

UK MANUFACTURER

Saphir Pro

Installation, Operating & Maintenance Manual



For Saphir Pro Models:

Saphir 1 / Saphir 2
Saphir 3 / Saphir 4
Saphir 7 / Saphir 10



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General

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, installing an isolation valve, a bypass and a drain valve 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.

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 prior UV treatment. A filter removing particles down to 5-10 micron in size will ensure the water is suitable. 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 pretreatment 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 distributor for advice.

What is UVC?

UV is part of the electromagnetic spectrum, with a wavelength just outside the visible light.

UV light with germicidal properties (UVC) can be used for disinfection.

The UVC lamp within the Saphir unit produces a wavelength of around 254nm (nanometres). At this wavelength when an organic cell is exposed to the UVC light, it causes a photochemical reaction within the Nucleic acids (DNA & RNA) of the micro-organisms, rendering them unable to reproduce. This process is referred to as 'inactivation'.

The UVC disinfection leaves no residual chemicals in the water after processing.



Safety

Read the instructions fully before use – installation and maintenance should be carried out by qualified individuals.

Do not operate the unit if any part appears damaged.

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.

UVC radiation is harmful to eyes and skin, care should be taken when using UVC.

The UV lamp must never be illuminated outside of the reaction chamber.

UV lamps contain various gasses and mercury. Care must be taken not to touch any of the glass (quartz) part of the lamp. It is recommended that gloves are used in case of lamp breakages.

If the lamp becomes damaged/broken ensure the area is well ventilated.

Professional help should be sought in the event of any mercury spillage.

The reaction chamber must be correctly earthed.

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.



Optical radiation
emission
Category 2
(EN 12198)



Warning
Contains
mercury



Danger
electric
shock risk



Danger
hot
surface

Installation

Saphir Pro Content

Control Box
(Saphir Pro)



Chambers

Saphir 10



Saphir 4/7



Saphir 2/3



Saphir 1

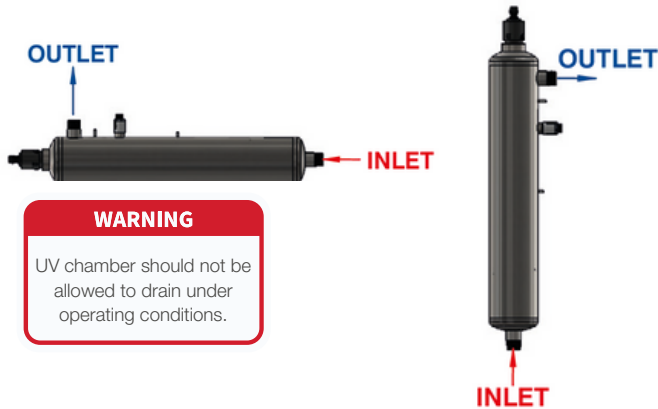


Reactor Chamber Installation

Saphir Systems are all fitted with BSPT fittings.

Stock code/model	Saphir 1	Saphir 2	Saphir 3	Saphir 4	Saphir 7	Saphir 10
Connection (BSPT male)	3/4"	3/4"	3/4"	1"	1"	1.5"

Recommended Chamber and Flow Arrangements:



WARNING

UV chamber should not be allowed to drain under operating conditions.

Control Box Installation

Suggested Control Box Locations:



The electrical control box can either be mounted directly to the chamber using the mounting brackets or wall mounted within 625mm of the chamber.

The electrical control box is fitted with an internal 2 amp fuse and external UK type G plug.

Refer to unit specification for electrical requirements.

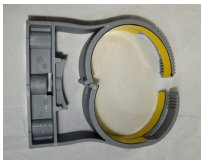
Chamber Mountings



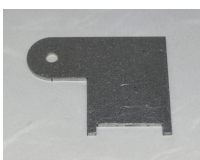
A Chamber wall-mount bracket



B Worm-drive Clip
a: small
b: large



C Saphir 10 wall-mount brackets



D Quartz Clamp Key

Saphir Pro Additional Parts



A UV Sensor



B Thermal Sensor



C VFC Connector

Model	Quantity supplied	Control box bracket	Control box bracket	Worm clip small	Worm clip large	Wall Bracket Saphir 10	Quartz clamp key
Saphir 1		2	2	3	0	0	1
Saphir 2		0	2	3	0	0	1
Saphir 3		0	2	3	0	0	1
Saphir 4		0	2	3	0	0	1
Saphir 7		0	2	3	0	0	1
Saphir 10		0	0	0	1	2	1

All Saphir Plus 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

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 3.5 - 4.0Nm 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.

