

CONTENTS

1. INTRODUCTION	7
1.1 ABOUT USER MANUAL	7
1.2 DEFINITION OF AN ULTRAVIOLET SYSTEM	7
1.3 SCOPE OF APPLICATIONS.....	7
2. HEALTH & SAFETY	10
2.1 SAFETY INSTRUCTIONS.....	10
HEALTH MEASURES.....	12
3. TECHNICAL SPECIFICATIONS	15
3.1 GENERAL TECHNICAL SPECIFICATIONS	15
General Technical Know-How about UV Devices	15
General Information about UV Control Panels.....	17
3.2 SYSTEM COMPONENTS	18
Body.....	18
Quartz Sleeve.....	20
Cap.....	21
Blind Cap.....	21
UV Lamp.....	22
O-Ring.....	22
Spring	22
Quartz Spring.....	23
Socket.....	23
Control Board.....	23

4. OPERATING PRINCIPLE & CONTROL PANEL.....	24
4.1 OPERATING PRINCIPLE.....	24
4.2 CONTROL PANEL.....	25
PRO Panels	26
PLUS Panels.....	31
5. HANDLING-STORAGE & INSTALLATION.....	37
5.1 HANDLING AND STORAGE	37
Precautions Before Installing	37
6. COMMISSIONING	43
6.1 STEPS FOR COMMISSIONING.....	43
7. OPERATION & MAINTENANCE	44
7.1 OPERATION.....	44
7.2 MAINTENANCE.....	44
Replacement of Ultraviolet Lamps	45
8. TROUBLE-SHOOTING	47
9. WARRANTY CONDITIONS	49
9.1 WARRANTY CONDITIONS FOR SYSTEM	49
9.2 GENERAL WARRANTY CONDITIONS	49
9.3 OUT-OF-WARRANTY CIRCUMSTANCES.....	50

LIST OF FIGURES

<i>FIGURE 1: E50 AND E305 UV BODY</i>	18
<i>FIGURE 2: ES 120 AND ES 150 UV BODY</i>	19
<i>FIGURE 3: EA 1200 UV BODY</i>	20
<i>FIGURE 4: CAP</i>	21
<i>FIGURE 5: BLIND CAP</i>	21
<i>FIGURE 6: ULTRAVIOLET LAMP</i>	22
<i>FIGURE 7: O-RINGS</i>	22
<i>FIGURE 8: SPRING</i>	22
<i>FIGURE 9: QUARTZ SPRING</i>	23
<i>FIGURE 10: SOCKET</i>	23
<i>FIGURE 11: E PRO CONTROL PANELS</i>	26
<i>FIGURE 12: ES PRO CONTROL PANEL (FOR MODELS WITH TWO OR THREE LAMPS)</i>	28
<i>FIGURE 13: ES PRO CONTROL PANEL (FOR MODELS WITH FOUR OR FIVE LAMPS)</i>	29
<i>FIGURE 14: ES PRO CONTROL PANEL (FOR MODELS WITH SIX, EIGHT OR TEN LAMPS)</i>	30
<i>FIGURE 15: E PLUS CONTROL PANEL</i>	31
<i>FIGURE 16: ES PLUS CONTROL PANEL (FOR MODELS WITH TWO OR THREE LAMPS)</i>	32
<i>FIGURE 17: ES PLUS CONTROL PANEL (FOR MODELS WITH FOUR OR FIVE LAMPS)</i>	33
<i>FIGURE 18: ES PLUS CONTROL PANEL (FOR MODELS WITH SIX, EIGHT OR TEN LAMPS)</i>	34
<i>FIGURE 19: EA PLUS CONTROL PANEL</i>	35

LIST OF TABLES

<i>TABLE 1: COMPARISON TABLE FOR UV DEVICE PANEL</i>	17
<i>TABLE 2: TROUBLE-SHOOTING TABLE</i>	48

GLOSSARY OF ABBREVIATIONS

<i>CIP</i>	: <i>Clean In Place</i>
<i>CM</i>	: <i>Centimeter</i>
<i>MIN</i>	: <i>Minute</i>
<i>DNA</i>	: <i>Deoxyribonucleic Acid</i>
<i>°F</i>	: <i>French Degree</i>
<i>GAC</i>	: <i>Granular Activated Carbon</i>
<i>Hz</i>	: <i>Hertz</i>
<i>J/M²</i>	: <i>Joule/Square Meter</i>
<i>LED</i>	: <i>Light Emitting Diode</i>
<i>M³/SA</i>	: <i>Cubic Meter/Hour</i>
<i>NM</i>	: <i>Nanometer</i>
<i>PPM</i>	: <i>Parts Per Million</i>
<i>PSI</i>	: <i>Pounds Per Square Inch</i>
<i>RNA</i>	: <i>Ribonucleic Acid</i>
<i>RO</i>	: <i>Reverse Osmosis</i>
<i>SN</i>	: <i>Second</i>
<i>SS</i>	: <i>Stainless Steel</i>
<i>UV</i>	: <i>Ultraviolet</i>
<i>UVC</i>	: <i>Ultraviolet C</i>
<i>V</i>	: <i>Volt</i>

1. INTRODUCTION

1.1 ABOUT USER MANUAL

USER MANUAL FOR ULTRAVIOLET SYSTEMS contains necessary information for the usage and maintenance of the devices. The user manual must be read carefully by all the related persons in order to ensure the safe usage of the systems before the operation of Ultraviolet devices. Please act in accordance with this information, follow the advices and instructions included in this user manual. Those who act in a contrary way will be responsible for any loss or damage.

1.2 DEFINITION OF AN ULTRAVIOLET SYSTEM

Disinfection by Ultraviolet (UV) Systems is a process removing micro-organisms, bacteria and virus from water without using any chemical or oxidant material. Ultraviolet rays damage DNA structures of micro-organisms and render them ineffective. Ultraviolet systems achieve approximately 99,9% disinfection efficiency.

1.3 SCOPE OF APPLICATIONS

Ultraviolet (UV) technology was originally used in Europe as an alternative to chlorination to ensure the adequate disinfection of municipal drinking water supplies. Today, it is used globally for disinfection of drinking water, wastewater, process water and industrial effluent. It is also used for non-disinfection applications such as de-chlorination in many industrial plants.

UV technology is particularly applicable to the bottled water, beverage and food processing sectors, where extremely high standards of hygiene are expected. Contamination processes started at any point by pathogenic or spoilage microorganisms can have extremely serious consequences for manufacturers. Therefore, effective microbial disinfection of the whole process is essential.

UV technology is highly efficient in all sectors of food and beverage industries and is globally accepted as non-chemical method of disinfection. UV kills pathogenic and food spoilage microorganisms, including bacteria (including *Cryptosporidium* and *Giardia*) viruses, yeasts and molds (and their spores). This environmentally friendly technology, which requires low maintenance, eliminates the need for chemical treatment while ensuring very high levels of disinfection.

Ultraviolet Applications in Industry

1.3.1.1 Directly Water Application

Although municipal water is normally free from harmful or pathogenic microorganisms, it should not be assumed so. In addition, water supplied from private sources such as natural springs or wells can also be contaminated. Any water used either as an ingredient in food or beverage products or in direct contact of water with the product can also be a source of contamination. UV disinfects water without using chemicals or pasteurization. It also enables the re-use of process water, to save money and to improve productivity without risking quality of the product.

1.3.1.2 CIP (Clean In Place) Rinse Water

It is essential to use final rinse water of a CIP process for flushing out foreign materials and make sure disinfection solutions are microbiologically safe. Fully-automated UV disinfection systems can be integrated with CIP rinse cycles in order to ensure that final rinse water does not re-introduce microbiological contaminants. Medium pressure lamps are ideal for this application because of their mechanical strength, which means that they are not affected by any sudden changes in temperature of the CIP water such as when hot (80°C) liquid is instantly followed by cold (10°C) liquid.

1.3.1.3 Wash/Rinse Water

Using UV for disinfection of water used to rinse or wash process equipments or process surfaces can dramatically decrease contamination while increasing their shelf-lives. UV also reduces the amount of chlorine required for disinfection of rinse and wash water.

1.3.1.4 Filter Disinfection

Stored reverse osmosis (RO) and granular activated carbon (GAC) filtrate is often used to filter water, but can be a breeding ground for bacteria. Installing post-filter on UV systems is a highly effective way of disinfecting both stored RO and GAC filtered water.

1.3.1.5 De-chlorination

GAC filters can sometimes be used to de-chlorinate water after the chlorination process. De-chlorination removes off-flavor often associated with chlorine disinfection, which means the flavor of final product remains untainted and free from unwanted flavors or odors. Placing UV systems ahead of GAC filters improves the performance of the filters and results in running carbon for longer, so decreases operation costs.

1.3.1.6 Sugar Syrup

Sugar syrups used as flavorings in the beverage, fruit juice and bottled water industries can be a prime breeding ground for microorganisms. Although the syrups with very high sugar content do not support microbial growth, any dormant spores may become active after the syrup has been diluted. Treating the syrup and dilution water with UV prior to use will ensure deactivation of dormant microorganisms.

1.3.1.7 Packaging & Surface Disinfection

Surface disinfection systems are used to reduce microorganisms that grow due to all kinds of packaging including glass and plastic bottles, cans, lids and foils. Irradiating the surfaces with UV prior to packaging ensures elimination of spoiling organisms, which will extend the shelf life of the product and reduce the risk of contamination.

2. HEALTH & SAFETY

ALL HEALTH AND SAFETY PRECAUTIONS SPECIFIED IN THIS SECTION MUST BE READ CAREFULLY AND ALL WARNINGS MUST STRICTLY BE FOLLOWED.

2.1 SAFETY INSTRUCTIONS

- △ UV lamp supplied with this system may cause serious damages to unprotected eyes and skin. Do not look directly at a lit UV lamp. Unplug the system before carrying out any process work on the UV system. Do not operate UV systems without inserting lamp first.
- △ Examine thoroughly UV disinfection systems after the installation. Do not plug the system in if the components such as ballast or lamp connection ports are wet.
- △ Do not operate UV disinfection systems if the electrical cable or plug is damaged.
- △ Before cleaning or maintenance, disconnect the system from water and power supplies. Do not pull electrical cable while unplugging the system, but remove the plug from the socket gently.
- △ Do not use UV disinfection system apart from its purposes.
- △ Do not use UV system in the open air. Ensure UV system against exposure of weather conditions (rain, direct sunlight etc.) or temperature at near freezing point. In the event that the UV system will not be operated for a long time, inlet and outlet connections of the system must be turned off and water left inside must be drained. If the device is installed in a place with a temperature near freezing point, appropriate background heating must be installed.

- △ If an extension cable is required, a correctly sized cable shall be used. For instance, if an extension cable with a lower amp or watt rating is used than is required by the UV, the cable can heat up and this can become highly dangerous (risk of fire).

- △ Ensure UV systems to be electrically grounded against electric shocks before operating the system.

