

‘Safety First with UV Light’

firstline.london



UV 20W – 150W Germicidal Tube Units (Aluminium)

Operating Manual

(including maintenance and health and safety)

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1. OptiMinUV® - Optimizing your Process – Minimizing the Risk

The UV germicidal tube units are supplied as individual products or as part of an OptiMinUV® solution which also includes:

- UV meter for process control
- Health and safety products
- Training course - *'Safety First with UV Light'*

The training course is designed to help you meet your legal obligations for compliance with personal UV light exposure limits and specific hazard awareness training for employees. The result is peace of mind that you've got performance, risk assessment and control covered, along with the confidence and acceptance of the process by your workforce.

OptiMinUV® is the 'Gold Standard' which guarantees optimum performance, easy implementation and compliance with Health and Safety Regulations.

2 Product Description

UV germicidal tube units are available in various lengths and tube wattage (see section 2.1) and designed for the following applications:

UV light disinfection of air and surfaces

They **MUST NOT** be used for any other purpose without first consulting First Line London Ltd

They are designed for fixed mount operation and require either a 100-277 V / 50-60Hz (UV 34W – 150W unit) or 220-240 V / 50-60 Hz (UV 20W unit) power supply.

The UV germicidal tube units have an aluminium housing and incorporate two UV germicidal tubes mounted in front of an aluminium reflector. These are shrink wrapped in clear UV-C transmitting plastic to contain glass fragments in the event of breakage. This meets the requirements of IEC 61549 for fragment retention. The units are waterproof and rated IP65. A digital ballast which provides the means of regulating the current through the UV germicidal tubes is mounted behind the reflector.

Disclaimer – First Line London Ltd cannot accept responsibility for damages resulting from improper use or use for any purpose other than those intended.

To help prevent accidents or ill health all operators and maintenance personnel must read, fully understand and follow all the instructions and warnings contained in this manual **BEFORE** operation or maintenance. It should always be readily available and prominently located in the area of usage. If you have any questions please contact First Line London Ltd.

Due to our policy of continuous product development, we reserve the right to amend specifications and technical data, therefore information in this manual may be subject to change without prior notice.

2.1 Options

UV 20W – 150W Disinfection Units (Aluminium)

- Standard and high output UV-C light intensity
- 4 length options
- 220 – 240 V / 50 – 60 Hz
- 100 – 277 V / 50 – 60 Hz option available

Model	Length	Width	Height	Output	Voltage
UV 150W	1290 mm	120 mm	118 mm	High	100 – 277 V
UV 110W	1028 mm	120 mm	118 mm	High	100 – 277 V
UV 72W	1290 mm	120 mm	118 mm	Standard	100 – 277 V
UV 60W	1028 mm	120 mm	118 mm	Standard	100 – 277 V
UV 34W	723 mm	120 mm	118 mm	Standard	100 – 277 V
UV 20W	465 mm	120 mm	118 mm	Standard	220 – 240 V

2.2 Process control and health and safety products



UV meter

For monitoring UV-C light irradiance levels for process control and assessing personal exposure levels.



UV blocking faceshield

Total UV light absorption, full face and neck protection.



UV blocking window film

Provides total UV light absorption and good visibility.



UV acrylic sheet

For construction of windows, enclosures or guards which allow visibility of a UV process while absorbing all UV light.



UV bulb change kit

Required in accordance with HSE Guidance Note EH17 (revised). Includes safety spectacles, gloves, alcowipes and mercury spillage kit.



UV hazard warning sign

A4 laminated

3. Health and Safety

Under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, it is necessary to assess the health and safety risks associated with work activities affecting employees and non-employees and take measures to control these risks as far as is reasonably practicable. This is not a matter of reducing any risks to zero, but managing the risks adequately.