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 Plus and Saphir Pro versions

- Fit the two wall-mount brackets (B) to the wall. Space apart by about $\frac{3}{4}$ 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 Plus and Saphir Pro versions

- Fit the two wall-mount brackets (B) to the wall. Space apart by about $\frac{3}{4}$ 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 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 Plus 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.

Installation continued

Saphir Pro Installation

The UV sensor should be fitted to the reaction chamber. It is recommended that a WRAS-approved anti-seize compound is applied to the thread on the sensor, ensuring that no excess compound fouls the sensor face.

Attach the thermal sensor to the reaction chamber using an M4 washer and nut.

Fit a solenoid valve (if system arrangement requires it), the pre-wired thermal sensor and the valve cable can be fitted to the control box.

Lamp Installation

The quartz sleeve is pre-installed into the Saphir reaction chamber. A lamp-locating spring is fitted inside the quartz sleeve and held in place with a closing cap. Remove the white cap and fit the lamp, being careful to only touch the caps at either end of the lamp with your fingers - avoiding the glass itself. Once the lamp is in place within the quartz, the lamp connector can then be fitted.

The lamp connector will only fit in one orientation. Once this has been connected the bayonet clamp can then be connected.

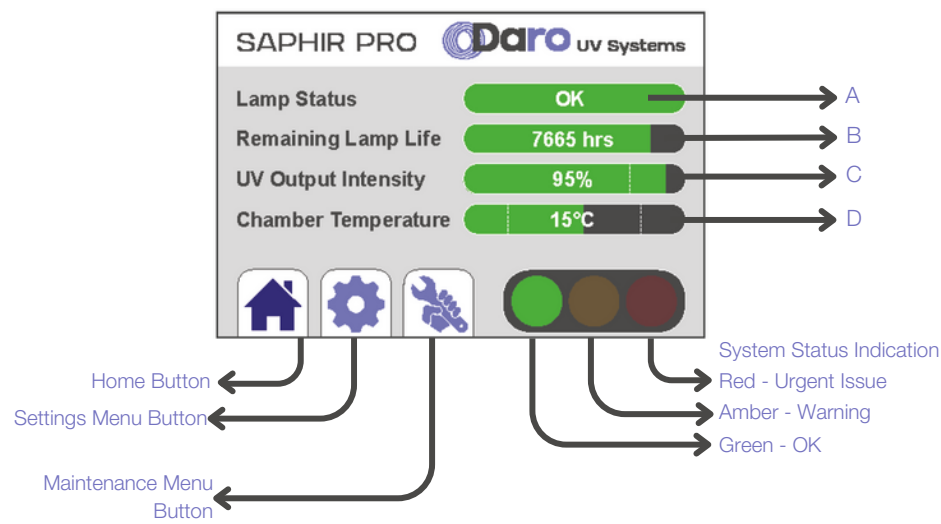
Refer to the lamp and quartz removal section (page 16) for detailed instructions on installing and removing the lamp and quartz.

Stock code/model	Saphir 1	Saphir 2	Saphir 3	Saphir 4	Saphir 7	Saphir 10
Power supply VAC/ PH/ Hz*	110 - 240V, 50 - 60Hz single phase					
Current rating - amps	0.07	0.13	0.17	0.18	0.30	0.30
Fuse - 3A HBC	✓	✓	✓	✓	✓	✓
Volt-free contact ratings	3A @ 240VAC maximum. 0.5A @ 24VDC maximum					
4-20mA Output	UV intensity output					

It is highly recommended that the water supply is applied to the reaction chamber before the unit is powered up. Allow two minutes of flow through the chamber, then check the system for any signs of leaks. If the installation appears leak-free then the unit can be powered up.