- △ In the event that the system has not been operated for a long time and power supply of the system has not been disconnected during this period, be cautious because water left inside the UV body could be hot as could the body.

- △ Pay extra attention to precautions against electrical shock in the vicinity where electrical equipments are in contact with water.

HEALTH MEASURES

- △ Flaming tools and devices shall not be used near storage and usage areas of chemicals.
- △ Usage of chemicals can be dangerous. Therefore, measures taken for health and safety of the personnel must be followed carefully. The end-user is responsible for training the personnel properly in how to use chemicals.
- △ Panel covers shall not be opened when the panel is electrified. You can be exposed to high voltage.
- △ Instructions given in this manual shall be strictly followed and any contrary operation or maintenance shall not be performed. The system shall be used just for the purpose of water treatment.
- △ All pipes on the system shall be monitored every day. The system must be stopped and the required precautions must be taken when a leakage is detected. Any pipe or equipment shall not be uninstalled without knowledge of its pressure value.
- △ The system shall not be maintained without protective equipments. Protective clothing and tools shall be always used, especially for protecting face, eyes, hands and neck. Chemicals must not be allowed to contact with eyes, skin and clothes; and vapor shall not be inhaled.
- △ Change in voltages shall be checked periodically. Electrical lines shall be grounded and precautions shall be taken against phase change or voltage reduction.
- △ No one must be allowed to enter into a confined area, tank or an indoor area without any accompanying person when proper ventilation is not provided and which is exposed to chemical vapors.

- △ Water is conditioned by means of chemicals in water treatment systems. Chemicals such as chlorine, sodium metabisulphite, acid and caustic etc. are used at pre-treatment and final treatment processes. The used chemicals have typical caustic, corrosive features and their MSDS shall be read carefully before usage.
- △ Power shall be switched off and this shall be checked with a voltage tester or multi-meter before any personnel work on the panel. Any electrical equipment or instruments shall not be handled before power is switched off.
- △ The system shall be protected against the risk of freezing.
- △ Water shall not be sprayed into the panel in case of fire. Dry powder extinguisher shall be used after main power is switched off.
- △ The system shall not be operated at higher flow rates than specified in the technical specifications. Maximum operation pressure is 8 bar (120 psi), maximum operating temperature is 80°C. These values shall not be exceeded.
- △ In case of electric shock, electric current shall be shut off via the switch or the casualty must be separated from current using a non-conductive object. First-aid shall be carried out by those with necessary knowledge and in case of loss of consciousness, burn or fracture arisen from falling down; the casualty must be taken to hospital without allowing him/her to stand up.
- △ No matter how small the injury looks, it must be examined by a doctor or nurse.
- △ In the event that chemicals are swallowed call a medically trained person immediately.

- △ In case of contact with eyes, the eyes must be washed with plenty of water for 15 minutes. In case of shock, tight clothes must be loosened and legs must be lifted up 25-30 cm above the ground (heart level).

- △ In the event that chemical vapor is inhaled, the person must be removed to fresh air. In case of respiratory arrest, artificial respiration must be given.

- △ All chemical contaminated clothes must be taken off. Parts of body contacted with chemicals must be washed with plenty of water at least for 15 minutes.

- △ In case of burn, oil or ointment must not be applied on the burnt part. In case synthetic clothes are adhered to the skin as a result of flash burn etc., do not try to take off the clothes. Wet clothes exposed to heat must be taken off.

3. TECHNICAL SPECIFICATIONS

3.1 GENERAL TECHNICAL SPECIFICATIONS

In this section, technical specifications are given about E Series, ES Series and EA Series Ultraviolet devices and panels used for the devices.

General Technical Know-How about UV Devices

General technical specifications of UV devices are specified below;

- **Body** : It is made from stainless steel in SS 304 quality. There are optional products made from stainless steel in SS 316 quality.
- **Power Supply** : 220 V, 50 Hz frequency
- **Operating Pressure** : It can be operated up to 8 bar.
- **Service life of lamp** : 8000 hours

TECHNICAL SPECIFICATIONS

MODEL	INPUT OUTPUT	FLOW RATE (m ³ /hour)	ENERGY (watt)	QTY OF LAMPS	DIMENSIONS (cm)			BOARD	
					A	B	C		
E – 30	¼" Thread	0,2	6	1	5	27	6,5	ADAPTER	
E – 50	½" Thread	0,4	14	1	6,3	35	6,3	ADAPTER	
E – 105	1" Thread	1,5	21	1	10	50	19	E PRO	E PLUS
E – 305	1" Thread	3	45	1	10	95	19	E PRO	E PLUS
E – 505	1" Thread	5	58	1	10	95	19	E PRO	E PLUS
ES – 110	1½" Thread	10	130	2	13	95	16	ES PRO	ES PLUS
ES – 115	1½" Thread	15	195	3	16	95	25	ES PRO	ES PLUS
ES – 120	2" Thread	20	260	4	20	95	40	ES PRO	ES PLUS
ES – 125	2" Thread	25	325	5	22	95	40	ES PRO	ES PLUS
ES – 130	2½" Thread	30	390	6	25	95	50	ES PRO	ES PLUS
ES – 140	3" Thread	40	520	8	33	95	55	ES PRO	ES PLUS
ES – 150	3" Thread	50	650	10	35	95	55	ES PRO	ES PLUS
ES – 160	4" Flange	60	900	12	40	95	60	ES PRO	ES PLUS
ES – 180	4" Flange	80	1050	16	43	95	65	ES PRO	ES PLUS
ES – 200	4" Flange	100	1200	20	43	95	65	ES PRO	ES PLUS

MODEL	INPUT OUTPUT	FLOW RATE m ³ /hour (300 J/m ²)	FLOW RATE m ³ /hour (400 J/m ²)	POWER (watt)	QTY OF LAMP	BOARD
EA – 300	2" Thread	25	19	320	1	EA PLUS
EA – 600	3" Flange	50	38	640	2	EA PLUS
EA – 900	4" Flange	75	57	960	3	EA PLUS
EA – 1200	5" Flange	100	75	1280	4	EA PLUS
EA – 1900	6" Flange	150	115	1920	6	EA PLUS
EA – 2400	8" Flange	200	150	2400	8	EA PLUS
EA – 3600	8" Flange	300	225	3600	12	EA PLUS
EA – 7200	12" Flange	600	450	7200	24	EA PLUS

General Information about UV Control Panels

There are 5 different panels used for E, ES and EA series; the details are given in the section *4.2 CONTROL* .

- E PRO
- E PLUS
- ES PRO
- ES PLUS
- EA PLUS

Differences between panels are given in *Table 1:* .

SPECIFICATIONS	E PRO	E PLUS	ES PRO	ES PLUS	EA PLUS
Failure Screen	✓	✓	✓	✓	✓
Analog Operation Hour	✓		✓		
Electronically Operation Hour		✓		✓	✓
Audible Fault Reporting		✓		✓	✓
Alarm Relay Output		✓		✓	✓
Warning upon Exhaustion of Lamp Life		✓		✓	✓
Ballast Quantity	1	1	2 – 20	2 – 20	1 – 24

Table 1: Comparison Table for UV Device Panel

3.2 SYSTEM COMPONENTS

In this section, system components are shown. These components can vary slightly in shape and appearance depending on each series and model.

Body

3.2.1.1 E Series

All bodies are made from SS304 stainless steel. E series consists of a body with a capacity of only one lamp. A blind cap is not provided with E 105, E305 and E505 models.

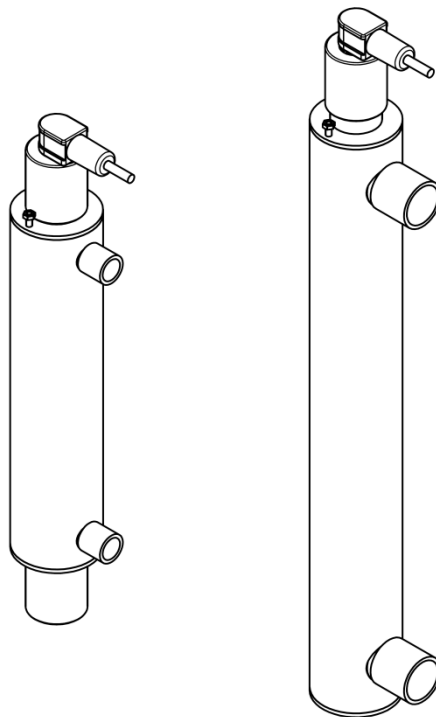


Figure 1: E50 (on the left) and E305 (on the right) UV Body

3.2.1.2 ES Series

All bodies are made from SS304 stainless steel. ES series consists of a body with a capacity of more than one lamp. Each model up to ES 140 is manufactured to stand horizontally and ES150 model and larger models are manufactured to stand vertically.

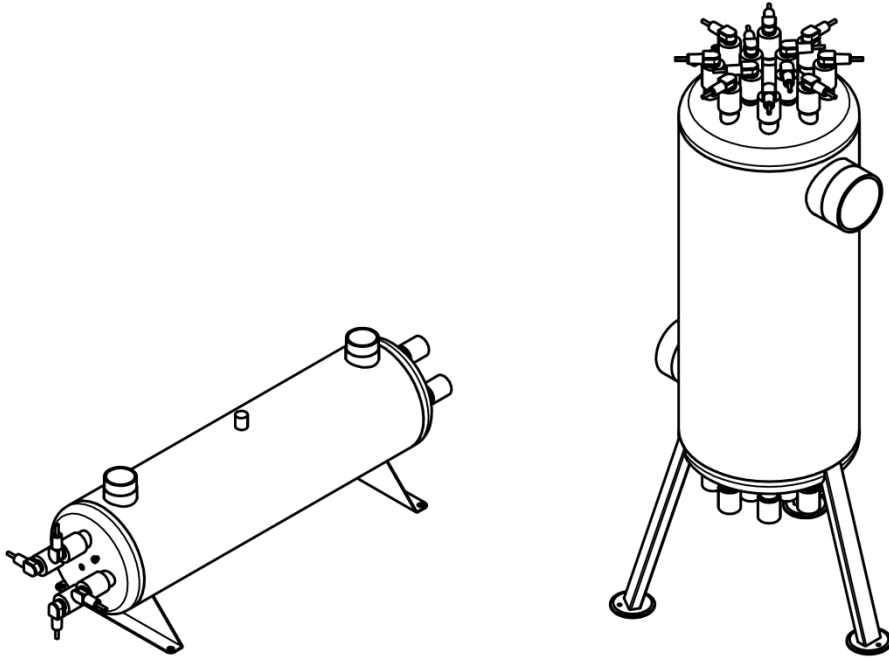


Figure 2: ES 120 (on the left) and ES 150 (on the right) UV Body

3.2.1.3 EA Series

All bodies are made from SS304 stainless steel. EA series consists of a body with a capacity of more than one amalgam lamp. All models are manufactured to stand horizontally.