To comply with the above, involves the person responsible for the risk assessment to make sound judgements regarding the levels of risk and then to decide what more, if anything, should be done to reduce the risk to an acceptable level. In order to assist with this process, the nature and extent of the following health and safety hazards and the necessary control measures are listed below:

- a) UV Light Exposure
- b) Fire
- c) Explosion
- d) Electrical
- e) Hot Surfaces
- f) Broken Glass
- g) Mercury

3.1 UV Light Exposure



Safety Classification in accordance with BS EN 62471:2008
Risk Group 3

It is well established and generally agreed, that low level exposure to certain wavelengths of UV light provides some health benefits, for example synthesis of vitamin D3, which improves the body's absorption of calcium, particularly into the bones. On the other hand, over exposure to UV light can cause adverse health effects, such as erythema (sunburn), photoconjunctivitis and photokeratitis (arc eye) in the short term (acute effects) and can be attributed to premature skin ageing, skin cancer and cataracts as a result of repeated exposure in the long term (chronic effects).

The level of risk for adverse health effects to the skin and eye from exposure to UV light depends on the UV light wavelengths, UV light irradiance values and personal exposure time.

The key is to avoid over exposure and this necessitates the strict implementation of exposure limit values, in order to protect against over exposure to UV light in the workplace.

Occupational UV light exposure in Great Britain is subject to the Control of Artificial Optical Radiation at Work Regulations 2010, which brought into law on 27th April 2010, the European Physical Agents (Artificial Optical Radiation 2006/25/EC) Directive. This incorporates statutory UV light exposure limit values (ELV's) which are based on those defined by the International Commission on Non-Ionising Radiation Protection (ICNIRP). It specifies the minimum requirements for the protection of workers from risks to their health and safety arising or likely to arise from exposure to artificial UV light during their work. Furthermore it dictates that in cases of persons subjected to UV light emissions from artificial sources, employers must determine personal UV light exposure levels and compare with the exposure limit values as a means of assessing risks and necessary controls. Workers should not be exposed above the exposure limit values and must be provided with specific information, instruction and training.

Where personal UV light exposure levels comply with the exposure limit values, the risk can be considered low for the majority of the population and adequately controlled so far as is reasonably practicable.

Where personal UV light exposure exceeds the exposure limit values this constitutes a regulatory offence and additional control measures must be implemented which decrease exposure to below the exposure limit values.

3.1.1 Control measures

The objective is to ensure that the UV light exposure limit values for the unprotected skin and eye are not exceeded by any person. This can be achieved by a combination of the following control methods: administrative, engineering, personal protective equipment.

Emphasis should be placed on administrative and engineering control measures to minimise the need for personal protective equipment.

3.1.1.1 Administrative control measures

a) *Hazard awareness*

All persons who could be exposed to levels of UV light exceeding the exposure limit values or significant personal exposure must be provided with sufficient information and training to understand the associated risks to their health and the precautions which should be taken to adequately manage the risk.

b) Compliance with the UV light exposure limit values for the unprotected skin and eye in accordance with the Control of Artificial Optical Radiation at Work Regulations 2010

The UV light exposure limit values are set below threshold levels of UV light exposure where observable adverse health effects would occur and incorporate significant safety margins.

They define a level of UV light exposure, below which it is believed that nearly all individuals may be repeatedly exposed without adverse health effects. Some people may be unusually photosensitive, exposed to photosensitising agents, aphakic (had an eye lens removed and not replaced by an artificial lens) or pseudophakic (had an eye lens replaced with a non UV light absorbing artificial intraocular lens) in which case these exposure limits may not provide adequate protection.

The applicable UV light exposure limit value for an 8 hour period per day is as follows:

UV light in the spectral region 180nm-400nm (UV-A, UV-B and UV-C)
 maximum permissible effective radiant exposure for
 the unprotected skin and eye = $30 \text{ J/m}^2_{\text{eff}}$

It is necessary for duty holders to limit personal UV light exposure time at the specified distances in the Table below, to ensure that the maximum permissible exposure values for the unprotected skin and eye are **NOT EXCEEDED** within an 8 hour period per day.