Controls & Indicators

Home screen



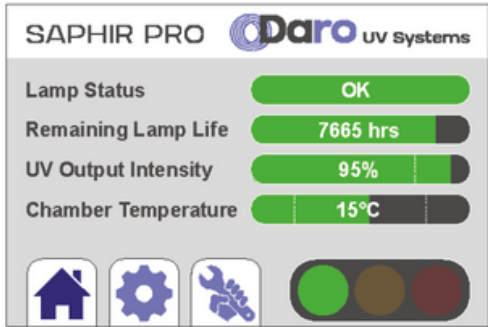
Once initialised the bars will display values for the following parameters:

- A. Lamp Status - Either displays 'OK' during normal operating conditions, or once the lamp life reaches 0 hrs, displays 'Change Lamp' and the bar turns red
- B. Remaining Lamp Life - This is displayed in hours, starting at 8760 hrs (1 year of continuous running)
- C. UV Output Intensity - This is an indication of lamp performance as a percentage
- D. Chamber Temperature - Indicates the current temperature of water in the chamber (°C)



Home Screen (Initialising)

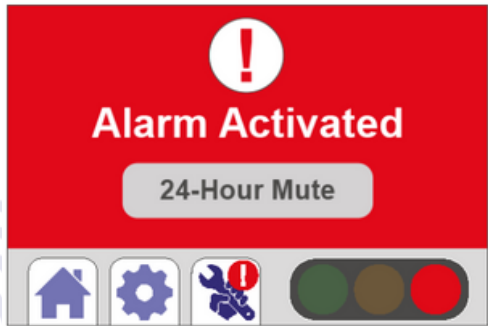
Upon initial power up, the system will initialise for 30 seconds before status values are displayed.



Home Screen (Normal Conditions)

This is the Home Screen under normal operating conditions, provided the parameters are all within the specified values of the settings menu, the bars and System Status Indicator will all display in green.

Please allow 5 minutes for the UV intensity to reach optimum output.



Home Screen (Alarm Activated)

In the event of a system fault (e.g. in the event of lamp failure, or low UV output) the sounder buzzer will activate and this screen will be displayed.

The buzzer can be silenced for 24 hours.

Home Screen (Fault Conditions)

The alarm will have sounded if any of the following conditions occur:

- Remaining Lamp Life reaches 0 hrs
- UV Output Intensity reads below the preset minimum parameters
- Chamber Temperature reads outside the preset minimum parameters

Once the alarm has been muted for 24 hours the home screen will display, with red bars showing for any parameters that have an issue.

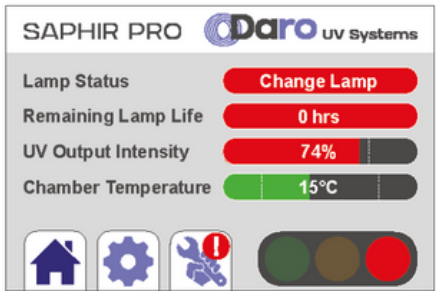
If the lamp life has reached 0 hrs then it should be immediately replaced.

If the UV Output Intensity is below minimum parameters, it could be a number of issues, such as:

- The UVT (UV Transmission) of the water has decreased, meaning the UV light isn't effectively treating the water
- The lamp has prematurely reached end of life
- The quartz sleeve requires cleaning (see page 17 for detailed instructions on maintaining the quartz)

If the Chamber Temperature is outside of the upper or lower limit, this will require further investigation as the water is either below minimum flow rates, or external factors are affecting the water temperature.

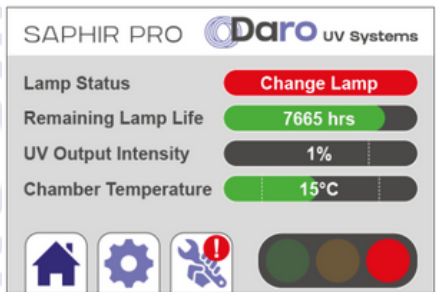
If any of the above are being indicated it is likely that inadequate UV treatment is being applied to the water, the system should be inspected immediately and checked for issues.



Once the lamp has been replaced, access the Maintenance Menu to reset the Remaining Lamp Life counter. Follow the instructions on page 16.