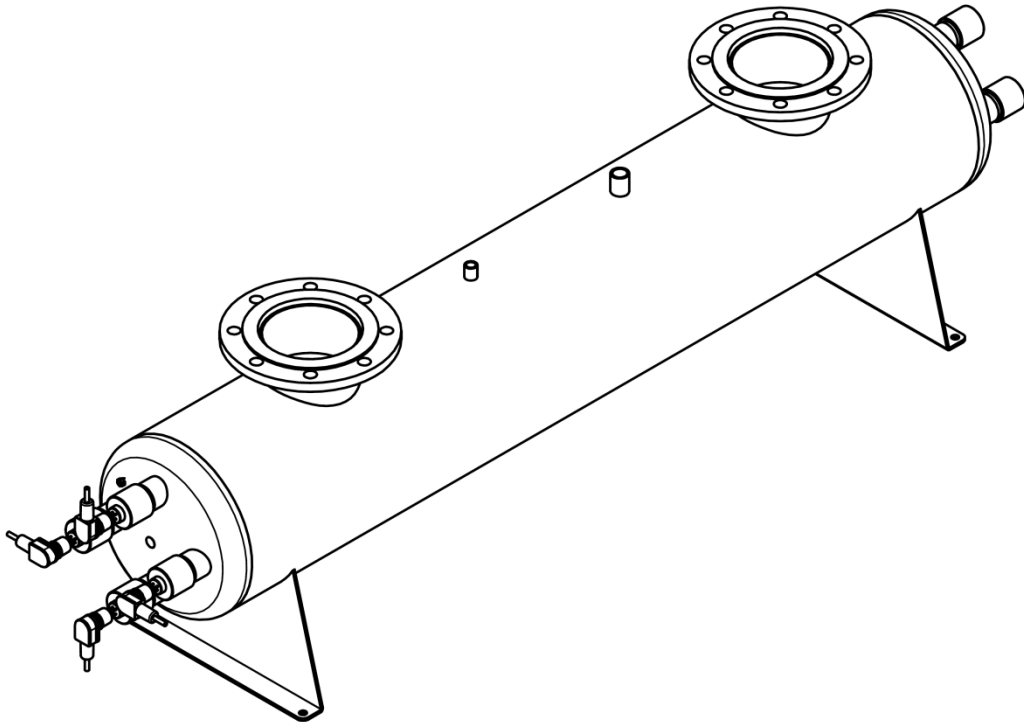
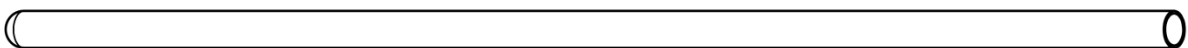


Figure 3: EA 1200 UV Body

Quartz Sleeve

Quartz sleeve is a component which UV lamp is placed in and ensures the UV lamps do not come into contact with water.



Cap

It is a kind of nut placed in front of quartz sleeves in order to ensure quartz sleeve are held firmly. Its front side is open because UV lamps are placed into the quartz sleeves through this cap.

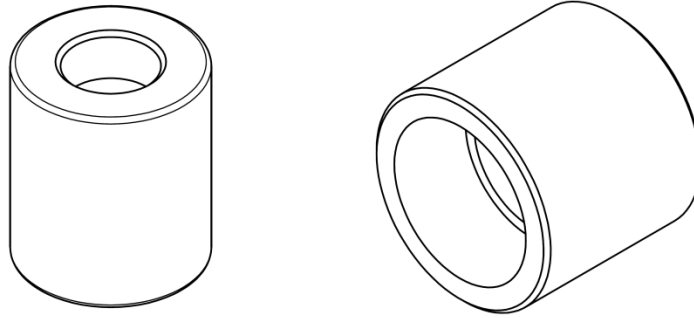


Figure 4: Cap

Blind Cap

It is a type of nut placed at the backend of quartz sleeves to ensure it to be held stable in the body.

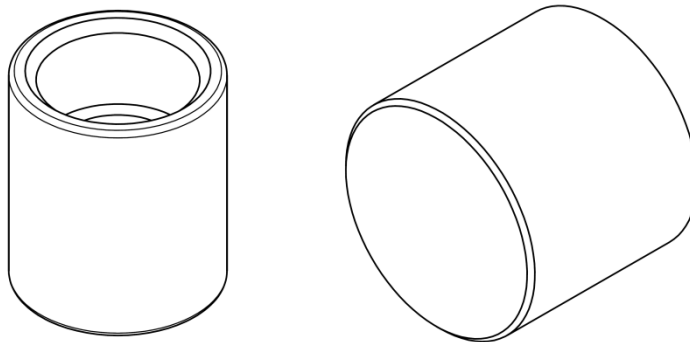


Figure 5: Blind Cap

UV Lamp

UV lamp is a the main component in disinfecting the water.

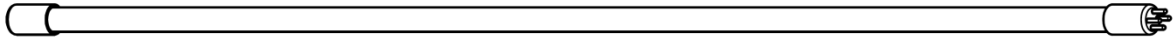


Figure 6: Ultraviolet Lamp

O-Ring

O-ring is a component placed on a quartz before mounting the caps to ensure a seal and stopping water leaks.

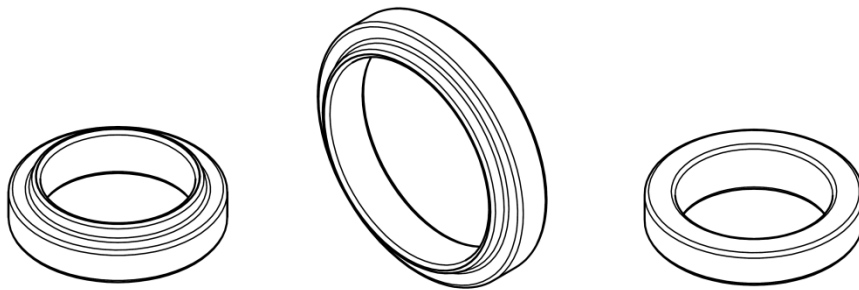


Figure 7: O-Rings

Spring

This spring is used to aid the removal of a UV lamp easily from the quartz sleeve and to reduce damage risks of UV lamp during mounting and replacement.

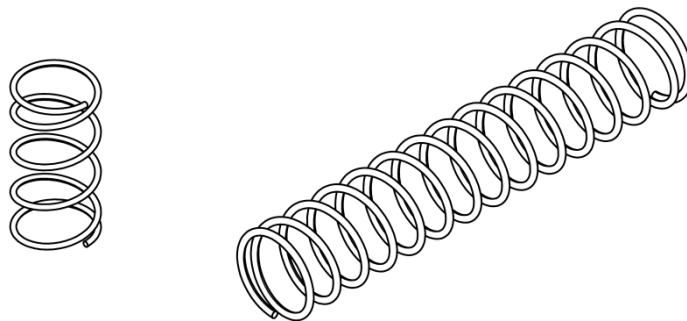


Figure 8: Spring

Quartz Spring

It is placed inside the body of E 105, E305 and E505 models. This spring is used instead of blind cap to ensure stable position of quartz sleeve.

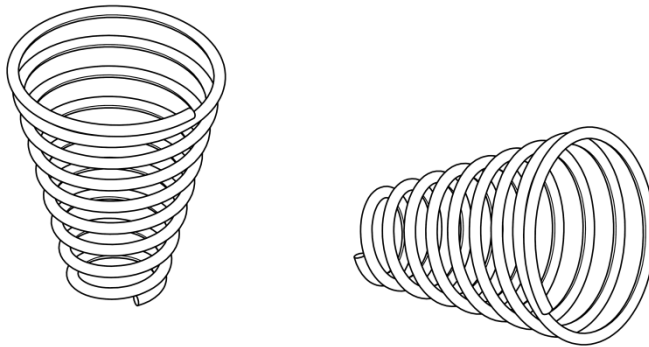


Figure 9: Quartz Spring

Socket

It conveys power from the board to a UV lamp.

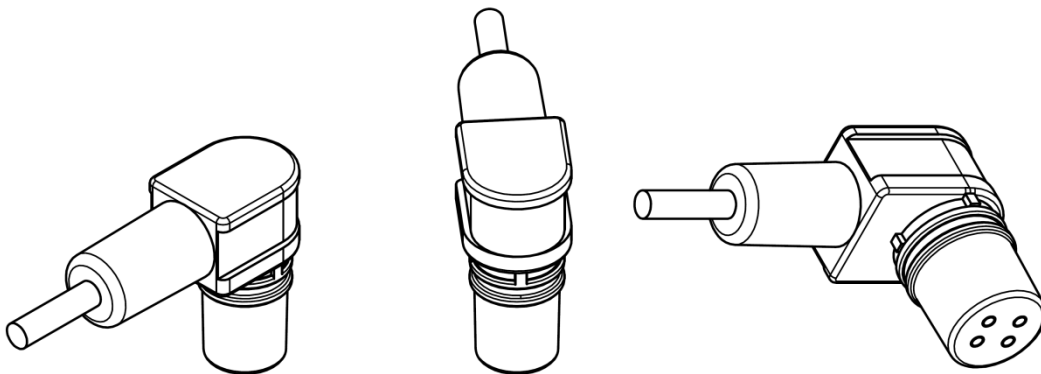


Figure 10: Socket

Control Board

Detailed information on control board is given in the section *4.2 CONTROL* .

4. OPERATING PRINCIPLE & CONTROL PANEL

4.1 OPERATING PRINCIPLE

An UV light is manufactured with special mercury-vapor lamp (UV-C rays $\lambda = 254\text{nm}$ wave length) and highly disinfecting to because it affects DNA and RNA at molecular levels. Ultraviolet lights needs to be irradiated directly on microorganisms to kill them. Therefore, parameters such as sediment, turbidity etc. should be removed from water before the water enters the UV system and so usage of a sand filter or cartridge filters is highly recommended prior to the UV disinfection process. Periodically maintenance of UV units is essential for higher efficiency.

It is generally recommended to install an pre-filter (max 5μ) prior to UV DEVICE; thus, all types of natural contamination and particles will be held. While flow rate of water decreases, efficiency of the device increases. If the water to be treated contains sulphuric acid or iron more than 0,3 ppm or filterable solid matter, visible sediment can build up on quartz sleeves as the water passes through the UV. If the water contains manganese or hydrogen sulphate ions, their concentration shall not be more than 0,05 ppm. Water exceeding 15 Fr. (degree of hardness) (150ppm as CaCO_3) should be softened before going into the UV. Quartz sleeves should be cleaned periodically (the cleaning frequency depends on usage and quality of the used water). Otherwise, efficiency of Ultraviolet radiation will decrease and so will device performance.

4.2 CONTROL PANEL

There are 5 different panels available used on UV devices. These panels;

- E PRO
- E PLUS
- ES PRO¹
- ES PLUS¹
- EA PLUS

The panels operate automatically with all the devices. Any interference with the panel is not required until the end of the life of lamp expires or the system breaks down.