Distance from UV germicidal tubes (mm)	Maximum permissible UV light exposure time within an 8 hour period per day for unprotected skin and eyes
100	0
200	0
500	0
1000	3 seconds
1500	6 seconds
2000	10 seconds
3000	20 seconds
4000	40 seconds
This data is only applicable to UV germicidal tube units, supplied by First Line London Ltd.	

Maximum permissible UV light exposure times, at various distances within the beam of the UV germicidal tube unit, for the unprotected skin and eye in an 8 hour period per day in compliance with the Control of Artificial Optical Radiation at Work Regulations 2010.

WARNING

The maximum permissible exposure times provided above for the unprotected skin and eye are extremely short. Therefore control measures for protection against exceeding the UV light exposure limit values will by necessity include ...

- ... containment of UV light within a fully light tight and interlocked room or enclosure.
- ... any person who could possibly be exposed to UV light must wear full body personal protective equipment. This means all skin, eyes and hair must be adequately covered and a UV blocking faceshield must be worn at all times.

c) **Limitation of access** - Access to an area where the UV germicidal tube unit is operated should be limited only to persons directly concerned with its use or those necessary.

d) **Warning labels and signs** – Should be used to indicate the presence of UV light which could result in persons being exposed to levels of UV light exceeding the exposure limit values, or significant personal exposure.



e) **Routine maintenance** – Regular routine maintenance is essential to ensure optimum performance and minimum risk. The recommended procedures and intervals should be strictly implemented.

UV germicidal tube replacement - Ensure that the correct type of UV germicidal tube is fitted, otherwise the UV light exposure information, provided on Page 10, will not be valid and new UV light measurements and evaluation would be necessary. Only use replacement germicidal tubes supplied by First Line London Ltd, otherwise this will invalidate the warranty and could result in a serious breach of health and safety regulations.

3.1.2.2 Engineering control measures

i) **Containment** – The UV light output from the UV germicidal tube unit must be contained within a fully light tight and interlocked room or enclosure.

If observation windows are required they should be made of a suitable UV absorbent material such as UV protective red acrylic sheet, available from First Line London Ltd. BS EN 953 covers enclosures.

Interlocks should be fitted to the enclosure where the removal of a cover could result in over exposure to ultraviolet radiation. All interlocks should be fitted in an appropriate manner, as described by BS EN 1088.

Any person who could possibly be exposed to UV light must wear full body personal protective equipment. This means all skin, eyes and hair must be adequately covered and a UV protective faceshield must be worn at all times.

- ii) **Reduction of reflected UV light** – Many surfaces, especially those of shiny metal or glossy light-coloured paints, will reflect UV light. To reduce reflected UV light, some surrounding area surfaces could be painted in a dark, matt colour.

3.1.2.3 Personal protective equipment

- i) **Protection of the skin** – All persons exposed to any UV light from the UV germicidal tube unit must always cover all skin. The areas of skin usually at risk are the backs of the hands, forearms, face and neck, other areas are usually covered by clothing. The hands can be protected by wearing gloves and arms can be covered by long sleeves, using material with low UV light transmission. In general, darker coloured, heavier fabrics with a closed structure offer a higher level of protection than light coloured, light weight fabrics with an open structure. The face can be protected by a UV blocking face shield, available from First Line London Ltd and this will also provide eye protection. Particular attention must be paid to prevent gaps in protective clothing that commonly occur around the neck and wrist areas.
- ii) **Protection of the eyes** – All persons exposed to any UV light from the UV germicidal tube unit must always wear a UV blocking faceshield. These are available from First Line London Ltd.

3.2 Fire



Never operate in areas where there is a flammable atmosphere hazard.

3.3 Explosion



Never operate in areas where there is a flammable atmosphere hazard.

3.4 Electrical



Electrical equipment is potentially dangerous and may cause death or injury if sufficient precautions are not taken before operation, installation or maintenance.