Home Screen: Lamp Expired

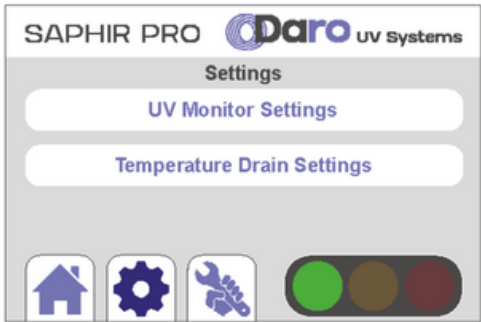
The lamp is still operational, but has reached the end of its useable output, although the lamp is still outputting UV, the achievable fluence (dose) is below the required level. The lamp should be changed as soon as possible to achieve the required fluence (dose).



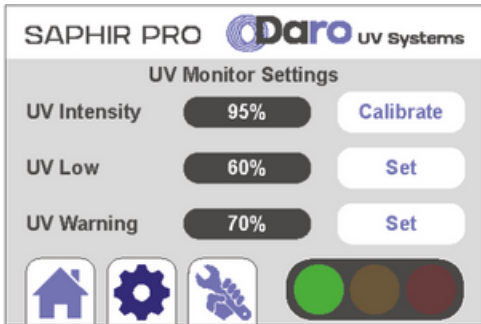
Home Screen: Low Output Intensity

The UV sensor is not indicating the required level of UV Output Intensity. This could be caused by a number of reasons, as outlined previously. If changing the lamp does not resolve the issue then please arrange a service or get in touch with Daro UV for technical support on +44 (0)1787 379187.

Setting Screen



Both the UV Alarm and Thermal drain set points can be altered by pressing the settings key.



UV Monitor Settings

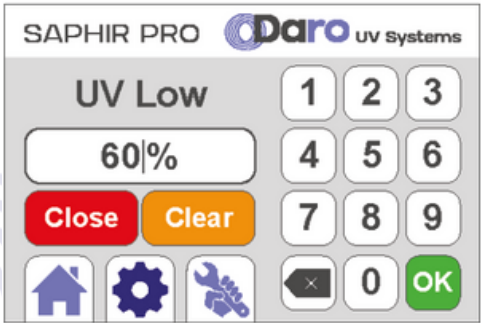
The Saphir Pro unit comes pre-calibrated from the factory for UV Intensity, using standard tap water. Recalibration should only be undertaken if water transmission (UVT %) is known.

UV Low and UV Warning trigger points can both be altered by pressing the 'Set' button. UV Warning is when the system is still running at acceptable levels of treatment, but nearing the limit. The System Status Indicator and relevant bars will change to amber. The cause of this should be investigated to ensure the UV output doesn't drop to critical levels. UV Low is when the system is no longer functioning at the required level of treatment and requires immediate remediation. The alarm will activate along with the alarm screen, where applicable the volt free contact will open.

UV Low must always be set below the UV Warning level.

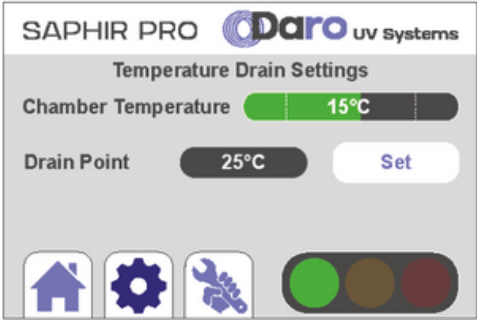
- Example
- UV Low 60%
 - UV Warning 70%

It is recommended that the set points are noted down at the back of this manual.



UV Alarm Trigger Point Settings

UV Low and UV Warning trigger points are set in the same manner. To alter the set point, input the required percentage value and press OK.



Settings Screen (Main)

The Saphir Pro System has a thermal drain facility, this function allows the system to flush cooler water through the reaction chamber. This helps reduce the chamber temperature and assists in preventing the lamps from overheating.

Enter the required drain point and press OK. The drain point can be adjusted. The default drain point is set to 25°C.

It is recommended that the set points are noted down at the back of this manual.



Drain Point Settings

To alter the drain point, input the required temperature value (°C) value and press OK.



Maintenance Screen



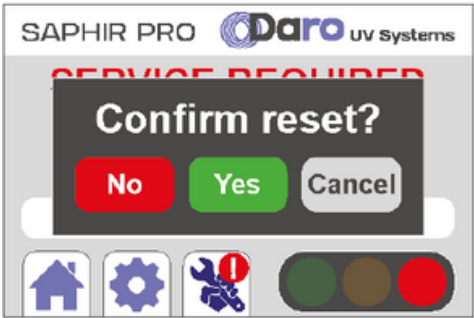
To access the maintenance screen after replacing a lamp, or for general maintenance information, press this key.



