamp on indicator	●	●	●
Lamp fail indicator		●	●
Power on indicator		●	●
Lamp change reminder with 365-days counter		●	●
Microcontroller		●	●
Visual alarm display (lamp failure and end of life)		●*	●
Alarm and microcontroller reset button		●	●
Volt free contact for remote telemetry or solenoid shut off valve connection		●	●
Selective 254nm UV sensor			●
Digital UV intensity display (%), with low UV warning			●
Digital display / lamp life readout			●

*Plus model also includes an audible alarm

Daro
UV SYSTEMS

Saphir Range

Description

The units are designed for the ultraviolet disinfection of water between 5°C and 23°C and 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. For ease of maintenance, fitting stopcocks, a bypass pipe and a drain tap with the unit is recommended.

For single-pass applications, it is best to install the unit close to the point of use, removing the need to store 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. To ensure the water does not become stagnant the tank should store no more than a few hours of water supply.

Safety

• UV light can harm eyes and skin. **Never operate the lamps outside of the chamber**. The units are safe when in normal use.

• Read the instructions fully before use – maintenance must only be carried out by competent individuals.

• Do not operate the unit if any part appears damaged.

• The stainless steel chamber must always be earthed.

• Water and electricity are a dangerous combination - it is essential that there are no water leaks in or around the unit that could result in the electrical system becoming wet.

If such a leak occurs, **do not touch anything electrical when either it, or your hands are wet**.

1. Switch off the power at the mains supply point

2. Switch off the water at the mains supply point

3. Find and fix the leak

4. Completely dry the unit and control box (inside and outside) before reusing

Saphir Range

Safe Disposal and Risk Due to Damaged Lamps

The lamps used in the Saphir Systems are filled with gas and mercury vapour at low pressure. Although they will not explode if broken there is a toxicity risk from mercury contaminated glass.

In the unlikely event that mercury is released from a broken lamp, evacuate the area and ventilate it. Seek professional help to clean up the spilled mercury. Do not use a vacuum cleaner as this will heat the mercury causing it to vaporize and create a greater widespread hazard.

Daro UV Systems provides a lamp replacement service which includes the safe disposal of the used lamp. Please contact our head office for more information.

Water Quality and Filtration

Ultraviolet light penetrates cloudy or coloured water much less than clear water, therefore, it is essential to ensure the water is clear before UV treatment. A filter removing particles down to 5-10 micron in size will normally ensure the water is suitable and such a filter must be fitted, unless the water is known to be completely clear at all times. Filtration will also extend cleaning intervals. Dissolved organic matter and metallic salts, mainly iron, will also absorb UV light and reduce the unit's effectiveness. If parameters exceed the EEC maximum admissible concentrations, suitable pre-treatment should be used to ensure water purity and effective UV treatment. Individual sites and requirements vary. Therefore, a site survey is recommended to determine the necessary ancillary equipment and filtration required before the UV equipment can be specified. If in doubt, please contact the manufacturer for advice.

Materials

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

- 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 on the chamber.

Installation

Installation must be carried out prior to making any electrical connections. See the general arrangement drawings, supplied at the end of this document.

Chamber Mounting
The unit can be mounted horizontally or vertically, however, consideration should be given to the following:

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.)

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
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.

Saphir 1 including Saphir+ and Saphir Pro versions
• Fit the two wall-mount brackets (B) to the wall. pace 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. Place the chamber on 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 lamp holder, fit 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. Fit the control box wall brackets through the slot in the control box feet and screw directly to the wall.

Saphir 2, 3, 4 and 7 including Saphir+ and Saphir Pro versions
• Fit the two wall-mount brackets (B) to the wall. Space 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. Place the chamber on the wall brackets, slip the clips into the slots on the brackets and tighten.

• For remote control box mounting, drill four holes on a grid of 180mm x 140mm (depending on the required orientation) and fit four off no. 6 screws. Use the keyholes to mount the control box.

• Where the control box is 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.