Never operate - if there is any visible damage to the UV light unit, cables or connectors.

Never operate - without a 3A fuse fitted in the plug or appropriate fuse protection in the lighting circuit.

Before maintenance isolate electrical supply.

3.5 Broken Glass



The UV germicidal tubes are made of glass and must be considered as fragile when handled. These are shrink wrapped in clear UV-C transmitting plastic to contain glass fragments in the event of breakage. This meets the requirements of IEC 61549 for fragment retention.

However, we recommend wearing suitable eye protection and gloves when handling, because in the event of damage to the tube and its protective plastic wrapping the glass could shatter producing large and small pieces of sharp glass. In this case precautions must be taken when handling to avoid the possibility of cuts. We recommend wearing suitable eye protection, gloves and the use of a dust pan and brush to clean up.

3.6 Mercury



UV germicidal tubes contain a small amount of mercury. In the event of damage to the UV tube and its protective plastic wrapping, clean up and remove any mercury spillage immediately, using the Mercury Spillage Kit, available from First Line London Ltd.



4. Installation

Unpack and visually inspect for any damage.

Handle with care to avoid damage and ensure all packaging material is removed.

Fix mount the unit in position.

Electrical connections

The UV light unit is rated IP65 and supplied with a mains lead to allow it to be plugged into a socket outlet. The circular socket connector on the mains lead is IP65, however the plug is not IP65.

To reach the required IP rating (up to IP65) either:

- Plug into a socket outlet with IP rating required.
- Remove the supplied plug and fit a different plug which meets the IP rating required.
- Remove the supplied plug and wire into a junction box which meets the IP rating required. Follow the procedure below to connect into a 220-240 V 50/60 Hz power supply.

IMPORTANT - This equipment must be earthed

The wires in the mains lead are coloured in accordance with the following code:

Green and Yellow	Earth
Blue	Neutral
Brown	Live

5. Operation

Operation should only be performed by suitably trained personnel. This should include UV hazard awareness training.

5.1 Pre-Operation Checks

Before switching on, always check the following. If in any doubt whatsoever do not switch on.

NEVER operate:

- a) **If** there is any visible damage to the unit, cables or connectors.
- b) **Without** correctly rated 3A fuse fitted in the plug or power feed.
- c) **Without** the necessary control measures in place for protection against exceeding the UV light exposure limit values.

The ambient temperature of the operating environment should not exceed 50°C and should not fall below 0°C.

5.2 Switching On

Switch on either the 100-277V / 50/60Hz or 220-240V / 50/60Hz power supply. The UV germicidal tubes will then ignite.

6. Maintenance

Regular routine maintenance is essential to ensure the UV germicidal tube unit is safe to use and operates at peak performance. The service intervals recommended are provided in the following sections.

Maintenance of any kind must only be performed by suitably qualified and trained persons.

Only use replacement parts and accessories supplied by First Line London Ltd.

First Line London Ltd cannot accept any responsibility for damages resulting from improper repairs or use of spare parts not supplied by First Line London Ltd.

6.1 Cleaning of the Aluminium Reflector

The Aluminium reflector should be kept free of dust, dirt and contamination by regular cleaning. Cleaning intervals will be dependent on the operating environment.

Failure to keep the Aluminium reflector clean will result in reduced performance.

To clean the Aluminium reflector follow the procedure below:

- a)  Disconnect power supply.
- b)  Allow to cool for 15 minutes.
- c)  Put on the safety spectacles which are included in the 'UV Bulb Change and Mercury Spillage Kit' available from First Line London Ltd.
- e) Remove the two germicidal tubes. This is done by unscrewing the tube holder locking collars anti clockwise until they are free of the tube holders and pulling the germicidal tubes towards the front of the unit, ensuring the pins travel freely through the slots in the tube holders.