From the maintenance screen, the Remaining Lamp Life reading can be reset once a lamp has been replaced.

WARNING

This should only be done when the lamp is replaced with a new item. Resetting the lamp life at any other time will give an inaccurate indication.



Press the Reset Lamp Timer, the system will then ask for the reset to be confirmed.

Press 'Yes' to confirm and reset lamp hours, 'No' to return to home screen or 'Cancel' to return to previous screen.

Telemetry

Terminal no.	Description	Information
Terminal 1	+VDC supply	4-20mA Current loop for UV intensity monitoring
Terminal 2	Lamp OK	Closes when the lamp is OK
Terminal 3	Lamp OK	Closes when the lamp is OK
Terminal 4	UV OK	Closes while the UV intensity level is above the UV low threshold
Terminal 5	UV OK	Closes while the UV intensity level is above the UV low threshold
Terminal 6	4-20mA signal	4-20mA Current Loop for UV intensity monitoring
Earth	Earth connection	Earth connection

The Saphir Pro comes with a 7-way VFC connector for external telemetry. The system has a failsafe VFC for both lamp OK and UV OK, as well as a passive 4-20mA output for the UV intensity.

The 4-20 mA current loop connection outputs a variable signal which changes with the UV intensity.

$4\text{mA} = 0\% - 20\text{mA} = 100\%$

Please refer to DUV 709 Sh 122

Servicing & Maintenance

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. Isolate electrical supply to the unit.
2. Remove the bayonet lamp holder cap. Carefully, partially withdraw the lamp, still connected to the lampholder, from the chamber.
3. Whilst supporting the lamp disconnect the lamp holder 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.
6. To reset the hour counter for Saphir Pro
 - i) Reset switch cycles ("switch cycles" 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.

WARNING

IMPORTANT:
Before starting any work on the system, isolate the unit from the power supply.

Lamp and Quartz Services

IMPORTANT: Before starting any work on the system, isolate the unit from the power supply.

Remove/isolate the water supply to the chamber, then drain chamber of water.

Remove the bayonet lamp holder cap and gently extract the lamp from the chamber.



Once the lamp had been extracted far enough to hold the white lamp cap and lamp holder these can be separated. Hold both parts and apply a little pressure to separate.

Servicing & maintenance continued



The lamp can now be fully extracted, making sure to keep the lamp straight so as not to cause any damage to the quartz sleeve.

Next undo the quartz, using the key supplied, turn the quartz clamp anti-clockwise.



The quartz sleeve can now be removed and cleaned.



We recommend using a domestic scourer pad and warm water with 10% citric acid mix. Gentle use of the scourer pad will not cause any damage to the quartz sleeve.

Only clean the outside of the quartz, as the inside is sealed in normal use.

Once the quartz has been cleaned it can be refitted to the chamber.

A new seal kit should be applied. The EPDM O-ring must be fitted first followed by the plastic shim (this may be a black or white shim).

Refit the quartz clamp checking for any damage. If damaged then it should be replaced.

Tighten by turning clockwise. The quartz clamp should be tightened to six newton meters. The new lamp can now be fitted. The lamp holder will only fit one way round as the pins are asymmetrical.

Refit the lamp into the chamber, again keeping the lamp as straight as possible while inserting, to avoid damage to the quartz sleeve.

Once the lamp is in place, tighten the cap with the bayonet.

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 regularly this 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:

- Turn off the power and remove the lamp as above
- Turn off the water supply, isolate the input and output and drain the unit
- 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
- 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
- Do not attempt to clean the inside of the quartz sleeve – they are sealed in normal use and this is unnecessary
- Replace the O-ring, the shim washer, and tighten the seal with firm hand pressure and another quarter turn
- Dry the unit. Turn on the water and check for leaks
- Replace the lamp and switch on



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.

Chamber guarantee

Daro UV Systems provides a 10-year guarantee on all stainless steel chambers. All other parts are covered in the manufacturer's warranty.