Saphir 10 including Saphir+ and Saphir Pro versions
Use the pipe clips provided to secure the Saphir 10 chamber to the wall. Fit the control box as described above, for types 2, 3, 4 and 7.

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Mounting Parts

A
B
C
D
E

A Control box wall-mount brackets
B Chamber wall-mount bracket
C Worm-drive Clip
   a: small
   b: large
D Saphir 10 wall-mount brackets
E Quartz clamp key

The accessory pack contains the following:

Model	Quantity Supplied	Control Box Bracket (A)	Control Box Bracket (B)	Worm Clip Small (Ca)	Worm Clip Large (Cb)	Wall Bracket Saphir 10 (D)	Quartz Clamp Key (E)
Saphir 1	2	2	2	3	0	0	1
Saphir 2	0	2	2	3	0	0	1
Saphir 3	0	2	2	3	0	0	1
Saphir 4	0	2	2	3	0	0	1
Saphir 7	0	2	2	3	0	0	1
Saphir 10	0	0	0	0	1	2	1

All Saphir+ and Saphir Pro models are supplied with a cable mounted connector for remote connection of the volt-free contact facility.

Notes:
• The control box must be earthed to the chamber using the earth strap provided.
• The Saphir 10 system is supplied with large pipe clips to enable the unit to be wall mounted.

Saphir Range

Electrical

This unit must be installed by a qualified electrician.

The Saphir range is supplied with a standard, BS1363 UK mains plug and should be connected to an earthed 220-240V, 50-60Hz, single phase and neutral supply, via a 3A fused socket.

The control box is provided with a trailing earth lead **– this must be connected to the stud on the chamber body**. If the installation of the chamber has interrupted a water pipe, bond these together again.

If the UV lamp is switched off at any point wait for approximately 30 seconds for the electronics to discharge before switching it back on.

Volt Free Contact Connections
(Saphir+ and Saphir Pro only)
A 4-way (3-ways plus earth) connector is supplied to mate to the control box volt-free contact socket. If required, a length of suitable three-core plus earth-control cable should be used to wire between the connector and the remote equipment. A junction box may be required to make the connection.

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.

See specifications, below, for relays ratings.

Connections
Terminal 1 - relay common. Connect to supply.

Terminal 2 - relay normally closed. Supply output when lamp has failed.

Terminal 3 - relay normally open. Supply output when lamp is OK. Connector Terminal 4 – earth. This terminal is bonded to earth inside the control box.

Indicators and Controls
The Saphir+ range has the following features:

- Switch to reset the internal hour counter (see maintenance, lamp replacement).

- Three-way indicator display showing the status of the system.

- Alarm to warn of lamp failure and end of lamp life, this can be temporarily silenced.

- Volt-free contact output for remote display of lamp on indicator (see specification).

System Status	Power On	Lamp On	Lamp Status	Alarm
System operating correctly, lamp less than 11 months old	Green	Blue	Green	Off
System operating correctly, lamp between 11 and 12 months old	Green	Blue	Alternating Green & Red	Off
Lamp still operating, but more than 12 months old	Green	Blue	Red	Bleep on 12-second interval
Lamp failed	Green	Off	Red	Bleep on 3-second interval

Daro
UV SYSTEMS

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 continues to age.

It should be replaced after 12-months use.

To turn off the audible alarm for 24-hours: press and hold the reset button for one second, until a single bleep is heard. This works in both alarm settings; lamp fail and lamp lifetime.

The alarm will restart 24-hours later but can be muted again if required.

Note: If the lamp has failed and the lifetime has expired the three-second alarm sequence will begin.

The display gives an indication of the age of the lamp. The lamp-on and lamp-status indicators will flash off for a half-second period once every minute.

The number of flashes 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 flashes
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 over	None

Maintenance

The lamp gradually deteriorates during use and must be changed at regular intervals. It is not possible to measure the level of UV being produced by the lamp by visual inspection. Therefore, a regular routine of lamp replacement is recommended to ensure effective performance. (see specification for lamp life.)