Caution: Incorrect handling or installation of a UV germicidal tube can result in damage and the risk of injury from sharp pieces of glass and mercury vapour.



In the event of damage to the UV germicidal tube and plastic wrapping clean up and remove immediately, using the 'UV Bulb Change and Mercury Spillage Kit' available from First Line London Ltd. This includes the necessary materials, personal protective equipment and instructions for use.

- f) Wipe over the surface of the Aluminium reflector with a soft, damp lint free cloth only. Never use any soaps, detergents or abrasive materials.
- g) Replace the two germicidal tubes. This is done by placing the pins into the slots in the tube holders, gentle push in to fix in place, then the screw tube holder locking collars clockwise until they are finger tight.

6.2 UV Germicidal Tube Replacement

The UV light irradiance will reduce over the lifetime of the UV germicidal tubes. The precise deterioration will depend on age, environment, switching and cooling.



The UV germicidal tubes should therefore be changed after a maximum 9,000 hours operating life.

Avoid touching the UV germicidal tubes with bare hands. This will cause finger prints which will reduce performance.

Remove any possible finger prints with an alcohol surface wipe.

To replace a UV germicidal tube follow the procedure below:

- a)  Disconnect power supply
- b)  Allow to cool for 15 minutes.
- c)  Put on the safety spectacles which are included in the 'UV Bulb Change and Mercury Spillage Kit' available from First Line London Ltd.
- d) Put on the lint free nylon gloves which are included in the 'UV Bulb Change and Mercury Spillage Kit' available from First Line London Ltd. This will avoid finger prints which would reduce performance.
- e) Remove the two germicidal tubes. This is done by unscrewing the tube holder locking collars anti clockwise until they are free of the tube holders and pulling the germicidal tubes towards the front of the unit, ensuring the pins travel freely through the slots in the tube holders.

Caution: Incorrect handling or installation of a UV germicidal tube can result in damage and the risk of injury from sharp pieces of glass and mercury vapour.



In the event of damage to the UV germicidal tube and plastic wrapping clean up and remove immediately, using the 'UV Bulb Change and Mercury Spillage Kit' available from First Line London Ltd. This includes the necessary materials, personal protective equipment and instructions for use.

- f) Take a new UV germicidal tube and check for any visible damage. Never use damaged UV germicidal tube.
- h) Replace the two germicidal tubes. This is done by placing the pins into the slots in the tube holders, gentle push in to fix in place, then screw the tube holder locking collars clockwise until they are finger tight.

6.2.1 Disposal of UV Germicidal Tubes

UV germicidal tubes contain a small amount of mercury and users must therefore comply with WEEE Regulations and HSE guidelines on the use and disposal of mercury. A business user of UV germicidal tubes is classified as a producer of waste under the WEEE regulations and is responsible for their safe disposal. UV germicidal tubes are considered hazardous and cannot be disposed of in normal industrial waste.

First Line London Ltd is a member of the Recolight WEEE compliance scheme and are committed to ensuring UV bulb recycling is as easy, efficient and cost effective as possible. All our UV germicidal tubes can be recycled simply and at no cost through Recolight – the only specialist WEEE compliance scheme to have a dedicated network of open collection points for business waste UV germicidal tubes.

General Maintenance

The UV germicidal tube unit should be routinely serviced. The service intervals will depend on usage and operating environment, but generally every 12 months is recommended.

6.3

This must only be done by First Line London Ltd.

The service schedule will include:

- a. External cleaning.
- b. Checking all cables and connectors.
- c. PAT testing with certificate.
- d. UV germicidal tube replacement if necessary.
- e. Measurement and validation of UV-C light output.

6.4 UV-C Light Irradiance and Exposure Measurement For Process Control

Many applications require a minimum UV-C light irradiance or UV-C light exposure in order to maintain strict process control. It is therefore necessary to conduct regular, routine measurement.

First Line London Ltd supply UV-C light irradiance and exposure meters which will allow accurate and reproducible measurements.