Warranty Terms

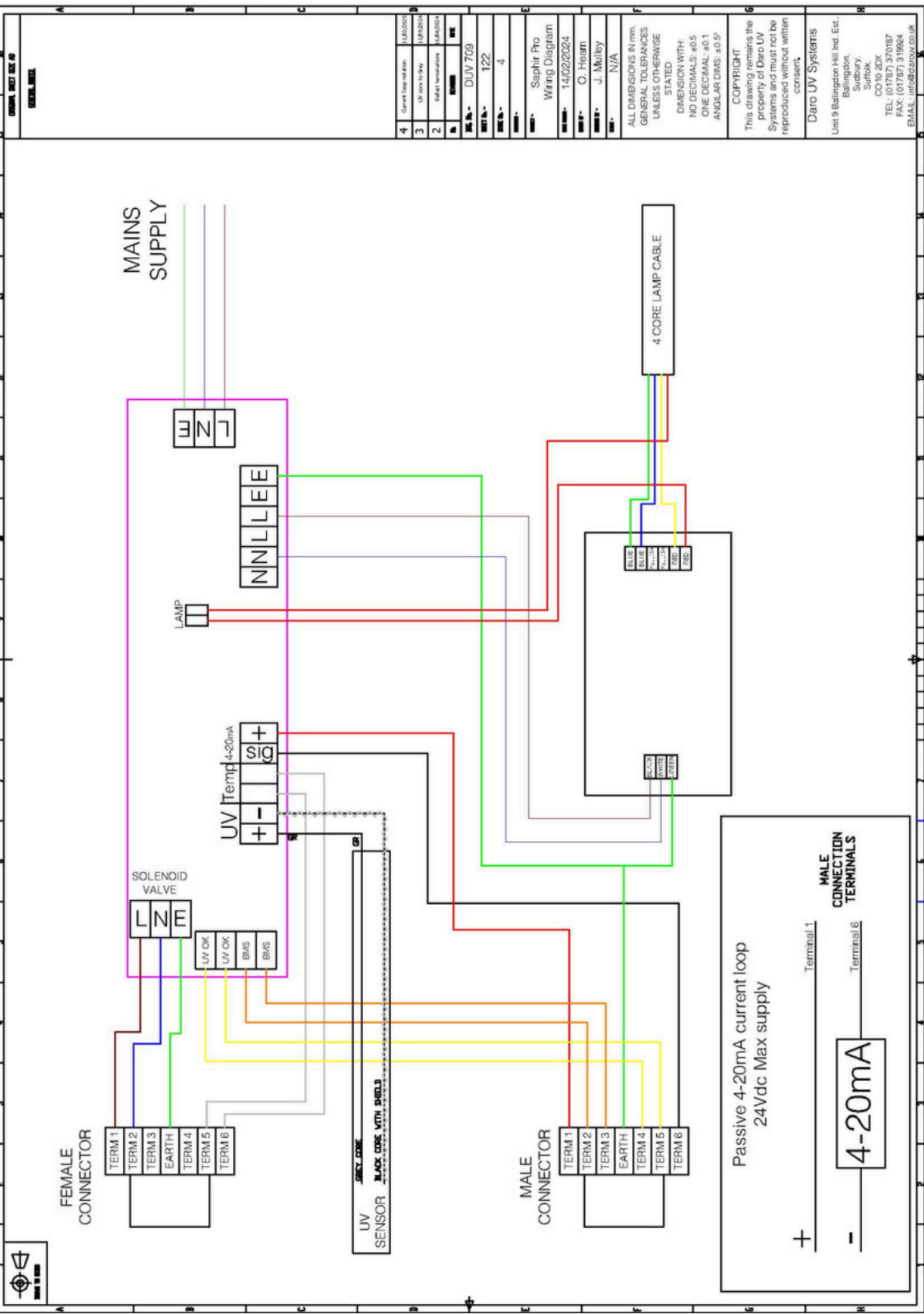
This warranty will become void if the unit(s) are not installed and operated according to the instructions in the manual. It will not be valid for damage(s) which has (have) been caused by misuse, accidents, negligence, frost, fire, flood, or force majeure. This warranty will not be applicable to parts 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 50°C or falls below freezing point.