¹ Three indicators in models with two or three lamps, five indicators in models with four or five lamps, ten indicators in models with six-ten lamps are used.

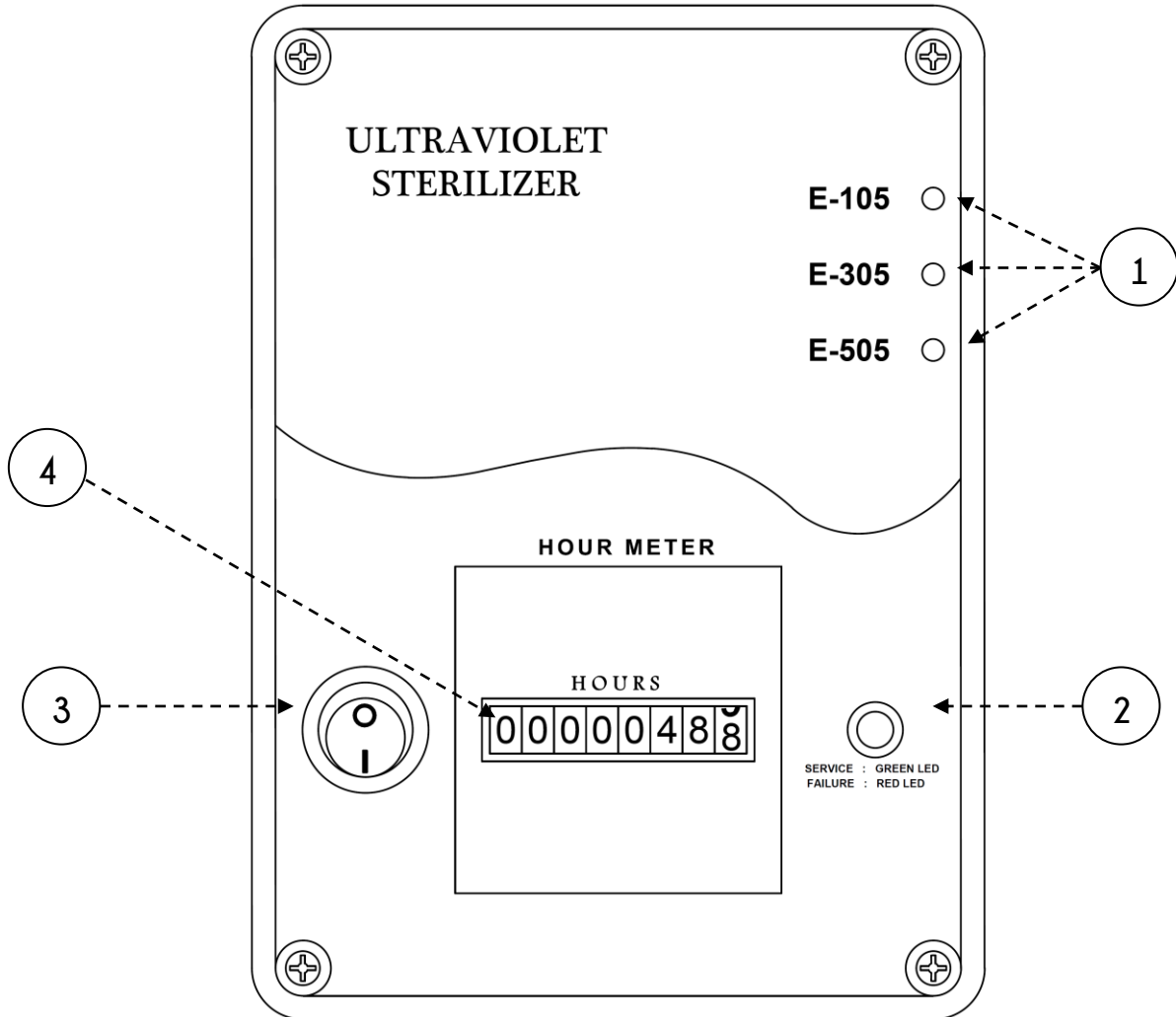
Two ballasts are used with ES 110 model and three ballasts are used with ES 115 model. Ballasts are connected to main panel by means of cables.

Four ballasts with sockets are used for ES 120 model and five ballasts with socket are used for ES 125 model. Ballasts are connected to main panel by means of sockets.

Ballasts with socket are used in as many as quantity of lamps in models with six, eight and ten lamps. Since quantity of ballast to be able to connect to a main panel is maximum five, an auxiliary panel is placed near main panel for these models. For instance, there are five ballasts on a main panel and three ballasts on an auxiliary panel for ES 140 (with eight lamps) models. Ballast are connected to main panel by means of sockets.

PRO Panels

Figure 11: E PRO Control Panel



4.2.1.1 E PRO Control Panels

- (1) – Model Display** : shows which model the panel is.
- (2) – UV Display** : Led light displays if UV lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.
- (3) – On– Off Switch** : It turns on/ off the power of the panel.
- (4) – Analog Hour Meter** : It is a meter displaying how long the ultraviolet lamp has been working. Analog hour meter cannot be reset.

4.2.1.2 ES PRO Control Panels

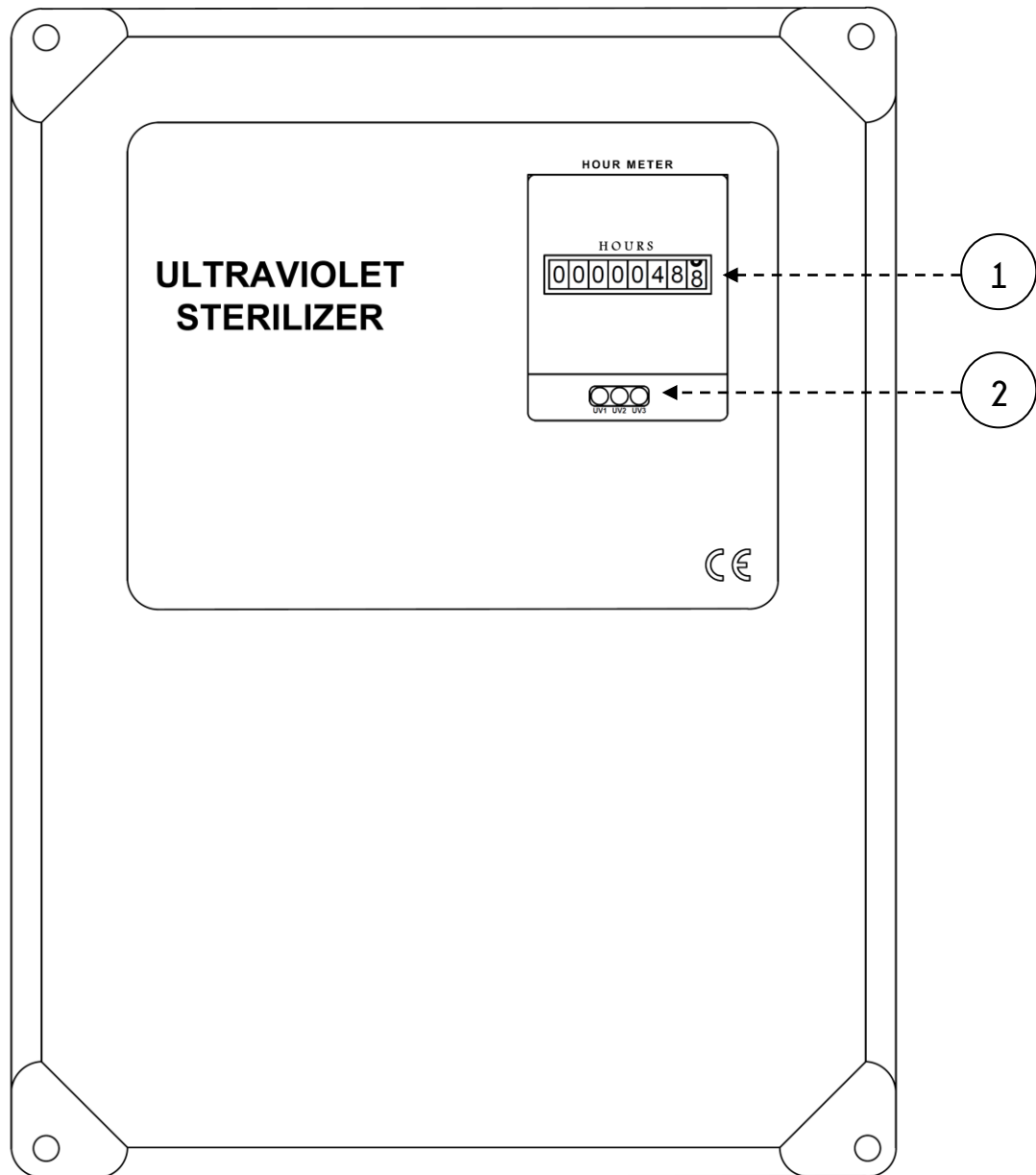


Figure 12: ES PRO Control Panel (For models with two or three lamps)

(1) – Analog Hour Meter : It is a meter displaying how long the ultraviolet lamp has been working. Analog hour meter cannot be reset.

(2) – Triple UV Display : Led lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.

