

# BARRIER™ TI UV SYSTEM SPECTRA 3 LP200 MEMBRANE

## INSTALLATION, OPERATION & MAINTENANCE MANUAL



## Document History:

ISSUE	CREATION DATE	CREATED BY
1	22/08/2023	George Foster

# CONTENTS

<b>DOCUMENT HISTORY:</b> .....	<b>2</b>
<b>HEALTH &amp; SAFETY</b> .....	<b>6</b>
IMPORTANT SAFETY INSTRUCTIONS .....	6
Health and Safety Information.....	7
<b>INTRODUCTION</b> .....	<b>9</b>
An Introduction to UV Disinfection Systems .....	9
What is Ultraviolet (UV) Light? .....	9
How does UV Disinfection Work? .....	9
Safety Advantages of Evoqua UV Technology Disinfection .....	9
Evoqua UV Technology Disinfection Systems .....	9
<b>TERMINOLOGY</b> .....	<b>10</b>
<b>INSTALLATION GUIDELINES</b> .....	<b>11</b>
General Installation Guidelines .....	11
UV Chamber Installation guidelines .....	11
Location of UV Chamber – Process Considerations .....	11
Location of UV Chamber – Mechanical Considerations .....	11
Location of UV Chamber – Airlocks/ Water Hammer .....	12
Chamber Orientation.....	12
Temporary Basket Strainer Installation (Optional).....	13
UV Control Panel Installation Guidelines .....	14
<b>BARRIER™ TI UV SYSTEM INSTALLATION, COMMISSIONING AND CALIBRATION</b> .....	<b>15</b>
Specific Installation Guidelines.....	15
Environmental Conditions .....	15
Chamber Installation Orientation.....	15
Horizontal chamber installation .....	15
Vertical chamber installation .....	16
Branch Orientation .....	16
<b>NSF/ANSI 50 PRODUCT INFORMATION</b> .....	<b>17</b>
Product Flowrate + Headloss Information Table .....	17
Disinfection Efficacy .....	17
Validation Information .....	17
Flowrate vs Intensity Information Table.....	17
<b>CABLE RECOMMENDATIONS</b> .....	<b>18</b>

<b>PANEL SUPPLY LOADS</b> .....	<b>18</b>
<b>INSTALLATION CHECKLISTS</b> .....	<b>19</b>
General Installation Checklist.....	19
Chamber Installation Checklist.....	19
Control Panel Installation Checklist.....	19
<b>COMMISSIONING</b> .....	<b>20</b>
Commissioning Procedure Checklist.....	20
UV Commission Work Sheet.....	21
<b>UV SENSOR CALIBRATION</b> .....	<b>21</b>
Validated 4-20mA UV Sensor .....	21
<b>BARRIER™ TI UV SYSTEM MAINTENANCE &amp; SPARES</b> .....	<b>22</b>
Maintenance Schedule.....	22
Maintenance Log.....	22
Performance Monitoring.....	22
UV Lamp .....	22
Quartz Cleaning and Replacement .....	22
Seals .....	22
Control panel.....	22
UV Lamp Maintenance.....	23
Draining the uv chamber .....	24
Quartz Thimble Maintenance .....	25
UV Sensor Maintenance .....	26
UV Sensor Window Maintenance.....	27
UV Chamber Maintenance.....	28
UV Chamber Access.....	28
UV Chamber Maintenance .....	29
UV Chamber Branch Orientation Adjustment.....	29
UV Chamber Maintenance .....	30
UV Chamber Clean in Place (CIP) .....	30
Lamp & Quartz Assembly.....	31
1 Lamp Chamber Assembly .....	32
2 & 4 Lamp Chamber Assembly.....	33
Spare Parts .....	34
Spares Kits.....	34
Replacement Components.....	34
<b>SPECTRA 3 MEMBRANE OPERATION</b> .....	<b>35</b>

Spectra Membrane Control System .....	35
Components.....	35
Spectra Membrane.....	36
ATUV1010 – Main Board .....	37
I/O Module (ATUV-1220).....	40
<b>START-UP SEQUENCE.....</b>	<b>41</b>
<b>SPECTRA OPERATION.....</b>	<b>42</b>
Main Screens .....	42
Navigating the Main Information Screens .....	43
<b>FAULT &amp; PRIORITY SCREENS.....</b>	<b>44</b>
<b>OPERATOR MENU SCREENS.....</b>	<b>45</b>
<b>SETUP MENU SCREENS.....</b>	<b>46</b>
Navigating the Setup Screen.....	47
Setup Menu - Parameter Descriptions .....	48
Flow .....	48
Lamp .....	49
Dose.....	50
Temperature.....	52
Comms & I/O.....	53
Process Interlock.....	55
UVT .....	56
Miscellaneous .....	57
<b>INTEGRATION.....</b>	<b>58</b>
Analogue Inputs .....	58
Digital Inputs .....	59
Digital Outputs.....	60
I/O Field Wiring Guide.....	61
TI-1200-4.....	61
TI-2200-8.....	62
TI-4200-8.....	63
<b>TROUBLESHOOTING.....</b>	<b>64</b>
<b>GENERAL PRODUCT WARRANTY FOR UV SYSTEMS .....</b>	<b>69</b>
Standard Warranty: .....	69
5 Year Warranty: .....	69
Exception and/or Exclusions: .....	69

## Health & Safety

### **IMPORTANT SAFETY INSTRUCTIONS**

When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:

#### **READ AND FOLLOW ALL INSTRUCTIONS**

**WARNING** – To reduce the risk of injury, do not permit children to use this product, unless they are closely supervised at all times.

**WARNING** – Risk of Electric Shock. Connect only to a branch circuit protected by a ground-fault circuit-interrupter (GFCI). Contact a qualified electrician if you cannot verify that the circuit is protected by a GFCI.