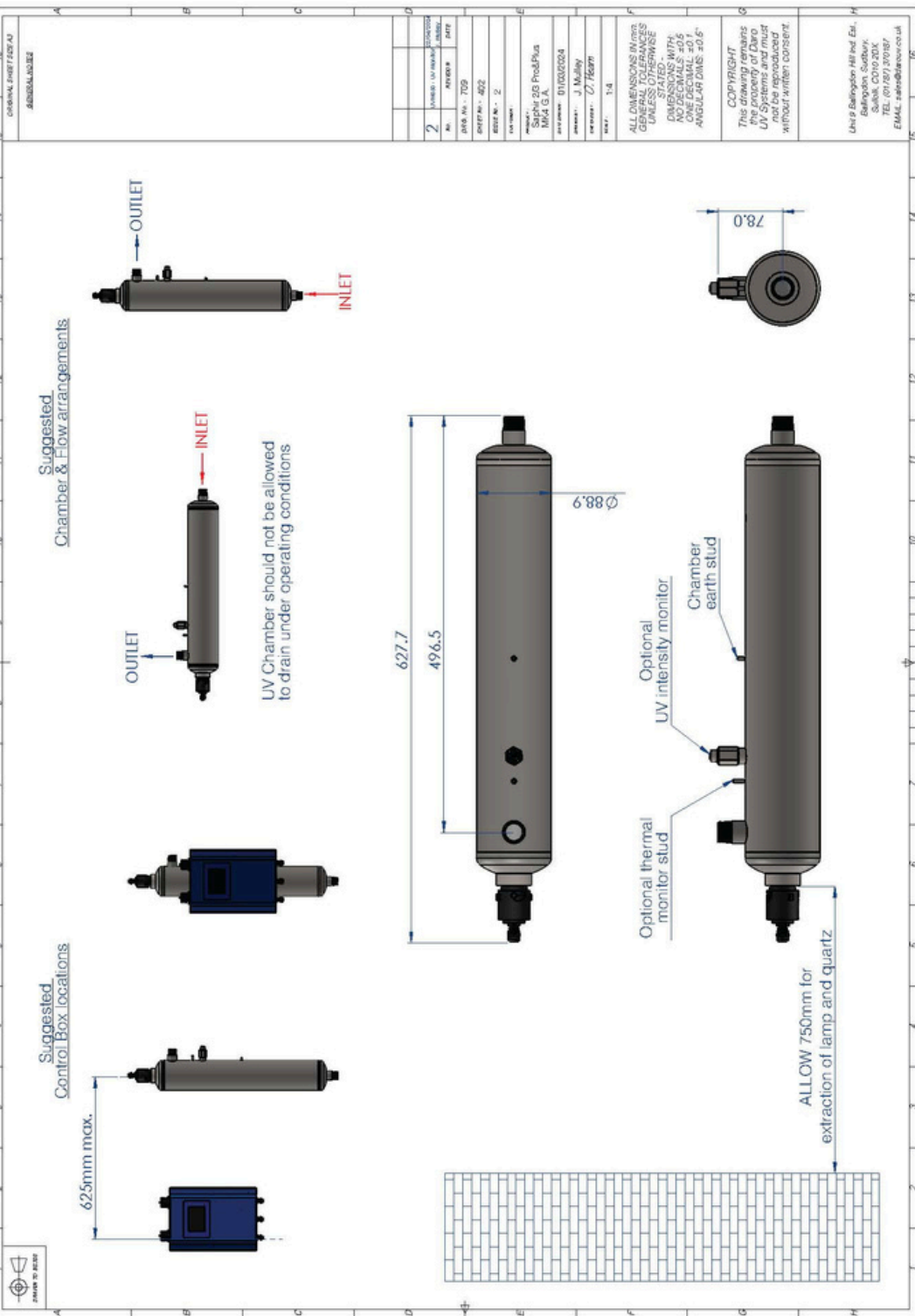
All faulty parts must be returned to Daro UV Systems for inspection and repair or replacement. Daro UV Systems will check and test the faulty parts and identify the reason for the defect. Faulty parts will be replaced free of charge. Daro UV Systems will not be liable for any labour costs but only for 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.