To replace the lamp:

1. Switch off electrical supply at the unit.

2. Remove the bayonet lampholder cap. 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.

4. Warning - levering the lamp against the quartz will result in damage to the sleeve.

5. Reverse the above to fit new lamp.

6a. To reset the hour counter for Saphir+
   i) Turn the unit on.
   ii) Press and hold the reset button for eight seconds to activate the reset function. The lamp-on and lamp-status indicators will flash four times to show the reset has been successful. (Once the indicators start to flash, the switch can be released.)

6b. To reset the hour counter for Saphir Pro
   i) Reset switch cycles ("switchcycles" on menu, press the white button to clear, press the red button to confirm.)
   ii) Reset UV sensor reading ("adjust" on menu, press the white button to select "yes", press the red button to confirm.)
   iii) Scroll to "config", press the red button to confirm. The new settings will be applied.

Cleaning

In the event that sediments build up on the surfaces of the quartz sleeve occasional cleaning will be required. This is dependent on the nature of the water supply and its pre-treatment; therefore, no firm guidelines can be given on how regular this is will be needed. Less sediment may be experienced when the unit is vertical. The unit should be inspected after a few months use to give an indication to the amount of cleaning necessary. Where possible look into the unit using a torch once the lamp has been removed. Where this is not possible the quartz sleeve will need to be removed as follows:

1. Turn off the power and remove the lamp as above

2. Turn off the water supply, isolate the input and output and drain the unit

3. Unscrew end seal; remove the shim and O-ring seal. Remove the quartz tube. Note: Care must be taken when removing quartz tube, as it is not supported inside the chamber. To avoid breakage, it must be kept parallel with the axis of the unit when being changed

4. Clean the outside of the sleeves using a mild abrasive such as wire wool or domestic scourer - a 10% solution of citric acid will help remove any hard deposits. Vigorous scrubbing will remove scale but will not scratch the quartz sleeve. When the quartz is clean, the friction experienced when cleaning the sleeve will be dramatically reduced. Do not use an industrial scourer, as these grades may be impregnated with abrasives which may damage the sleeve surface

5. Do not attempt to clean the inside of the quartz sleeve – they are sealed in normal use and this is unnecessary

6. Replace the O-ring, the shim washer, and tighten the seal with firm hand pressure and another quarter turn

7. Dry the unit. Turn on the water and check for leaks

8. Replace the lamp and switch on

Note: Care must be taken when handling the quartz sleeves

Saphir Range

Specifications

Stock Code / Model		Saphir 1	Saphir 2	Saphir 3	Saphir 4	Saphir 7	Saphir 10
Chamber material - 316 stainless steel		✓	✓	✓	✓	✓	✓
Flow	(litres/min)*	18	30	53	60	118	160
Lamps	GER15SE	1	-	-	-	-	-
	GER25SE	-	1	-	-	-	-
	GER25XOSE	-	-	1	-	-	-
	GER36SE	-	-	-	1	-	-
	GER36XOSE	-	-	-	-	1	1
Lamp life - hours		8760	8760	8760	8760	8760	8760
Connection (BSPT male)		¾"	¾"	¾"	1"	1"	1.5"
Input water temperature		5°C minimum - 23°C maximum					
Pressure rating - bar		10	10	10	10	10	10
Control box material		Extruded aluminium	Painted steel	Painted steel	Painted steel	Painted steel	Painted steel
Power supply VAC/PH/Hz*		220 - 240V, 50 - 60Hz single phase					
Current rating - amps		0.095	0.116	0.163	0.214	0.330	0.330
Fuse - external 3A HBC		✓	✓	✓	✓	✓	✓
Mains cable length - 3 metre		✓	✓	✓	✓	✓	✓
Features - Saphir		Lamp-running indicator					
Features - Saphir+		Lamp-running indicator Lamp-life clock Lamp-status indicator, alarm for lamp failure and end of lamp life Remote lamp-on indicator via internal volt-free contacts, by plug and socket connection (capped if not used).					
Volt-free contact ratings		3A @ 240VAC maximum. 0.5A @ 24VDC maximum					

*Flow rates based on 40mJ/cm² UV dose applied at 98% per 1cm at end of lamp life.