The unit must be connected only to a supply circuit that is protected by a ground-fault circuit-interrupter (GFCI). Such a GFCI should be provided by the installer and should be tested on a routine basis. To test the GFCI, push the test button. The GFCI should interrupt power. Push the reset button. Power should be restored. If the GFCI fails to operate in this manner, the GFCI is defective. If the GFCI interrupts power to the equipment without the test button being pushed, a ground current is flowing, indicating the possibility of an electric shock. Do not use the equipment. Disconnect the equipment and have the problem corrected by a qualified service representative before using.

Only suitably qualified personnel should operate/maintain the system - always follow safe working practices and do not take risks.

To reduce the risk of drowning from hair and body entrapment, install a suction fitting(s) with a marked flow rate that is not less than the flow rate marked on the remote packaged unit.

**CAUTION: THE EQUIPMENT AND CONTROLS SHALL BE LOCATED NOT LESS THAN 1 M HORIZONTALLY FROM THE SPA OR HOT TUB.**

**ATTENTION: MAINTENIR UNE DISTANCE MINIMALE, MESURÉE DANS UN PLAN HORIZONTAL, DE 1 M ENTRE LA CUVE DE RELAXATION ET LES APPAREILS ET COMMANDES.**

If in doubt always ask, for further information and support please visit our website:  
[www.Evoqua.com](http://www.Evoqua.com)

**SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE**

## HEALTH AND SAFETY INFORMATION



All personnel involved in the installation, maintenance and operation of the UV system should read the relevant manual.



### Electrical Safety

**WARNING:** Always ensure electrical plant or equipment is isolated before carrying out maintenance.



### Electrical Ground / Earth

**WARNING:** All equipment must be Grounded / Earthed.



### Hot Temperature

**CAUTION:** Chamber can be hot.  
Allow 15 minutes for lamps and other components to cool down before removal.

### Process Isolation - Fluid



**WARNING:** Always fully isolate the system from the process before carrying out maintenance.  
**DANGER:** Failure to follow the correct procedures can cause serious injury or death due to forcible ejection of materials from the UV chamber.

### Process Isolation - Wiper



**CAUTION:** Contact with moving parts can cause injury, for example trap fingers, clothing may become caught in moving parts of machinery, drawing in operatives.

### Ultraviolet Light



**WARNING:** Do not expose skin or eyes to ultraviolet light.  
**CAUTION:** Do not touch lamps immediately after operation. Allow 15 minutes for lamps and other components to cool down.



### Quartz Components

**CAUTION:** Handle quartz components with care to avoid breakages.



### Mercury - Lamp Breakage / Chemical Hazard

**CAUTION:** Lamps contain Mercury take care to avoid breakages. If a breakage occurs follow mercury spillage procedure below.



### Lamp Recycling

Always recycle UV lamps properly and safely.

---

## MERCURY SPILLAGE

Anticipate this event by having a spill kit on hand. Spill kits are commercially available, and most however most contain the following components:

1. Latex barrier gloves
2. Sealable plastic bag
3. Soft cloth, or cardboard rectangle
4. Syringe or pipette
5. Small brush, barrier foam or duct tape
6. Powdered Sulphur.

Mercury spillage procedure:

1. Put on Latex gloves
  2. Collect quartz pieces, place in cloth in sealed bag. Mark bag as "sharp hazard"
  3. Locate mercury ball. Use brush to aggregate smaller balls into large ball
  4. Use syringe to draw up mercury bead. Transfer mercury onto paper towel, place inside sealed bag. Mark bag as "mercury hazard"
  5. Use barrier foam or duct tape to collect remains of mercury - dispose of as detailed in point 4.
  6. Consult site regulations regarding notification of a mercury spill. A UV lamp contains a maximum of 300 mg of mercury
  7. Powdered Sulphur is optional - it can make collection of very small mercury balls easier.
-



## Introduction

### **AN INTRODUCTION TO UV DISINFECTION SYSTEMS**

Unlike chemical approaches to water disinfection, Ultraviolet (UV) light provides a rapid and effective method to disinfect water and other liquids.

### **WHAT IS ULTRAVIOLET (UV) LIGHT?**

UV light is a form of light that is invisible to the human eye and is classed as a non-ionising (or non-radioactive) radiation. It occupies the portion of the electromagnetic spectrum between X-rays and visible light.

### **HOW DOES UV DISINFECTION WORK?**

A unique characteristic of UV light is that a specific range of its wavelengths (those between 200 and 300 nm are categorized as germicidal – meaning that UV light damages the DNA and RNA of microorganisms and prevents them from causing infection. This capability has allowed widespread adoption of UV light as an environmentally friendly, chemical-free, and highly effective way to disinfect liquids.

### **SAFETY ADVANTAGES OF EVOQUA UV TECHNOLOGY DISINFECTION**

- UV is a chemical-free process that adds nothing to the water except UV light.
- UV requires no transportation, storage or handling of toxic or corrosive chemicals – a safety benefit for plant operators and the surrounding community.
- UV treatment creates no carcinogenic disinfection by-products that could adversely affect the quality of the treated water.
- UV is highly effective at inactivating a broad range of microorganisms including chlorine-resistant pathogens like Cryptosporidium and Giardia.
- UV can be used (alone or in conjunction with a catalyst) to break down toxic chemical contaminants while at the same time performing disinfection of the treated water.

### **EVOQUA UV TECHNOLOGY DISINFECTION SYSTEMS**

The main features of the Evoqua Barrier™ Ti UV system are:

- UV Chamber: pure titanium chamber body inside which water is exposed to UV light for disinfection.
- UV Lamps: housed within a high purity quartz sleeve, these emit high-intensity UV light to treat the process fluid.
- Control Panel: contains the Spectra controller and lamp power system.
- Wiper: manual system used to clean quartz sleeves.
  - Note: not all systems are fitted with a Manual Wiper
- UV Sensor: monitors UV intensity inside the chamber and feeds readings back to the control panel.
- Temperature Sensor: monitors temperature of the chamber to protect people and equipment if the water flow is interrupted unexpectedly.