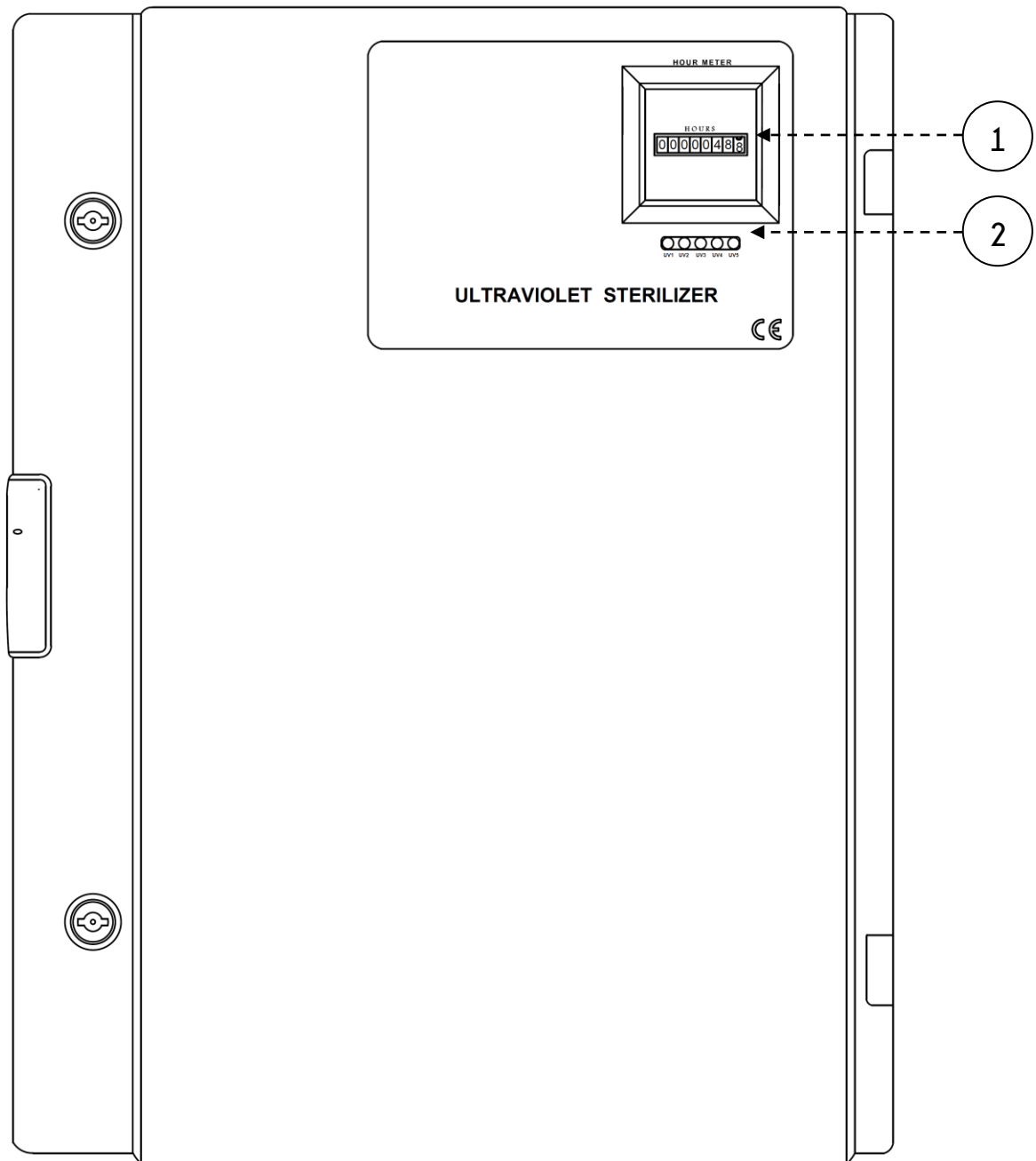


Figure 13: ES PRO Control Panel (For Models with Four or Five Lamps)

(1) – Analog Hour Meter : It is a meter displaying how long the ultraviolet lamp has been working. Analog hour meter cannot be reset.

(2) –UV Display with Five LEDs : Led lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.

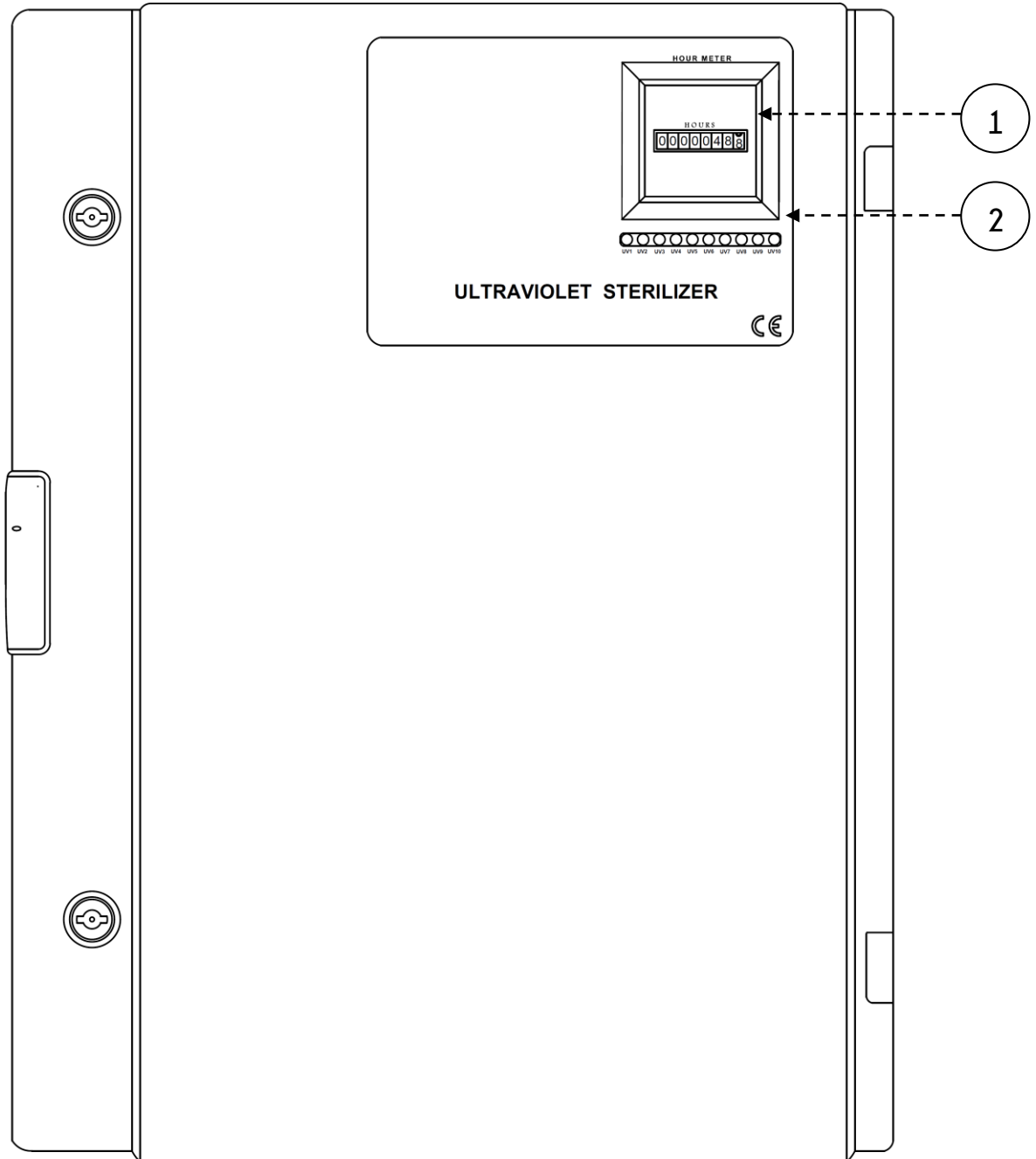


Figure 14: ES PRO Control Board (For models with six, eight and ten lamps)

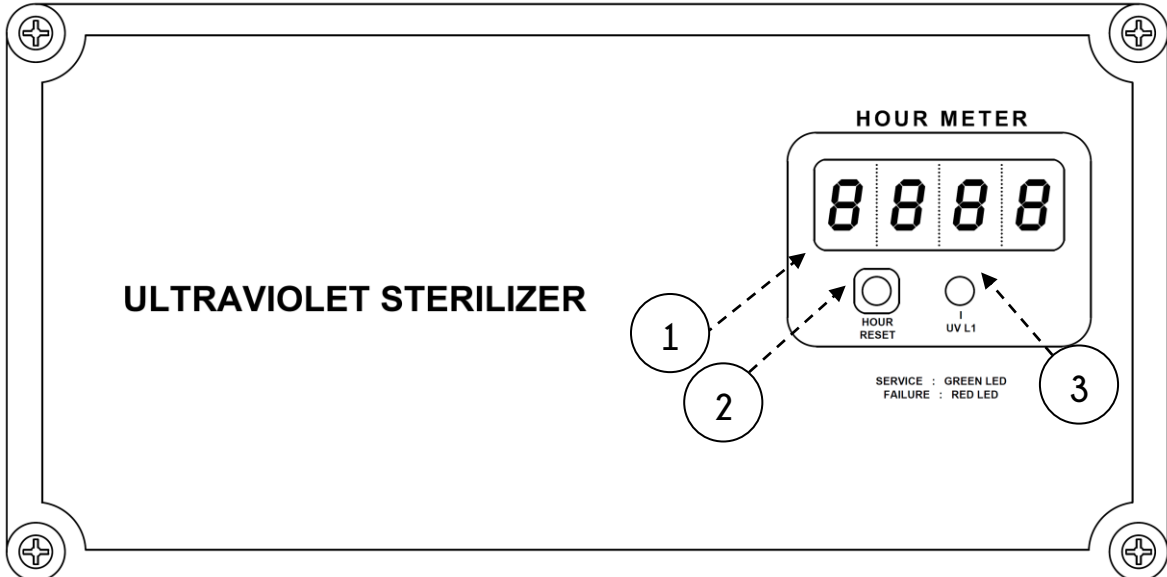
(1) – Analog Hour Meter : It is a meter displaying how long the ultraviolet lamp has been working. Analog hour meter cannot be reset.

(2) –UV Display with Ten LEDs : Led lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.

PLUS Panels

4.2.2.1 E PLUS Control Panel

Figure 15: E PLUS Control Panel



(1) – Digital Hour Meter : meter displaying how long the ultraviolet lamp has been working. It can be reset after replacement of the lamp.

(2) – Reset Button : It is used to reset hour meter after replacement of the lamp. Usage instructions have been given in 0 Replacement of Ultraviolet Lamps .

(3) –UV Display : LED lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.

4.2.2.2 ES PLUS Control Panels

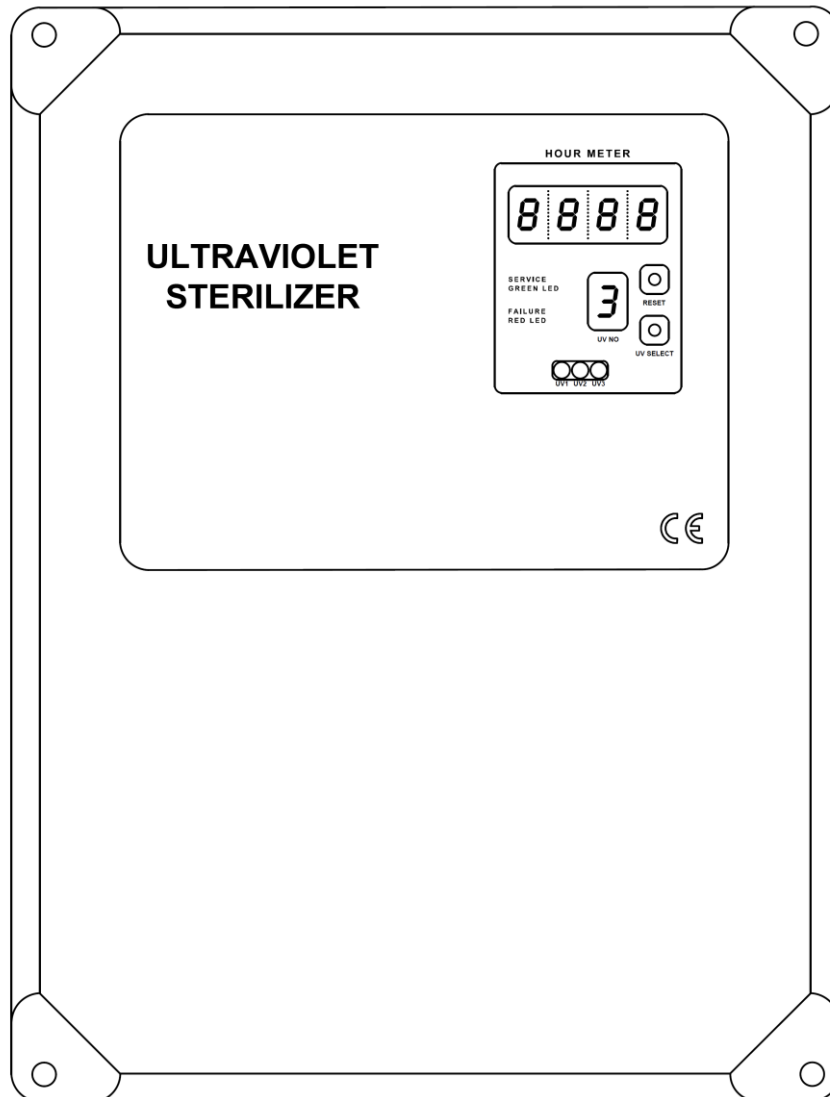


Figure 16: ES PLUS Control Panel (For models with two or three lamps)

- (1) – Digital Hour Meter** : It is a meter displaying how long the ultraviolet lamp has been working. It can be reset after replacement of the lamp.
- (2) – Reset Button** : It is used to reset hour meter after replacement of the lamp. Usage instructions have been given in 0 Replacement of Ultraviolet Lamps .
- (3) – UV Select** : It is used to switch between lamps.
- (4) – UV NO** : It displays the number of lamp during selection.
- (5) – Triple UV Display** : LED lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.