Warranty

12-month warranty for Water Disinfection Unit:
Daro UV Systems provides a twelve (12) month warranty from the date of purchase for this ultraviolet water disinfection unit, provided that it is installed and maintained in accordance with the manufacturer's 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 unit(s) 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 label 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 freezing point.

All faulty parts must be returned 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 will be replaced 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 should be notified in writing to Daro UV Systems within thirty (30) days from identifying any damage. The receipt of the plant must be presented to ensure the validity of this warranty.

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Setup & Calibration – Saphir Pro Models

To set up the system must be connected to 230VAC.
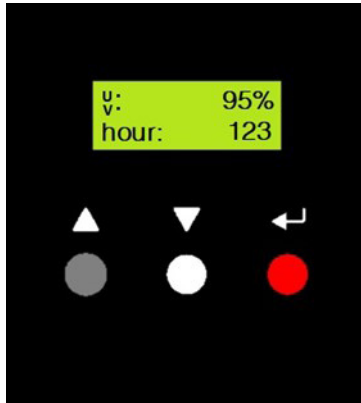
Use button red to select menu change. Keep pressing to skip to next parameter.

Use buttons grey or white to change settings for any one parameter. (Grey increases values, white decreases values.) Hold the buttons down to scroll through values more quickly.

To save changes, scroll through the entire parameter list to reach the final page, "configuration write" and wait for the settings to be saved.

If you leave the menu for 20 seconds without change, the start display will return and any changes will NOT be saved.

The system is set with the default lock code "0000". This can be changed to a four-digit code of your choice.

Procedure
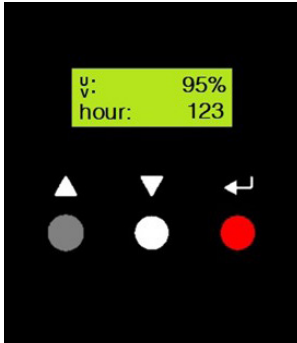
1　On powering the system, the version of software will be displayed followed by the standard screen display of hours and UV intensity.
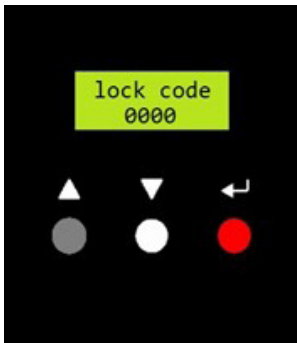
2　To display the menu, press the red button for two seconds. The "lock code" displays, to prevent unauthorised access. Use the grey and white buttons to enter the correct code if changed from the default.
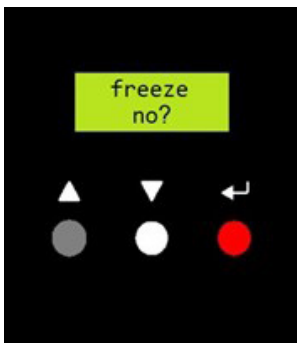
3　Press the red button again to show "freeze". This freezes monitoring and disables alarms to allow maintenance. This will remain active until any other button is pressed.
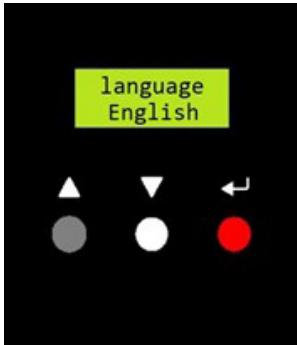
4 Press the red button again to set language. Scroll through options with the grey and white buttons.
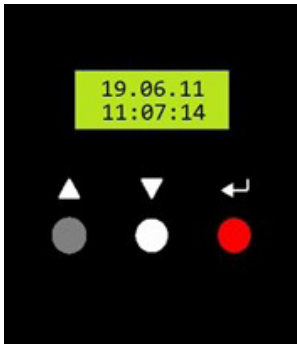
5 Press the red button again to set date and time (mm.dd.yy). Change values with the grey and white buttons.
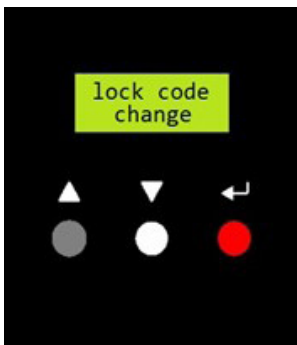
6 Press the red button again to change the lock code. Change values with the grey and white buttons.