## Terminology

The following terminology is used throughout this Manual:

TERM	DESCRIPTION
Control Panel	Contains control and power electronics for UV system
ATUV-1220	I/O module
AT-900	4-20mA Validated UV Sensor
MCB	Miniature circuit breaker
Electronic Ballast	Power supply used to control the starting voltage of the UV lamp and regulate the operating current
Wiper	Cleaning system for UV Lamp sleeves
Spectra	Electronic control systems used for monitoring and control of UV treatment
UV Sensor	Component for continuous measurement of the UV-C intensity inside the chamber
UV Chamber	Comprising a single chamber in which water is treated by UV irradiation, and the associated inlet and outlet valves, components, and instruments
Restrike Timer	Timer used by the control system to allow the lamps to cool after stopping, during this time the lamps are inhibited from starting
Start-up Mode	Period between switch on of the UV system and running mode
Running Mode	When all lamps are struck, and the dose reading has exceeded the minimum Dose level
Lamp Power	Electrical Power rating of UV Lamp
Dose	Calculation of the amount of UV treatment the water is receiving, based on UV intensity and flow rate
UV Intensity	A measurement of the strength of the Ultraviolet (UV) radiation given off from the UV lamps
UVC	A region in the electromagnetic spectrum. Wavelength range 200-280 nm
UVT	Ultraviolet transmissivity of the water undergoing treatment
Validated	Certified envelope of operation of UV Chamber, comprising for example flow, UVT

## Installation Guidelines

### GENERAL INSTALLATION GUIDELINES

The guidelines in this section are designed to assist in the installation of an UV Disinfection system into a typical plant. The recommendations below are **NOT** definitive. Depending on the installation, it may be necessary to install contrary to specific recommendations. If at any stage you are unsure as to any aspect of these instructions, consult with a specialist installation contractor. Please also make use of the Installation and Commissioning Checklists later in this manual section.

#### Please be aware:

- Evoqua cannot accept responsibility for any installation carried out by other parties.
- When planning or executing any installation ensure all local Health & Safety Regulations are followed, local codes complied with and implement all appropriate risk assessments.
- Always ensure there is a suitable footprint around the chamber and control panel to allow for safe work and access.

### UV CHAMBER INSTALLATION GUIDELINES

#### Location of UV Chamber – Process Considerations

1. Unless there are other process considerations the UV unit should be located as close to the point of use as possible.
2. The UV system is normally installed after all other physical or conventional water treatment equipment (filters, softeners, de-mineralization etc.). The effectiveness of UV treatment is dependent upon water clarity and removal of the majority of suspended solids will reduce fouling of quartz sleeves and thimbles. However, for certain process requirements and considerations, the UV unit may need to be installed 'up front' and before some or all of the treatment equipment.
3. If chemical dosing is utilized to provide a residual, this should be installed downstream of the UV chamber. This will reduce chemical reduction by the UV system and will prolong the chamber life.

#### Location of UV Chamber – Mechanical Considerations

1. Allow sufficient room for removal of lamps, quartz thimbles and wiper components.
2. Ensure the UV Chamber location does not prevent safe maintenance of existing equipment.
3. Ensure that all equipment and pipe work will be adequately supported when installed. The UV chamber should not be used to support the pipe work as this may damage the UV chamber.
4. Avoid locating chambers and panels under dripping pipe work or chemical equipment and avoid storing chemicals that can lead to corrosion of components close to the UV.
5. To minimize flow interruption during maintenance and where process considerations allow it, a by-pass should be installed around the UV chamber.
6. Do not install in direct sunlight and protect from extreme environments.
7. Where cable lengths exceed the distance between the control panel and UV chamber, ensure these are not coiled as this could create un-wanted noise on the signal cables, and in the case of lamp cables, a voltage drop may result. Please contact Evoqua UV for further information.

**Note:** long term exposure to UVC light can cause degradation of PVC pipe. This can be mitigated by avoiding reducing pipework directly onto the UV chamber and/or using Class 'E' or equivalent schedule pipe.

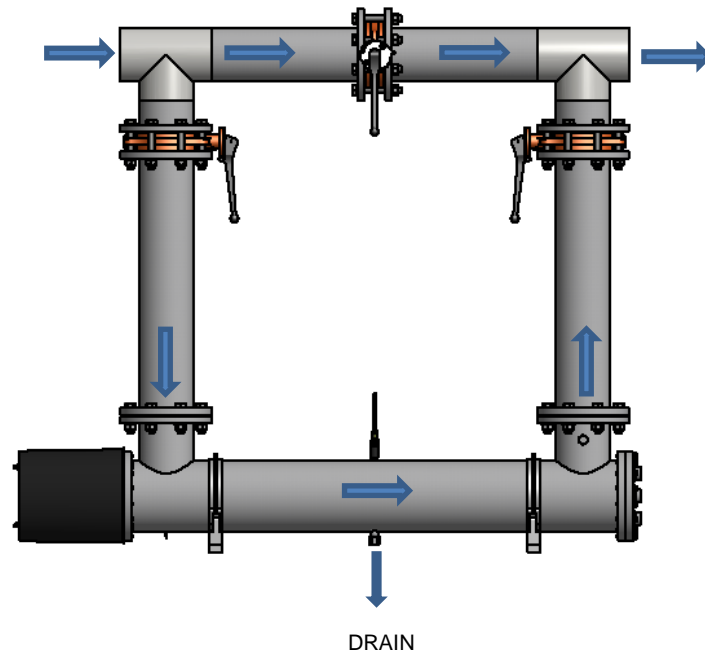
## Location of UV Chamber – Airlocks/ Water Hammer

1. Install the pipe work in such a way that the UV Chamber always remains flooded. If the chamber drains down, the mechanical shock when full flow is regained may damage the quartz components.
2. If it is not possible to ensure the chamber remains flooded due to its location, air release and check valves can prevent emptying and draining of the system. Discuss this with your installer.
3. Avoid excessive water hammer as this can damage quartz components. Avoid locating the chamber close to the outlet side of a pump. If this is unavoidable, installing a 'soft start' on the pump can reduce the chance of quartz breakages.
4. On installations where the chamber and / or pipe work cannot remain flooded, a bypass should be installed where it can be easily operated. This should be opened when flow is restarted otherwise lamp and quartz breakage may occur. (Flow restarting can mean the pump starting, a backwash cycle or movement of another valve).