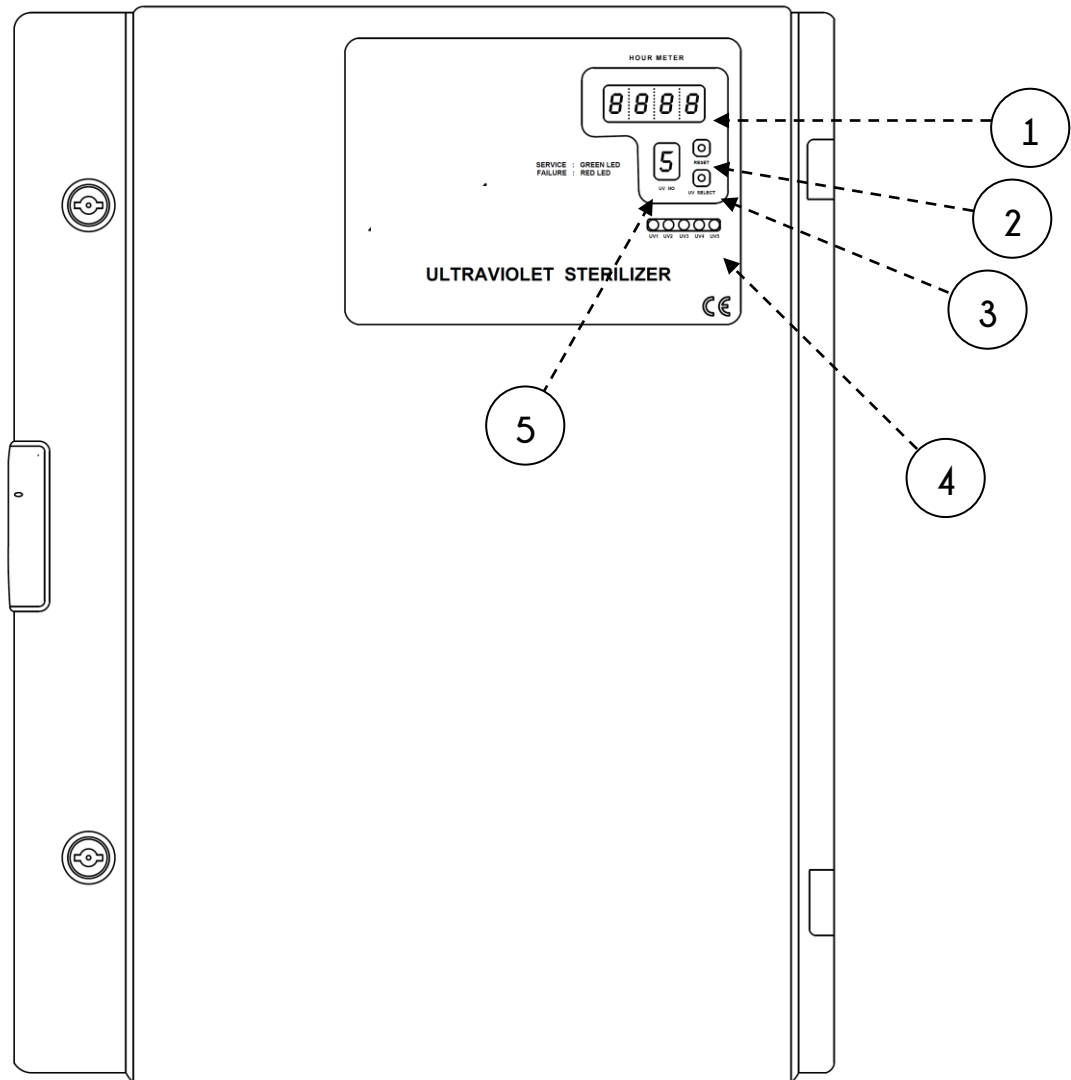


Figure 17: ES PLUS Control Panel (For Models with Four or Five Lamps)

- (1) – Digital Hour Meter** : It is a meter displaying how long the ultraviolet lamp has been working. It can be reset after replacement of the lamp.
- (2) – Reset Button** : It is used to reset hour meter after replacement of the lamp. Usage instructions have been given in 0 Replacement of Ultraviolet Lamps .
- (3) – UV Select** : It is used to switch between lamps.
- (4) – UV Display with Five Lamps** : LED lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.
- (5) – UV NO** : It displays the number of lamp during selection.

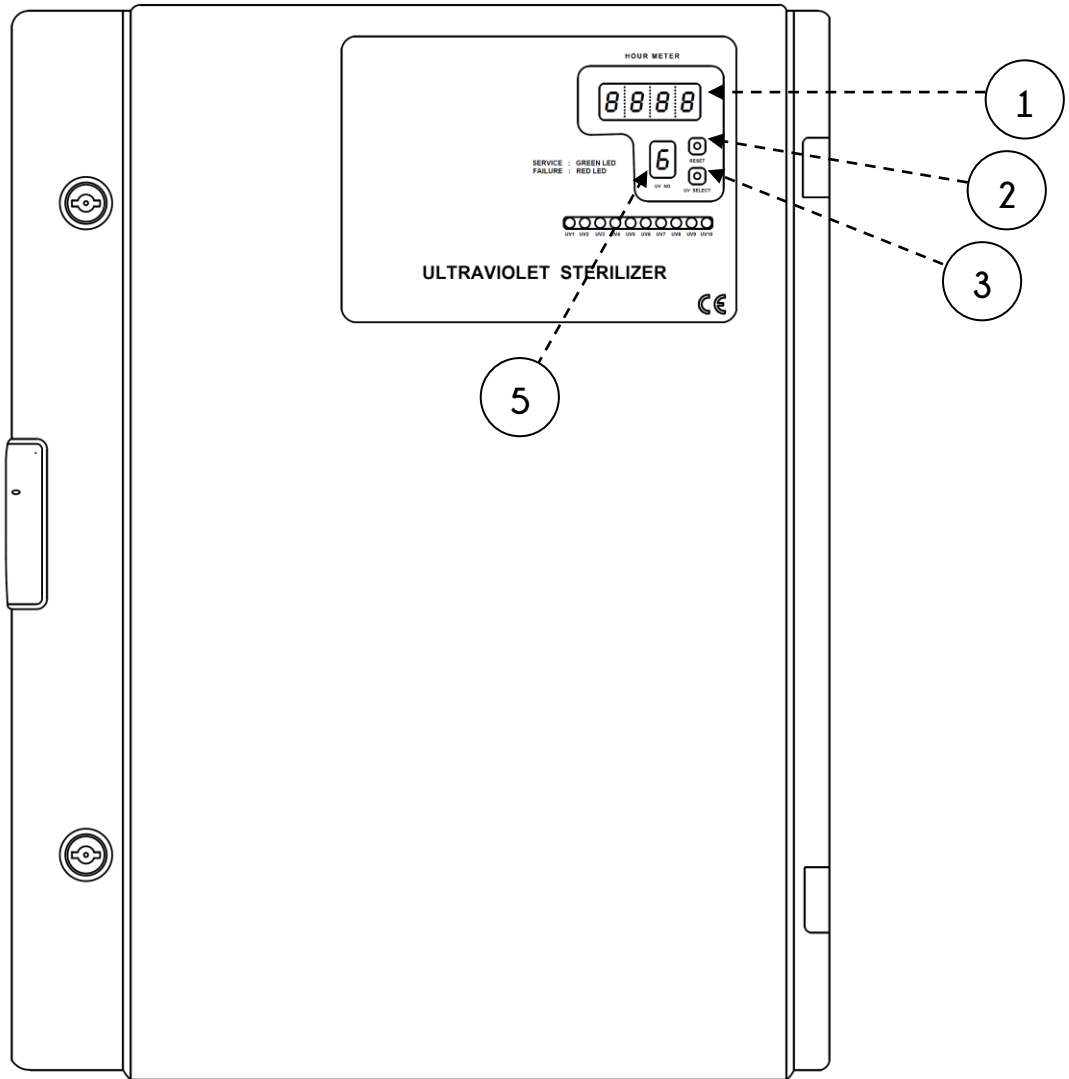


Figure 18: ES PLUS Control Panel (For Models with Six, Eight or Ten Lamps²)

- (1) – Digital Hour Meter** : It is a meter displaying how long the ultraviolet lamp has been working. It can be reset after replacement of the lamp.
- (2) – Reset Button** : It is used to reset hour meter after replacement of the lamp. Usage instructions have been given in 0 Replacement of Ultraviolet Lamps .
- (3) – UV Select** : It is used to switch between lamps.
- (4) – UV Lamp with Ten Led** : LED lamp displays which lamp is in service. If green light is on, the UV lamp works; if red light is on, it does not work because there is a failure in lamp or panel.
- (5) – UV NO** : It displays the number of lamp during selection.

² Two panels are provided along with models with 12, 16 or 20 lamps.