14
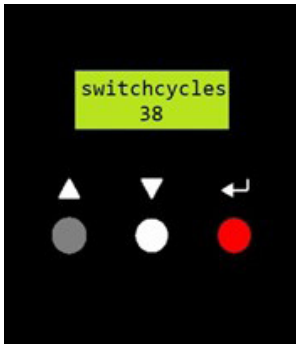
7   Press the red button again to access "switch cycles". This records the number of power downs of the system. Press the white button to clear and the red button to confirm.
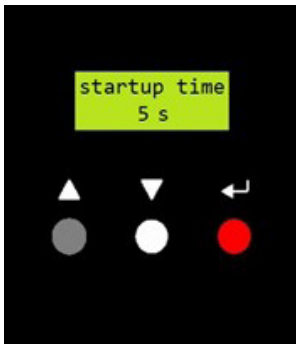
8   Press the red button again to access "startup time". This sets a delay from power up to when monitoring starts. (Please note alarms are not activated until lamps have warmed, and output has risen.)
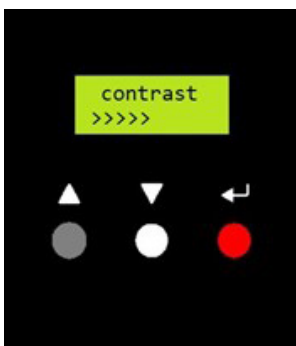
9   Press the red button again to adjust the display contrast.
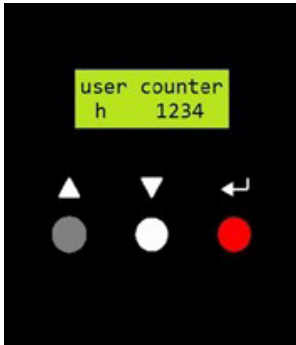
10 Press the red button again to access "user counter". This records the hours from the previous reset. This is used to record lamp hours since previous changes. Press the white button to clear and red button to confirm.
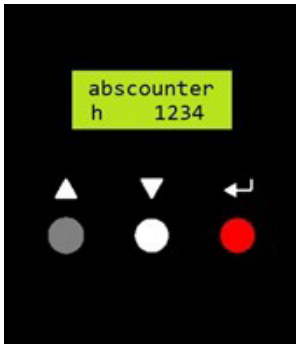
11 Press the red button again to access "abs counter". This records the total hours the system has run since initiation and is <u>NOT CHANGEABLE.</u>
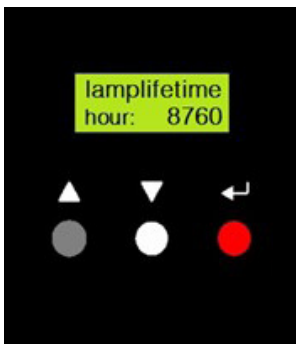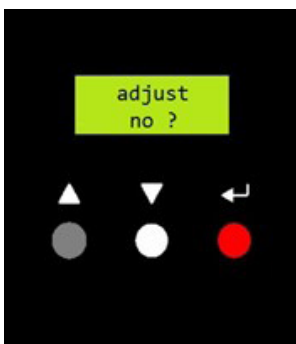

12 Press the red button again to access "lamp lifetime". This activates an alarm after the lamp lifetime has passed (example shown 8760 hours) including the period that has passed since the previous "user counter" reset.