## Chamber Orientation

1. Install the system so that both the temperature sensor and the UV monitor can be installed and maintained if fitted.
2. Ensure the lamps and sleeves can be removed, and service access is considered for the UV system and adjacent equipment.
3. See 'Chamber Installation Orientation' **pages 15-16** for more information.

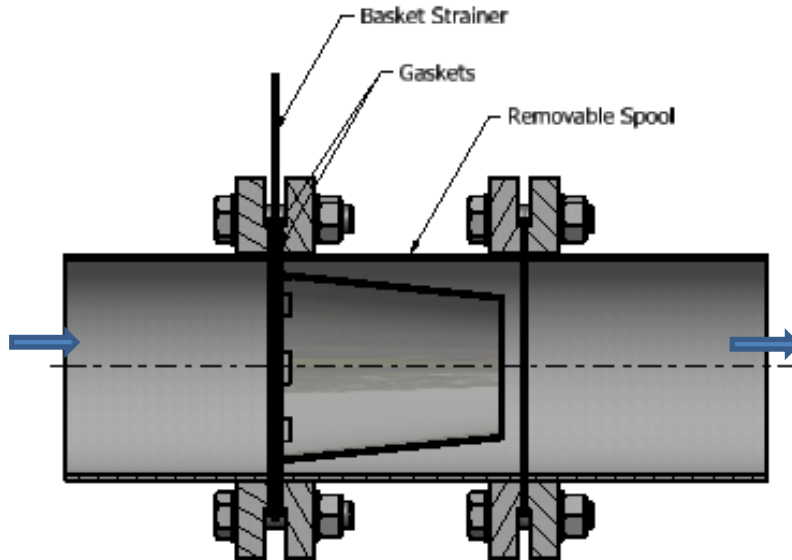
## *Axial Flow Chamber Installation Example*



### Temporary Basket Strainer Installation (Optional)

1. These should be located after the UV unit. Where the temporary basket strainer is of a larger micron rating than the upstream filtration then regular access to the strainer should not be required, however the strainer should still be accessible if necessary.
2. We recommend installing this device after the UV system in a spool piece, which can be removed for maintenance in the orientation shown in the diagram below. If the UV chamber is mounted in a vertical section of pipe work, it is recommended that a point of access be provided to the pipe section below the chamber, to remove any quartz shards which have dropped through it in the event of a quartz breakage.

*Diagram of Strainer Installation*



## **UV CONTROL PANEL INSTALLATION GUIDELINES**

1. Complete the Installation and Commissioning Checklists later in this manual section to ensure proper installation and safe work.
2. Locate the panel as close as possible to the chamber.
3. Ensure that the floor/wall structure can withstand the weight of the enclosure. For wall mounted panels, secure the enclosures to the mounting surface with hardware as appropriate for the application used using the 4 x mounting lugs provided.
4. Ensure the correct supply is available on site and the correct supply cable is used. If the correct voltage is not available, a Step Up / Step Down transformer may be needed - please contact your supplier for details.
5. Ensure the correct circuit breaker size and type is available for the unit (see the Cable Recommendations subsection of this manual). If the suggested breaker is installed, then sufficient discrimination should be ensured.
6. Ensure that the UV chamber and the control panel are correctly earthed / grounded – an Earth / Ground point is fitted and cable supplied with all UV panels.
7. The panel must be firmly mounted against a vibration free wall or suitable supporting frame.
8. Ensure panel fans (if fitted) are not obstructed. It is recommended to change or clean the filter media once construction on a project has finished.
9. Do not install in direct sunlight and protect from extremes of environment (Weather, High Humidity, High or Low Temperatures).
10. Install control panel display at eye level.
11. Do not locate the control panel in areas where it may be subjected to chemical or water leaks.
12. If the panel is floor mounted ensure that the panel is not located in a potential flood area.

# Barrier™ Ti UV System Installation, Commissioning and Calibration

## SPECIFIC INSTALLATION GUIDELINES

### Environmental Conditions

Unless otherwise agreed the following environmental conditions should be met:

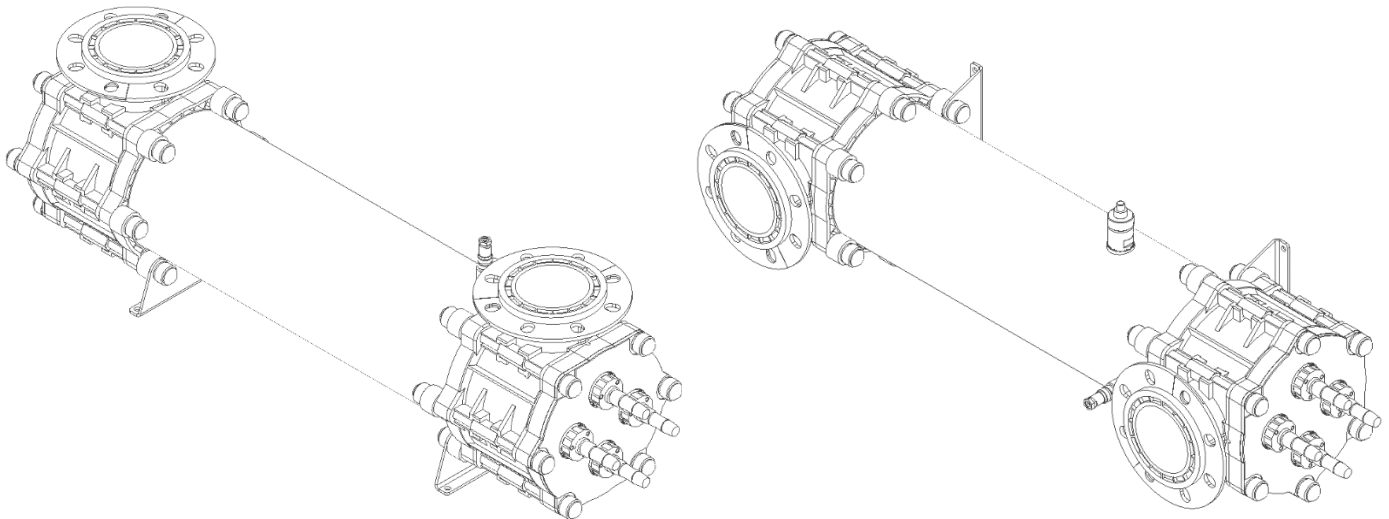
CONDITION	RANGE
Ambient Temperature	0 – 45 °C (32 – 113 °F)
Water Temperature	5 – 40 °C (41 – 104 °F)
Relative Humidity	< 90%