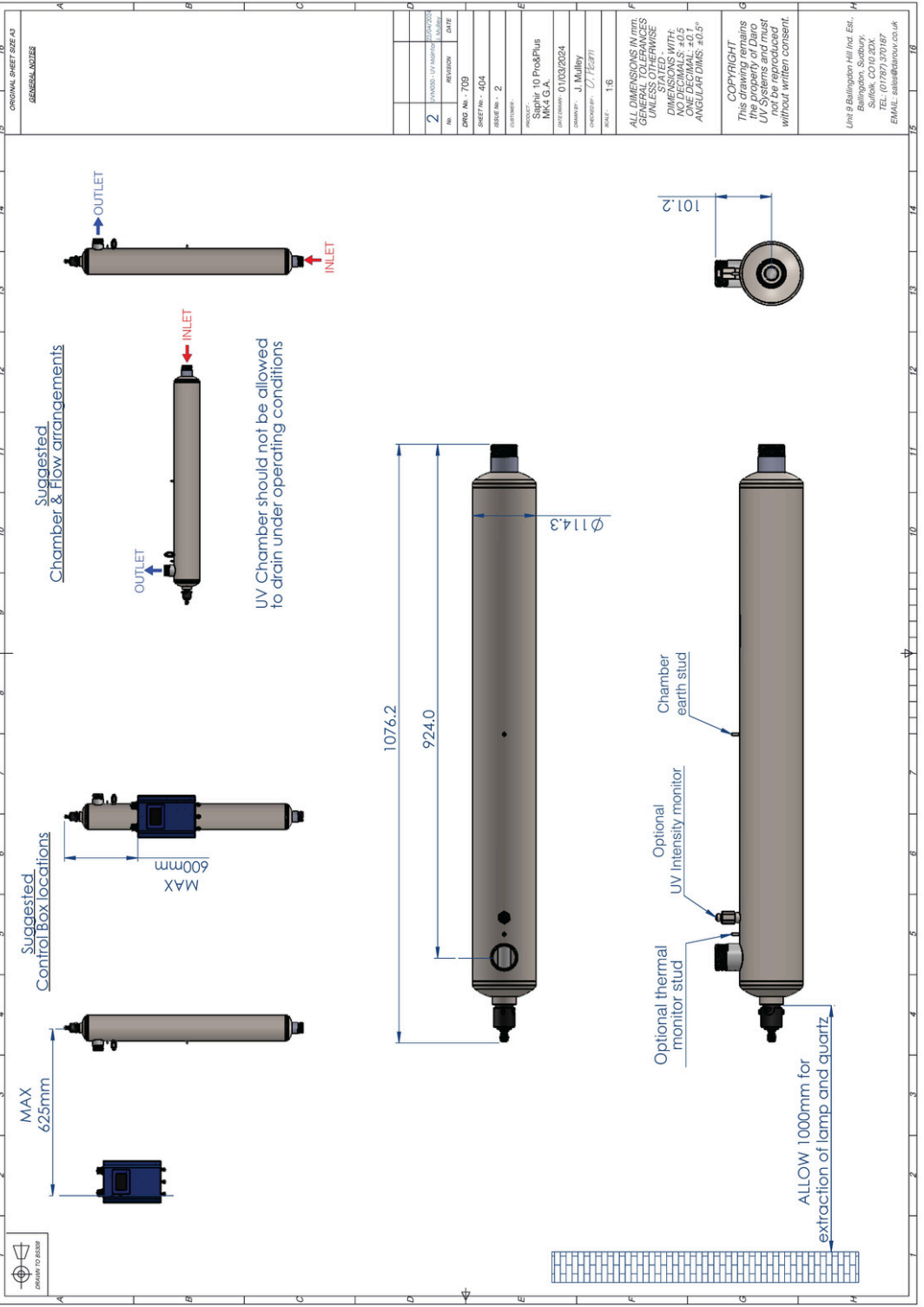


Spares

	Saphir 1	Saphir 2	Saphir 3	Saphir 4	Saphir 7	Saphir 10
Lamps						
GER15SE	✓					
GER25SE		✓				
GER25XOSE			✓			
GER36SE				✓		
GER36XOSE					✓	✓
Quartz Sleeve & Accesories						
QTZ15SE	✓					
QTZ25SE		✓	✓			
QTZ36SE				✓	✓	✓
USK 15/25/36 Seal Kit	✓	✓	✓	✓	✓	✓









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