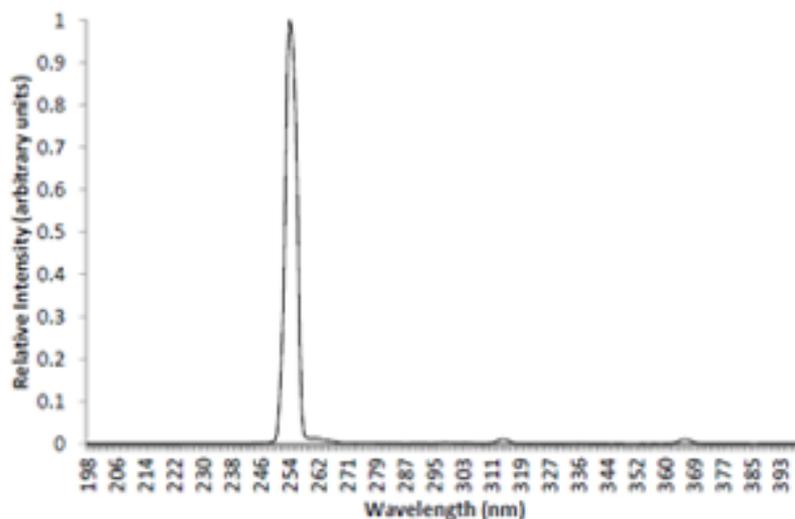
If a measured value is below the minimum threshold limit value this indicates that maintenance work is necessary.



7. Technical Data

	UV 20W	UV 34W	UV 60W	UV 72W	UV 110W	UV 150W
UV germicidal tubes: 	2 x 9W (12")	2 x 17W (24")	2 x 30W (36")	2 x 36W (48")	2 x 55W (36")	2 x 75W (48")
Estimated useful life of UV germicidal tubes:	9,000 hours depending upon age, environment, switching and cooling.					
Reflector:	Aluminium – UVL full spectrum grade					
Power supply requirement:	220-240V 50/60Hz	110-277V 50/60Hz				
Power:	20W	34W	60W	72W	110W	150W
Fuse protection:	3A					
Weight (approximate):	2 Kgs	3 Kgs	6 Kgs	8 Kgs	6 Kgs	8 Kgs
Operating environment temperature range:	0 – 50°C					
IP Rating:	IP65					
RoHS:	First Line London Ltd products are RoHS compliant.					

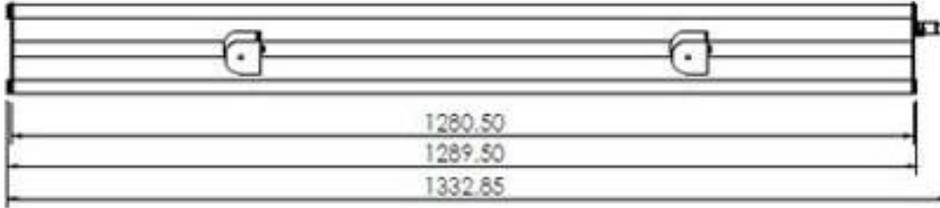
UV Light Spectral Output



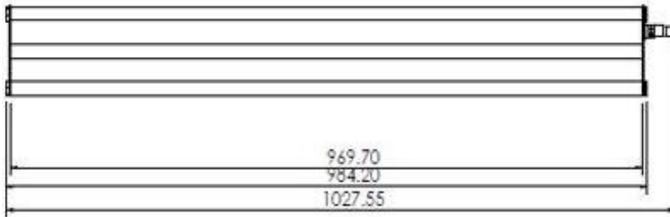
Schematic Drawings

Rear View

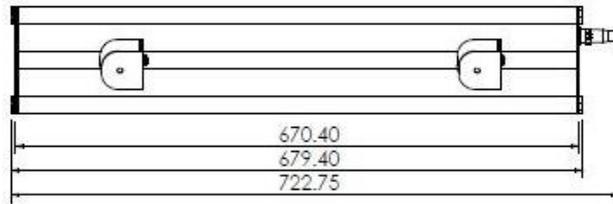
UV 72W and 150W - 1323 mm (48")