### Chamber Installation Orientation

The Barrier Ti chambers can be installed in a variety of orientations, including multiple inlet/outlet arrangements. Please see the instructions below for more information.

#### Horizontal chamber installation

When the Chamber is installed horizontally it should be mounted using the brackets provided. It is recommended to use the fixing points provided to secure the brackets to the mounting surface (fasteners not provided). The brackets can then be moved and/or the chamber/end caps rotated until the branch connections are in the desired orientation

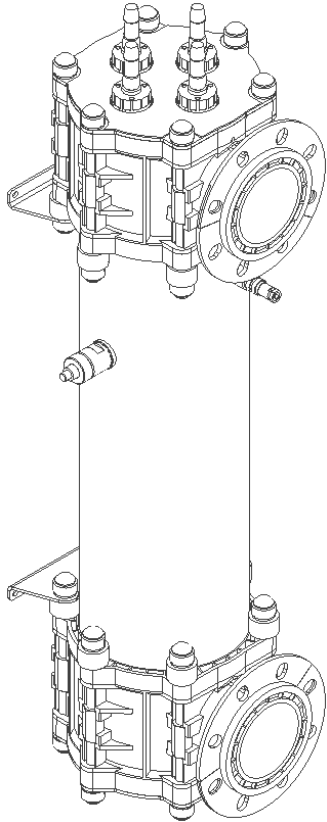


**U-Shape** chamber installed horizontally with branch connections facing upwards

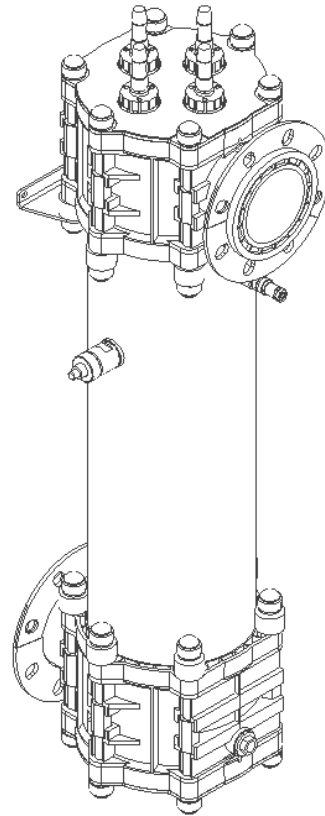
**U-Shape** chamber installed horizontally with branch connections facing sideways

## Vertical chamber installation

When the Chamber is installed vertically it should be mounted with the lamp connections facing upwards. The chamber is provided with rubber feet to prevent damage by the mounting surface. These feet are NOT intended to make the chamber stable when free standing; care should be taken to ensure the chamber is supported during installation using the provided brackets



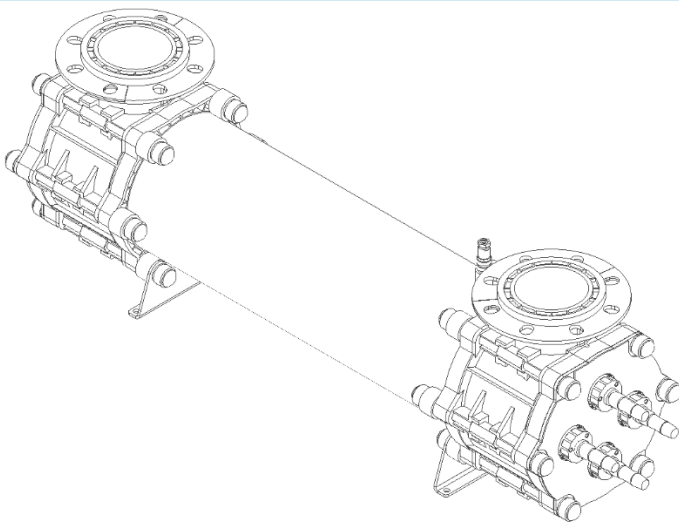
**U-Shape** chamber installed vertically



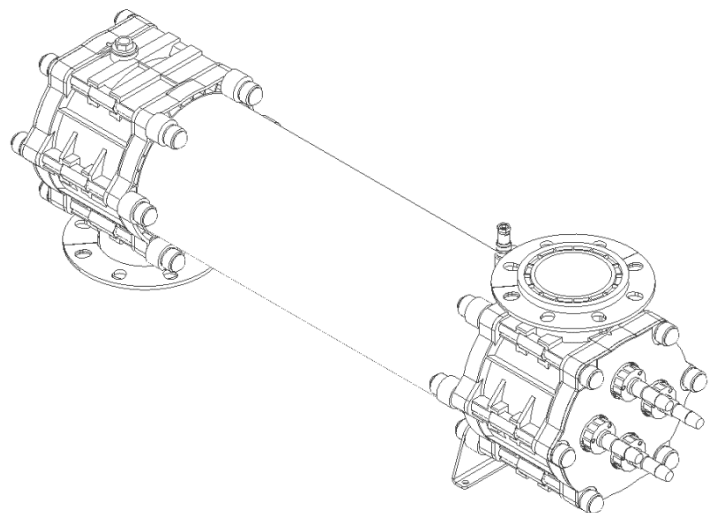
**Z-Shape** chamber installed Vertically

## Branch Orientation

Each chamber end cap can also be rotated independently of the chamber body by 180 degrees to provide further flexibility for the branch orientation. This allows for U shape and Z shape chambers with the same body. This change can be completed on site to suit specific needs.