4.2.2.3 EA PLUS Control Panels

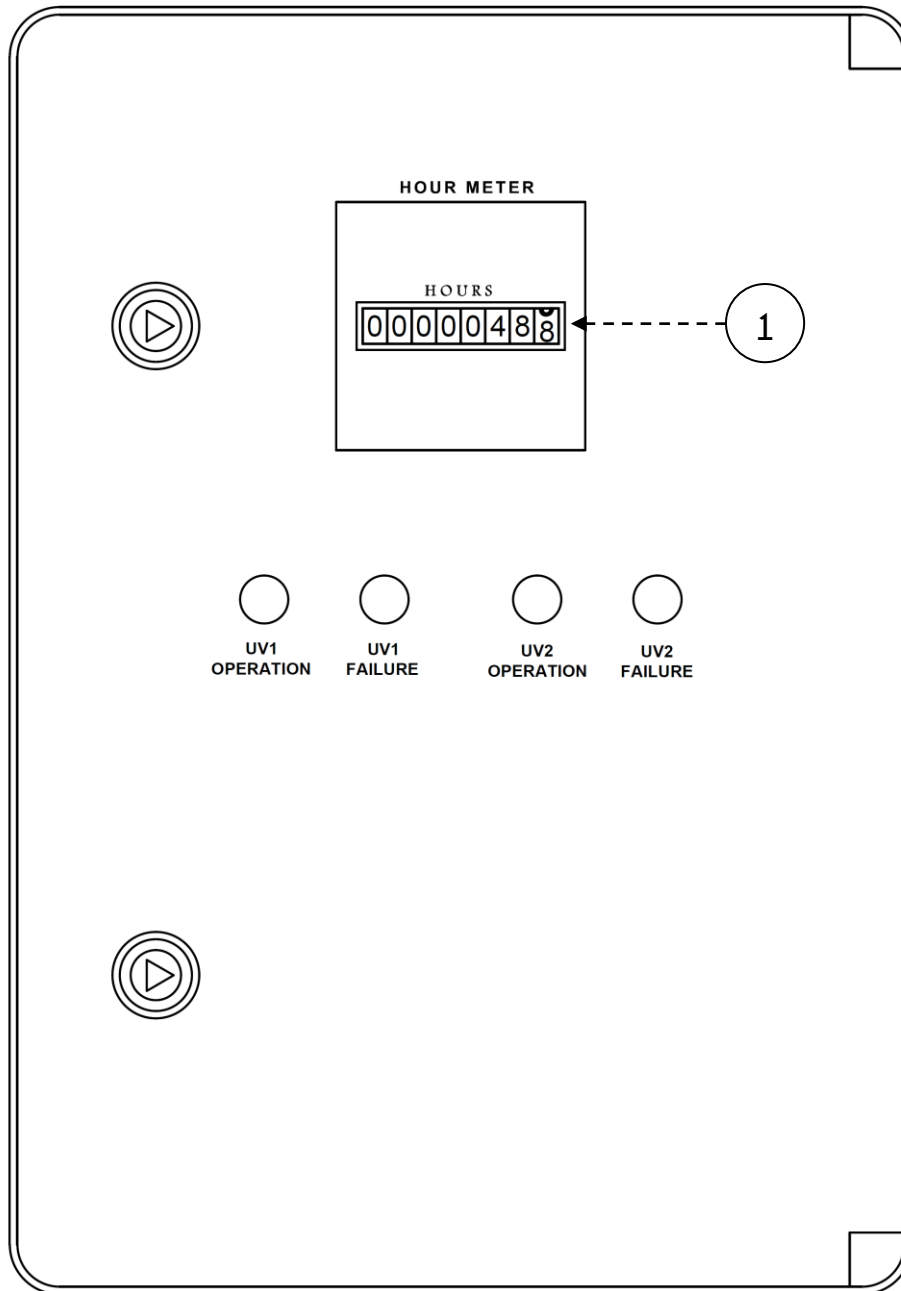


Figure 19: EA Plus Control Panel

(1) – Analog Hour Meter : It is a meter displaying how long the ultraviolet lamp has been working. Analog hour meter cannot be reset.

(2) – Operation Display : It displays if UV lamp works.

(3) – Failure Display : It displays if there is any failure in lamp or panel.

5.HANDLING-STORAGE & INSTALLATION

5.1 HANDLING AND STORAGE

The UV equipment should be handled with care. During handling of ultraviolet devices, there are two important components, which are fragile. These components are the quartz sleeves and the ultraviolet lamps that are placed into the quartz sleeves. These components shall be handled very carefully because they are fragile. Be careful to avoid lamps and quartz sleeves slipping sideways during handling.

The goods shall be kept in a dry and dust free environment. If quartz sleeves and lamps are not installed, they shall not be unpacked. If they are unpacked, smuts, dust and lubricant etc. materials can accumulate on ultraviolet lamps and quartz sleeves, which will impact on the efficiency of the system.

Don't put heavy items on top of the system.

The system shall be protected against freezing or excessively hot weather. It can be kept at minimum 0,5°C and maximum 40°C.

Precautions Before Installing

- I. The Ultraviolet chamber can be installed in a horizontal or vertical position depending on the model. In vertical installations, the water inlet will be at the bottom and water outlet will be at the top; in horizontal installation inlet and outlet directions are not important.
- II. Ultraviolet device are not direction sensitive. You can choose which is the inlet and outlet.
- III. Power provided to the system shall meet its power requirements specified in Technical Information.

- IV. Ultraviolet system shall be installed in a dry and well-illuminated place having enough space to enable for regular maintenance. Most of failures on ultraviolet electronics arise from moisture getting to the ballasts (power supply).
- V. UV panel shall be installed near the device. It will be ideal to install the panel less than 1 meter away from the device (cable length is 1.5 meter). In the event that the panel is installed directly onto the wall, moisture on the wall may penetrate into the panel, which may damage the panel. Installing the panel at approximately 10 cm distance from the wall using wall-mounting spacers will minimize risks.
- VI. The lamp will eventually need replacing so leave a space at least as long as the length of the lamp in order to slide in/out the lamps without demounting the device.
- VII. UV system shall be kept near the point where the disinfected water will be used. (minimizing the chance of re-contamination)
- VIII. The packages shall be opened fully and then ultraviolet lamp should be taken out carefully. The lamps need to be removed carefully as they are fragile..
- IX. You shall unpack the system in an open area, which minimizes the risk of breaking the quartz sleeve and lamp by hitting a wall, pillar and machine etc. after unpacking.
- X. Lamp and quartz sleeve shall not be carried with bare hands. Installation or replacement shall always be done by wearing cotton gloves. Finger prints left on quartz sleeves, will begin to corrode quartz sleeve when UV reaches 650 – 800 °C.

Stages of Installation

Before starting the UV system installation, please read and carry out carefully each article specified under *0 Precautions Before Installing*

Materials and equipments constituting an ultraviolet device are given below. All the materials and components are available in each model but their sizes and shapes can vary.

Materials and equipments of a device;

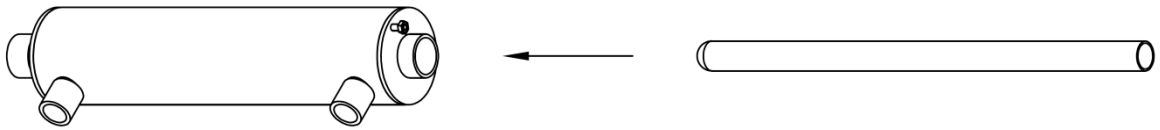
- SS304 Stainless Body
- Glass Quartz
- Cap
- Blind Cap
- UV Lamp
- O-Ring
- Spring
- Quartz Spring³
- Socket
- UV Panel

Before inserting the quartz and UV lamp, the UV device body shall be placed in situ. As mentioned in previous section, there is not a specific inlet and outlet. After determining which is to be the inlet and outlet, installation connections can be made. The UV panel shall be installed near the device. It will be ideal to install the board less than 1 meter away from the device because length of socket cables is 1.5 meter. UV lamp can be inserted after mounting the UV panel.

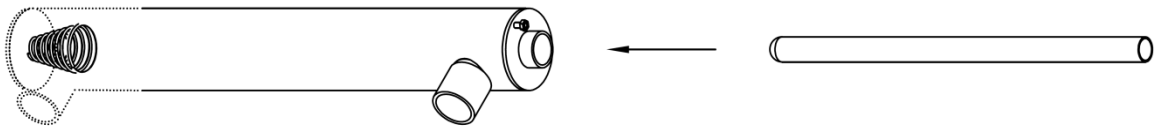
³ Only available with E105, E305 and E505 models.

THE IMAGES BELOW ARE OF E50 MODEL AND STAGES OF UV LAMP INSTALLATION ARE THE SAME FOR EACH SERIES AND MODEL.

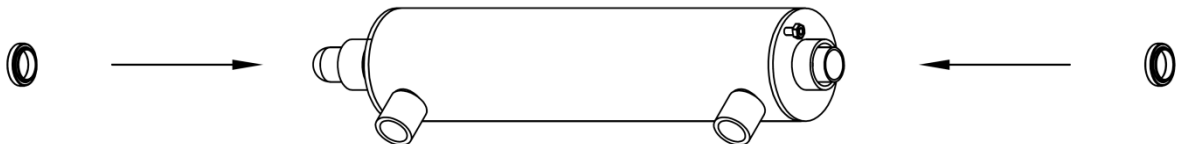
- I. Place the quartz sleeve into the UV body in a parallel position and push until its other edge appears out of the other end.



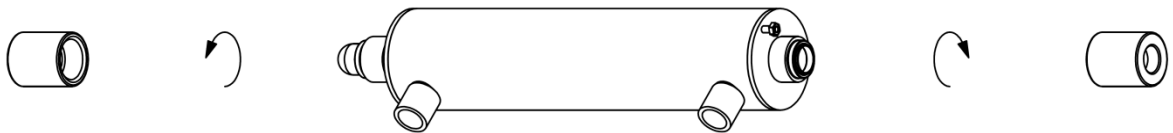
- II. In E105, E305, E505 models, there is a fixed spring in the other side of the body. In these models, the quartz sleeve is placed in the centre of this spring by pushing in a parallel position to the body.



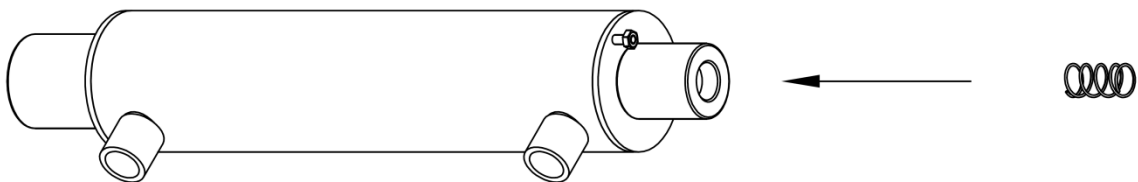
- III. O-rings are mounted on quartz.



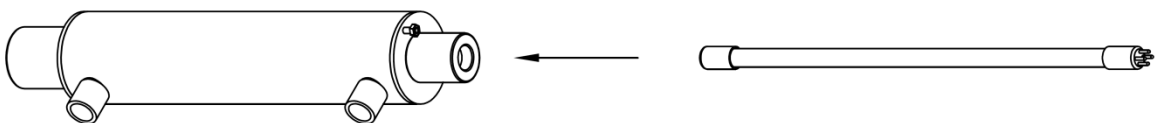
- IV. A blind cap is placed onto the closed side of quartz sleeve and an open cap is placed onto the open side of the quartz sleeve. Utmost attention must be paid while tightening and any wrench or any kinds of tools must not be used for tightening; otherwise, quartz sleeve or caps may be damaged.