16
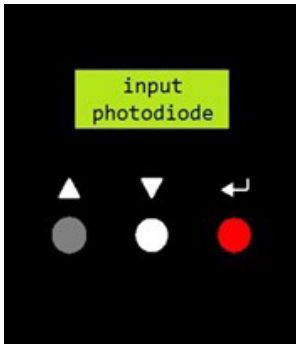
13 Press the red button again to access "input photodiode". This is a pre-set configuration. Please <u>DO NOT CHANGE.</u>
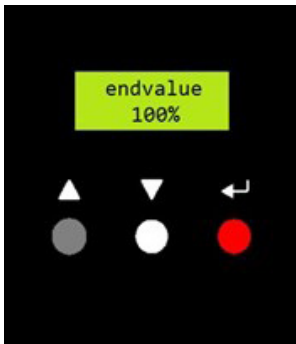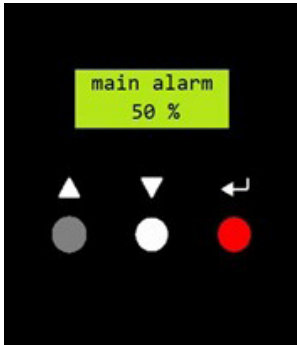

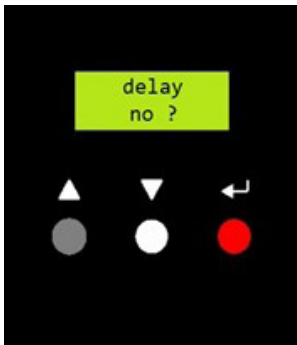14 Press the red button again to access "endvalue". This is pre-set to 100%. Please <u>DO NOT CHANGE.</u>

15 Press the red button again to access "adjust" to calibrate the system. Using the up button (grey) or down(white) button change "no?" to "yes" then press enter (red button).

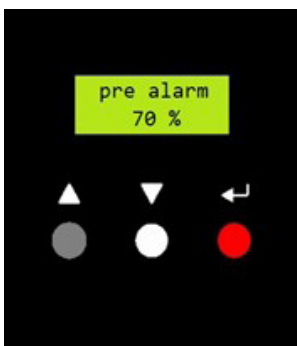The monitor calibration will then automatically be carried out.

Once this is complete press the red button.

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16 Press the red button again to access "main alarm", to amend the UV threshold setting. The display flashes red and volt the free contacts will also switch.
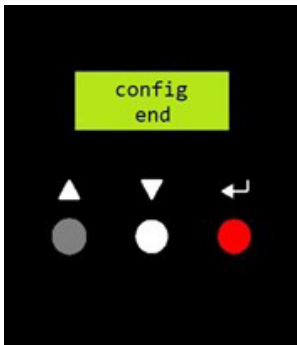
17 Press the red button again to access "delay", to add a time delay before the main alarm is triggered.

18 Press the red button again to access "pre alarm", the UV threshold setting. The display flashes amber to give an early, local warning of low UV intensity.
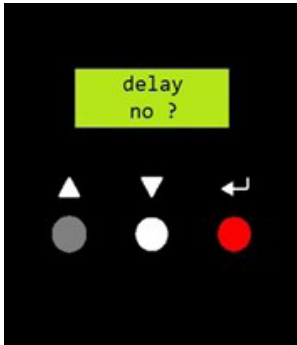
19 Press the red button again to access "delay", to add a time delay before the pre-alarm is triggered