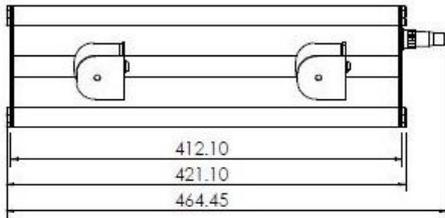
UV 60W and 110W - 1015 mm (36")



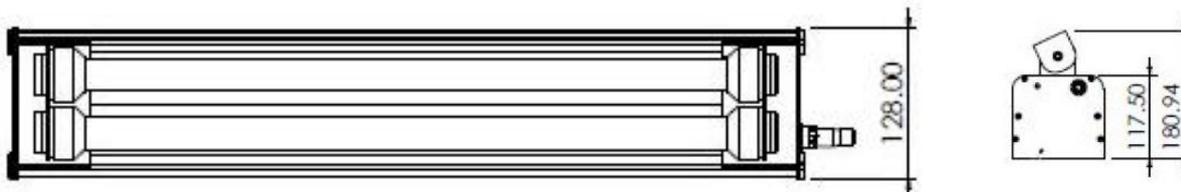
UV 34W - 709 mm (24")



UV 20W - 455 mm (12")



Front view and adjustable mounting bracket



Replacement Parts



10W-GERM-WP	UV 10W germicidal tube (wrapped)
17W-GERM-WP	UV 17W germicidal tube (wrapped)
30W-GERM-WP	UV 30W germicidal tube (wrapped)
36W-GERM-WP	UV 36W germicidal tube (wrapped)
60W-GERM-WP	UV 60W germicidal tube (wrapped)
75W-GERM-WP	UV 75W germicidal tube (wrapped)

Accessories



LCKIT **UV Bulb Change and Mercury Spillage Kit**

Recommended in accordance with Guideline Note EH17 (revised) from the Health and Safety Executive.



UV-FS **UV Blocking Face Shield**
Clear

Total UV light absorption, full face and neck protection.



UV-PWF **UV Blocking Flexible Plastic Window Film**

635mm wide – provides total UV light absorption and good visibility.



UV-PS **UV Blocking Red Acrylic**

Sheet 1000mm x 500mm x 3mm - suitable for construction of windows, enclosures or guards which allow visibility of a UV process while absorbing all UV light.



PM0006 **Hazard Warning Signs**

Laminated
Size: 210mm x 298mm (A4)

PM0007
Self-adhesive vinyl
Size: 100mm x 125mm

Warranty

The UV germicidal units are covered by our twelve (12) months back to base warranty, from the date of delivery. (All customs duties and disbursements for the return will be the responsibility of the purchaser.)

First Line London Ltd undertake that if, within the warranty period, our equipment or any part thereof, is proved to be defective by reason only of faulty workmanship or materials, we will at our option, repair or replace the same free of charge. However, the following conditions and exclusions will apply:

Conditions:

- The defective equipment or parts are returned to First Line London Ltd at the address below.
- The equipment has been correctly supplied by an authorised First Line London Ltd distributor and used in accordance with the operating, maintenance and health and safety instructions.
- The equipment has not been serviced, maintained, repaired, taken apart, or tampered with in any way by any person not authorised by First Line London Ltd.
- The equipment is still in the possession of the original user.
- Any equipment or defective parts replaced shall become the sole property of First Line London Ltd.

Exclusions:

- UV germicidal tubes.
- Damage resulting from transportation, fire, accident, abuse, misuse, improper use, neglect, or act of God.
- Damage resulting from immersion in or exposure to chemicals, liquids or dirt, extremes of climate, fungus or excessive wear and tear.