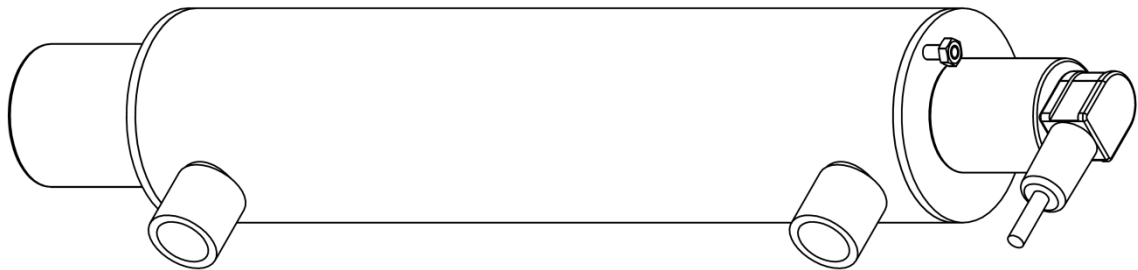
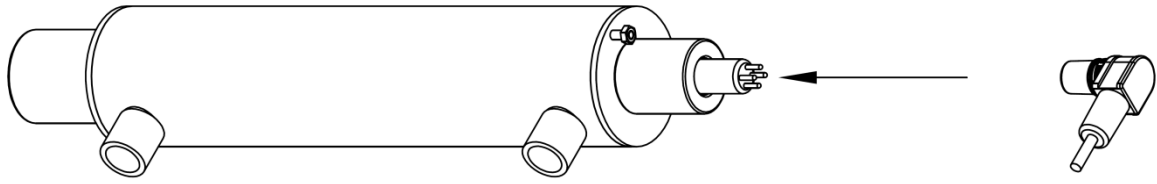
- V. UV lamp spring is put inside quartz. Only one spring must be used for each quartz sleeve.



- VI. Place UV lamp into quartz sleeve.



VII. Connect the UV lamp with a socket.



VIII. In the event that you have an UV model with multiple lamps, perform all the steps above for each UV lamp.

**AFTER COMPLETING INSTALLATION OF DEVICE, CONNECT UV BODY
GROUNDING TO NETWORK GROUNDING LINE.**

6.COMMISSIONING

6.1 STEPS FOR COMMISSIONING

After both mechanical and electrical (panel) installation are completed, the UV system can be commissioned following the steps below.

- I. Inlet- outlet valves are opened very slowly, which prevents quartz sleeves in UV device from getting damaged due to pressurized water.
- II. In ES 150 and forth models, an air venting valve is available for the purpose of discharging air more easily. This valve is kept semi-opened during water flowing into the system, which helps existing air be discharged. The valve is turned off after air is fully discharged and water starts flowing.
- III. You must check carefully if there is any leakage from quartz seals.
- IV. If there is no leakage, electrical plug is inserted to socket.
- V. The system is started after fuse switch is opened in the panel.

7. OPERATION & MAINTENANCE

7.1 OPERATION

Aqualine Ultraviolet devices operate automatically after they are commissioned.

During normal operation, a green LED light on display of control panel is on. In the event that there is any failure on the UV lamp, signal is not transmitted to electronic card in the panel, an audible alarm is given and the display (led light) on the panel turns into red. In models with multiple UV lamps, warning display of failed lamp will turn into red.

The device displays how long it has been used since start-up. This process continues until any failure occurs. In case of any failure, led light(s) on the panel turns red and an audible alarm is given. After the failure is fixed, the device is reset and re-continues its operation normally.

7.2 MAINTENANCE

Aqualine UV system has been designed to be simple and functional. It is recommended that quartz sleeves and UV lamps should be checked periodically (once three months for the operation at maximum efficiency).

Ultraviolet lamps shall be replaced after 8000 hours of service. When this time expires or a failure occurs in any of the ultraviolet lamps as mentioned in the operation section, the red led light will turn on and give an audible alarm, which means the ultraviolet lamp has to be replaced.

Replacement of Ultraviolet Lamps

Before replacing lamps, please read carefully all warnings given in the section of *2.HEALTH* & The lamp can be replaced only after all safety precautions are taken.

- I. Prior to replacement of lamp, turn on by-pass valve and turn off inlet-outlet valves slowly and ensure no water passes throughout the UV device.
- II. Disconnect electrical plug of the board from the socket. Remove socket of the failed or expired lamp.
- III. Take the ultraviolet lamp out of quartz slowly in a parallel position.
- IV. Place new ultraviolet lamp into the quartz sleeve in a parallel position.
- V. Insert electrical plug of the panel into the socket.
- VI. In ultraviolet devices with one lamp; press "reset" button for 5 seconds in order to reset operating time before connecting socket and UV lamp.
- VII. In ultraviolet devices with multiple lamps; the number of lamp to be replaced is selected with UV Select button. Press "reset" button for 5 seconds in order to reset operating time before connecting socket and UV lamp. Follow the same steps for other lamps to be replaced and thus, their operating time will be reset.
- VIII. After that, sockets are connected to ultraviolet lamps.
- IX. Inlet-outlet valve is turned on slowly and by-pass valve is turned off. Ensure water to start passing throughout UV system and to operate normally.

OPERATING TIME CANNOT BE RESET BEFORE REPLACEMENT OF UV LAMP OR LAMPS. IF ANY RED LIGHTS ON UV NUMBERS IS ON OR A SOUND ALARM IS HEARD, POWER OF UV PANEL IS SWITCHED OFF/ON BUT NO MORE THAN THREE TIMES. PLEASE CHECK TROUBLE-SHOOTING TABLE FOR OTHER FAILURES APART FROM THESE.

THE POWER MUST BE SHUT OFF BEFORE ANY WOK ON OR IN THE PANEL IS ATTEMPTED AS UV PANELS AND CONTROL CARDS HAVE HIGH VOLTAGE.

IT IS DANGEROUS TO REPLACE OR UNINSTALL UV LAMPS WHEN THE LAMPS ARE IN OPERATION OR THE LIGHTS ARE ON. UV LAMPS SHALL BE REPLACED AFTER POWER OF THE BOARD IS SHUT OFF BECAUSE UV RAYS ARE HAZARDOUS FOR EYES.

8.TROUBLE-SHOOTING

Below is trouble shooting guide listing possible faults, which may be encountered while using Aqualine UV devices, and reasons and solutions of the faults, are mentioned in this section.

Faults should be traced and corrected using

*Table 2: Trouble-shooting **Tabl**.* If you have already carried out solution suggestions and could not get a result, please contact your authorized dealer.

BEFORE CARRYING OUT THE SUGGESTED SOLUTIONS, SHUT OFF POWER
AND WATER INLET - OUTLET.

TROUBLE-SHOOTING

FAULT	POSSIBLE REASON	POSSIBLE SOLUTION
RED LED OF UV PANEL IS ON AND CONTINUAL SOUND ALARM IS HEARD	LOOSE CONTACT WITH UV LAMP	REPLACE THE UV LAMP WITH A NEW ONE
	BURNT UV LAMP	
	FAULT IN ELECTRONIC CARD	REPLACE THE ELECTRONIC CARD WITH A NEW ONE
	LOOSE CONTACT WITH 4-PIN SOCKET	CHECK THE SOCKET
	LOOSE CONTACT WITH CABLES	CHECK CABLE CONNECTIONS
RED LED OF UV PANEL IS ON AND SOUND ALARM IS INTERMITTENT BUT A LONG COURSE	8000 HOURS OF LAMP LIFE MAY EXPIRE	REPLACE THE UV LAMP WITH A NEW ONE
	FAULT IN INLET FUSE SWITCH	REPLACE INLET FUSE SWITCH
RED LED ON UV PANEL IS OFF BUT SOUND WARNING IS HEARD	FAULT IN FUSE	REPLACE FUSE SWITCH ON ELECTRONIC CARD
LEAKAGE ON UV BODY	BROKEN QUARTZ SLEEVE INSIDE THE BODY	CHECK THE NUTS; IF BROKEN, REPLACE WITH NEW ONES.
	MANUFACTURING FAULT ON STAINLESS BODY	SEND BACK TO THE MANUFACTURER FOR REPAIRMENT
	LOOSE NUTS AND DEFORMED O-RING	TIGHTEN THE NUTS OR REPLACE THE DEFORMED O-RINGS
UV PANEL DOES NOT FUNCTION	POWER CUT-OFF OR FAULT IN PLUG OR SOCKET	CORRECT THE FAULTS OR USE ANOTHER POWER SOURCE
	LOOSE CONTACT WITH CABLES	CHECK CABLE CONNECTIONS

Table 2: Trouble-shooting Table

9.WARRANTY CONDITIONS

9.1 WARRANTY CONDITIONS FOR SYSTEM

- △ 100 % decrease in performance efficiency per year is likely for ultraviolet lamps. It is recommended that ultraviolet lamps be replaced annually.
- △ Operation conditions or settings, which affect system's performance, shall not be changed without the prior written consent of ESLI and/or authorized services.
- △ In the event that ESLI and/ or the authorized services are not informed about the parameters/conditions and their effects, impacts of these factors on system's performance are out of warranty.
- △ In the event that system's operation data as from commissioning date are not fully submitted on the warranty request date, it is deemed as out of warranty.
- △ Average life of the whole lamps is 8000 hours unless otherwise specified.

9.2 GENERAL WARRANTY CONDITIONS

- △ Our all systems are guaranteed for 2 YEARS against all kinds of manufacturing faults. The warranty starts as of invoice date of systems.
- △ ESLI and/or authorized services repairs equipment/material, which fails to work due to material, manufacturing and installation faults, or has it repaired free within 20 days at the latest under warranty. The time elapsed during repair is added to warranty period of the related equipment/material.
- △ In the event that faulty parts, which fails to work due to material, manufacturing and installation faults, cannot be repaired; faulty material/ equipment is replaced with a new part. Replacement time is 10 days for goods supplied domestically but it depends on delivery time of supplier for overseas supplies.
- △ Warranty period of the material/ equipment replaced under warranty is restricted with remaining warranty period of the material/equipment.

9.3 OUT-OF-WARRANTY CIRCUMSTANCES

- △ Damages and faults arisen from not operating the system as specified in Production Catalogue and User Manual and not following the specified warnings,
- △ Damages and faults arisen from reduction in or excess of voltage, faults in electrical installation and feeding the system with a different voltage from specified in Production Catalogue and User Manual,
- △ Faults arisen from not grounding energy supply line as specified in Production Catalogue and User Manual,
- △ Damages and faults arisen from hitting, crushing and falling down materials etc. during operation or transportation in the event that the transportation is organized by the customer.