20 Scroll to "config", press the red button to confirm. The new settings will be applied.

Settings

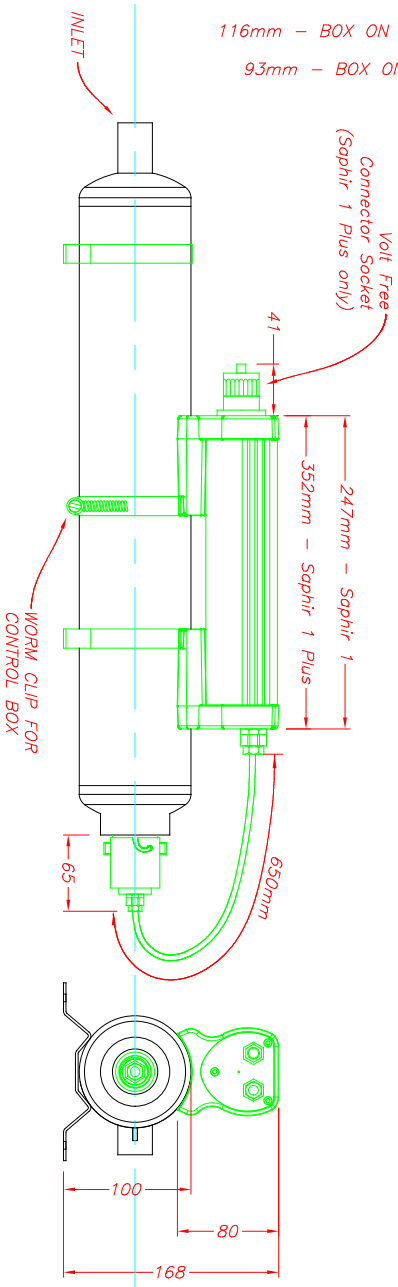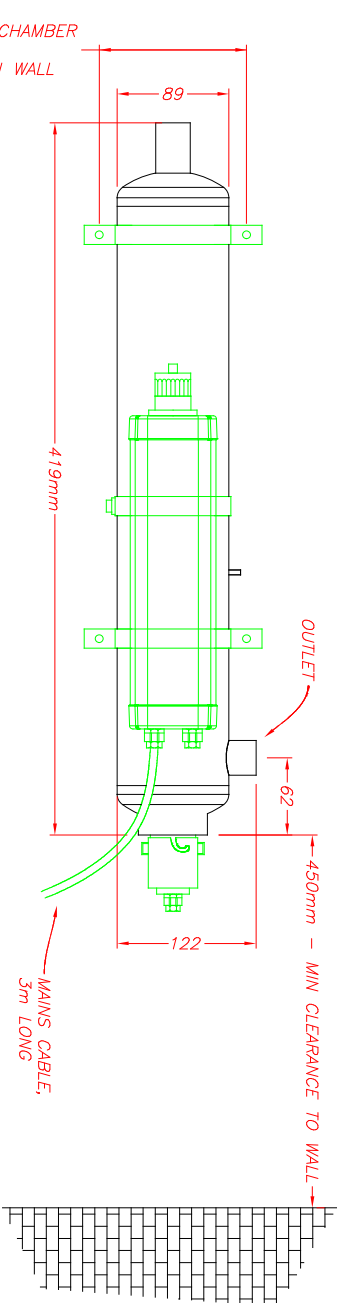| Setting	Default Value
Lock code	0000
Lamp life time	8760
Input	Photodiode – <u>DO NOT CHANGE</u>
Main alarm	50 %
Pre-alarm	70 %

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Notes

Notes

Model: Saphir 1 & 1+   General Arrangement Drawing 709-17-10

DRAWN TO BS308

Notes

1 – preferred mounting is vertical with lamp access at top. If horizontally mounted, outlet MUST BE UPPERMOST, inlet & outlet to be configured as shown below, whether horizontal or vertical. Do not mount vertically with lamp access at bottom.

2 – the position of the electrical compartment on the chamber is not fixed – it can be positioned to suit, within the constraints of the cable length.