**U-Shape** chamber installed horizontally with branch connections facing upwards



**Z-Shape** chamber installed horizontally with branch connections facing up and down



## NSF/ANSI 50 Product Information

Product Flowrate + Headloss Information Table

SYSTEM	MAX FLOW (M <sup>3</sup> /HR)	DEFAULT FLOW RATE (M <sup>3</sup> /HR)	FLOWRATE (M <sup>3</sup> /HR)				
			4	17	34	66	132
			Headloss (mbar)				
TI-1200-4 <sup>[1,2]</sup>	30	20	2.1	30.3	121.3	-	-
TI-2200-8 <sup>[1,2]</sup>	75	50	0.5	2.6	7.3	37.3	186.3
TI-4200-8 <sup>[1,2]</sup>	115	75	0.6	3.2	12.7	49.0	200.0

### Disinfection Efficacy

[1] This unit has demonstrated an ability to provide three log inactivation of *Pseudomonas aeruginosa* and *Enterococcus faecium*. This product is designed for supplementary disinfection and is intended for use with appropriate residual levels of EPA registered disinfecting chemicals. Specific residual levels of EPA registered disinfecting chemicals may be required by the regulatory agency having authority.

[2] This unit has been tested to confirm a minimum inactivation equivalent of 3 log (99.9%) *C. parvum* in accordance with NSF/ANSI/CAN 50 and the US EPA UV DGM. This product has met the requirements of NSF/ANSI/CAN 50, Section N-8.1: Disinfection Efficacy, for the ≥ minimum of a 3 log (99.9%) reduction of *Enterococcus faecium* [ATCC #6569] and *Pseudomonas aeruginosa* [ATCC #27313]. This product is intended for secondary disinfection and is intended for use with appropriate residual levels of EPA registered disinfecting chemicals. Specific residual levels of EPA registered disinfecting chemicals may be required by the regulatory agency having authority.

### Validation Information

The validation utilized MS2 phage as the test organism and ran from 67 to 97% UVT. The test organisms were correlated to *C. parvum* using the methods outlined in the *USEPA 'Ultraviolet Disinfection Guidance Manual' (UVDGM)* and the *NSF/EPA ETV: Generic Protocol for Development of Test / Quality Assurance Plans for Ultraviolet (UV) Reactors*. The UV systems demonstrated a minimum inactivation equivalent of 3 log (99.9%, 12 mJ Validated Dose) *C. Parvum*. Both U and Z shape chamber configurations are certified for secondary disinfection.

Flowrate vs Intensity Information Table

Flow (m <sup>3</sup> /hr)	INTENSITY REQUIRED FOR 3 LOG CRYPTO REDUCTION (W/M <sup>2</sup> )					
	5	15	30	40	75	115
TI-1200-4	42.8	89.5	145.4	-	-	-
TI-2200-8	58.1	58.1	88.8	109.3	165.9	-
TI-4200-8	54.4	54.4	83.1	103.2	155.7	205.9

## Cable Recommendations

Below are recommendations for cable/circuit breaker sizes:

- Un-bunched installed in free air on perforated cable tray
- Installed in an ambient temperature of 0...45°C
- Maximum cable length of 15m

If there are any other specifications that are in place that does not meet these criteria, please contact Evoqua UV for further information.

Model	No. of Lamps	Lamp Power	Cable to Panel from Distribution	Breaker in Distribution Panel	
				110-120V	200-240V
TI-1200-4	1	200W	1.5mm <sup>2</sup> c.s.a., 600/1000V, 3-Core cable (L, N & E) Steel Wire Armour Cable with Weatherproof Gland	4Amp Type "D" GFCI Breaker	4Amp Type "D" GFCI Breaker
TI-2200-8	2	200W	1.5mm <sup>2</sup> c.s.a., 600/1000V, 3-Core cable (L, N & E) Steel Wire Armour Cable with Weatherproof Gland	6Amp Type "D" GFCI Breaker	6Amp Type "D" GFCI Breaker
TI-4200-8	4	200W	1.5mm <sup>2</sup> c.s.a., 600/1000V, 3-Core cable (L, N & E) Steel Wire Armour Cable with Weatherproof Gland	16Amp Type "D" GFCI Breaker	10Amp Type "D" GFCI Breaker

**WARNING!** Always ensure cables are installed with adequate mechanical protection!

**Disclaimer:** These cable recommendations are sized based on the maximum load of the system; therefore, fault protection/discrimination should be assessed depending on the site installation and local regulations. Evoqua is not responsible for any unsafe work practices, procedures, actions, or inactions taken by the client during the installation.

## Panel Supply Loads

Please refer to table below for approximate supply loads for each model.