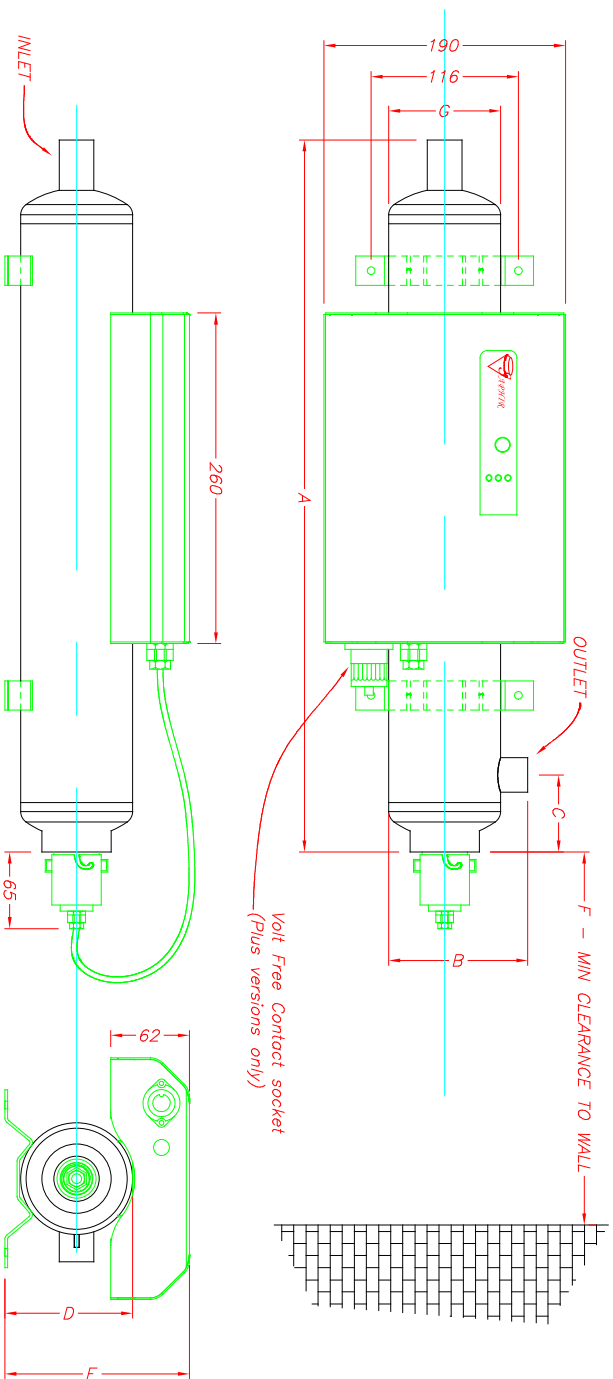3 – clearance "J" accounts for lamp or quartz removal during maintenance.

INLET

116mm – BOX ON CHAMBER

93mm – BOX ON WALL

Volt Free
Connector Socket
(Saphir 1 Plus only)

41

247mm – Saphir 1

352mm – Saphir 1 Plus

419mm

WORM CLIP FOR
CONTROL BOX

INLET

650mm

65

89

OUTLET

62

450mm – MIN CLEARANCE TO WALL

122

MAINS CABLE,
3m LONG

100

80

168

INLET / OUTLET CONNECTIONS – ¾" BSPT MALE

DRAWN TO BS308

Models: Saphir 2, 2+, 3, 3+, 4, 4+, 7, 7+, 10 & 10+

General Arrangement Drawing, 738-202-1

Notes

1 – preferred mounting is vertical with lamp access at top. If horizontally mounted, outlet MUST BE UPPERMOST. Inlet & outlet to be configured as shown below, whether horizontal or vertical. Do not mount vertically with lamp access at bottom.

2 – the position of the electrical compartment on the chamber is not fixed – it can be positioned to suit. If the chamber is horizontally mounted, it should be central to balance the chamber weight.

3 – pipeclips are supplied to secure the Saphir 10 chamber. The electrical compartment can be chamber or wall mounted.

4 – clearance "F" accounts for lamp or quartz removal during maintenance.

INLET

OUTLET

Volt Free Contact socket
(Plus versions only)

190

116

G

260

65

A

C

B

F – MIN CLEARANCE TO WALL

62

D

E

MODEL	A	B	C	D	E	F	G	CONNECTIONS
2 & 3	562	122	62	100	145	600	89	¾" BSPT MALE
4 & 7	980	122	62	100	145	1000	89	1" BSPT MALE
10	1010	160	85	166	211	1000	114	1½" BSPT MALE

Hole centres for mounting control box on wall
145mm x 112.5mm, screw size – No. 6

Lamp cable length – 650mm

Mains cable length – 3m