Model	Supply Loads (A)							
	110V	120V	200V	208V	220V	230V	240V	250V
TI-1200-4	2.0	1.8	1.1	1.1	1.0	1.0	0.9	0.9
TI-2200-8	4.0	3.7	2.2	2.1	2.0	1.9	1.8	1.8
TI-4200-8	8.0	7.3	4.4	4.2	4.0	3.8	3.7	3.5

**Note:** The supply loads provided are based on the maximum load of the system (i.e. full power).

## Installation Checklists

<b>GENERAL INSTALLATION CHECKLIST</b>	Y/N
<b>Inspect the goods</b> to ensure no damage has occurred in transit. Check that that all ordered items are present.	
<b>Install the UV chamber and control panel</b> as described in the Installation Guidelines above, pages 11-16	
<b>Run the cables</b> in accordance with local regulations. Do not pull cables tight around sharp corners as this may affect the performance and reliability of the system, segregate cables, do not cable tie together.	
<b>Cabling required from Control Panel to Chamber:</b> <ul style="list-style-type: none"> <li>• Lamp Cable - 1 per lamp, supplied as standard</li> <li>• Earth Cable 1 core - supplied as standard</li> <li>• Temperature sensor Cable - 1 per sensor, supplied as standard</li> <li>• UV sensor Cable - 1 per sensor, supplied as standard</li> </ul>	
<b>CHAMBER INSTALLATION CHECKLIST</b>	Y/N
<b>Connect Earth/Ground cable</b> to the boss on the chamber from the panel ground/earth point.	
Connect the <b>temperature sensor</b> cable to the temperature sensor mounted on the chamber. Note that this is orientation sensitive	
Connect the <b>UV sensor</b> cable to the UV sensor mounted on the chamber. Note that this is orientation sensitive	
<b>Check the quartz sleeve/seal</b> Prior to flooding, remove the lamp retainers and connectors, and check that the quartz sleeve/thimble is not damaged as per the Maintenance section of this manual.	
<b>Install the lamp/s</b> and make the electrical connections Check that the correct lamp is used, visually checking the lamp for any damages. If more than 1 lamp is fitted ensure the lamps are fitted in order (i.e. lamp1 then lamp2 etc.)	
<b>CONTROL PANEL INSTALLATION CHECKLIST</b>	Y/N
<b>Before the power supply</b> to the panel is switched on:	
Connect the Earth/Ground cable from the chamber to the terminal provided in the panel.	
<b>Check the Temperature sensor and UV sensor cables</b> are terminated as per the Schematic or Termination Block Diagram	
<b>Check the Lamp Cables</b> are terminated as per the Schematic or Termination Block Diagram	
<b>Connect the Customer I/O</b> – Connect the digital/analogue I/O as required. Please refer to the Control Operation section of the manual, pages 35-63.	

## Commissioning

Use the Commissioning Procedure Checklist to safely put the unit into operation. The following steps should also be taken:

1. The pipe work and UV systems should be filled with water and excess air vented. Check for leaks
2. For commissioning the flow rate of liquid to cool the lamps should be at least 1 m<sup>3</sup>/hr (4 gpm) per kW to cool the lamps
3. After lamps have been switched off wait 15 minutes to allow them to cool before attempting to restart - frequent start / stop cycles will shorten lamp life.

<b>COMMISSIONING PROCEDURE CHECKLIST</b>	Y/N
Ensure the unit has been installed as per local regulations and according to the Installation Guidelines	
<b>Check that the incoming mains connections are correct:</b> Please check the electrical schematics to verify what power supply is required	
<b>Ensure quartz and lamps are installed</b> and waterproof	
<b>Ensure Temperature and UV Intensity sensors are installed</b> if supplied, and connect to their corresponding terminals in the control panel	
<b>Ensure Lamp cables are installed</b> and connected to their corresponding terminals in the control panel	
<b>Ensure the earth/ground cable</b> is connected from the chamber to the terminal provided in the panel.	
<b>Ensure full flow through the chamber</b> is available and any air trapped at the top of the chamber is released	
<b>Turn on the power</b> at the distribution source	
<b>Check that the incoming voltage</b> is correct and record this in the UV Commission Work Sheet that follows this section	
<b>Test temperature sensor</b> by disconnecting the sensor on the chamber; a fault should be displayed. Reconnect the sensor and clear the fault (refer to the Control Operation section for more details).	
<b>Time &amp; Date</b> - verify that the time and date are set correctly and adjust if necessary (see Operation section for more details).	
<b>Check that the system variables</b> are set as required i.e. Fixed Flow Rate	
<b>Check lamp fault</b> – , start the system; a lamp fault should be displayed. Clear the fault (see Operation section for more details).	
<b>Start the system</b>	
<b>Check the fan is running correctly</b>	
<b>Stop the system</b>	

## UV COMMISSION WORK SHEET

All readings to be obtained with Fixed Flow Rate and lamp in Full Power

Supply Voltages		Lamp Power (%)							
Ph-N / Ph-Ph :	V	L1 :	%	L2 :	%	L3 :	%	L4 :	%

Checks	Y/N	Y/N	Y/N	Y/N
Lamp Fault		Chamber	Installed Correctly	Cooling fans operating
Temperature Trip		Distribution GFCI MCB	Wiper Fitted	Customer IO
Chamber Earth Cable		Quartz Leaks	Low Dose Alarm	Lamp Cable Flash Test
Flow meter Enabled		Auto Restart Enabled	Re Strike Time	SD Card back-up

Checks before leaving site			Y/N
Flow (m <sup>3</sup> /hr) :	Local/Remote :	By-Pass fitted?	
Final UVT % :	Power Setting :	Running?	
Dose (mJ/cm <sup>2</sup> ) :	Temp °C :	Clean?	
Lamp Power :	Average UV% :	Alarms Present?	

## UV Sensor Calibration

**Warning:** Do not expose skin or eyes to ultraviolet light.

### VALIDATED 4-20MA UV SENSOR



The validated UV sensors (W2T898830 - Validated UV Probe - 500 W/m<sup>2</sup> - LP) are factory calibrated in reference to a known device.

They are most often used on validated UV systems but can also be used on non-validated UV systems. These sensors are 4-20mA devices and are fitted to the UV sensor housing using a separate window housing.

# Barrier™ Ti UV System Maintenance & Spares

## MAINTENANCE SCHEDULE

### Maintenance Log

Whenever maintenance work is carried out on the UV system, particularly with reference to lamp changes and cleaning / replacing the quartz, a record should be kept of the work carried out and the lamp run hours noted. This log should be used to monitor general lamp life and to develop accurate frequencies for cleaning and replacing the quartz components.

**Note: ensure system is electrically isolated and chamber is fully drained before any maintenance work is carried out.**

### Performance Monitoring

Taking samples from pre and post the UV chamber can be used to monitor the performance of the system. Care should be taken when sampling not to contaminate the sample itself. Poor performance test results can often be traced back to poor sampling techniques.

### UV Lamp

Lamp life expectancy is based on continuous use before the output drops to the low UV output threshold level, making replacement necessary. Frequent stop / start operation will reduce lamp life.

### Quartz Cleaning and Replacement

The quartz sleeve should be cleaned at regular intervals. The wiper (if fitted) cleaning frequency should be increased if there are excessive deposits on the quartz sleeve or decreased if the sleeve remains very clean.

A change in water quality may necessitate a change in the wiper (if fitted) cleaning frequencies. The quartz sleeve should be removed and cleaned in a soap and water solution. Heavier or stubborn deposits can be removed by soaking in a 5% solution of citric acid or wiping with household vinegar. To remove fingerprints from the quartz sleeve, use surgical spirit and a lint free cloth.

### Seals

It is good practice to replace the seals whenever the quartz sleeve is removed from the chamber.

### Control panel

Commissioning often takes place in a dusty environment. The inlet filter mat should be cleaned shortly after commissioning and at regular intervals depending on the cleanliness of the air. The distribution GFCI MCB should also be tested at regular intervals by an electrically competent person by pressing its Test button.

## UV LAMP MAINTENANCE

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



### UV Lamp Extraction

Ensure the UV system is isolated from power before carrying out maintenance on the UV Lamps

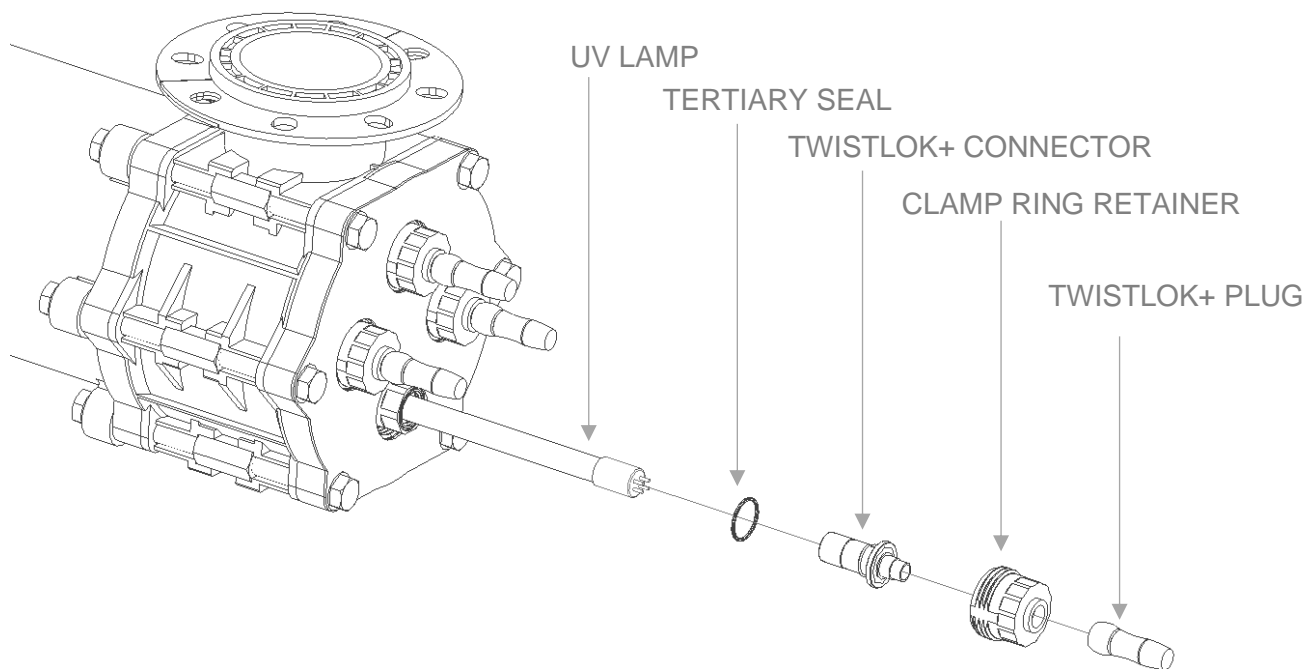
- 1 Twist the locking ring on the TWISTLOK+ PLUG anti-clockwise and remove
- 2 Unscrew the CLAMP RING RETAINER to access the TWISTLOK+ CONNECTOR & UV LAMP
- 3 Rotate the TWISTLOK+ CONNECTOR anticlockwise about 2 full turns to release the UV LAMP. The Tertiary seal should remain fitted to the CLAMP RING
- 4 Carefully extract the UV LAMP & TWISTLOK+ CONNECTOR from the QUARTZ THIMBLE keeping the lamp parallel to the UV Chamber at all times to avoid damage

### UV Lamp Installation

Before inserting a new lamp, ensure all components are clean and dry.

**Note:** Please ensure that no dirt or fingerprints get onto the lamp surface as this will reduce the lamp life

- 1 Connect the TWISTLOK+ CONNECTOR to the new UV LAMP and insert into the CLAMP RING, keeping it parallel with the UV Chamber to avoid damage
- 2 While applying light pressure on the TWISTLOK+ CONNECTOR, rotate 2 turns clockwise into the CLAMP RING until the flange on the TWISTLOK+ CONNECTOR contacts the TERTIARY SEAL
- 3 Replace the CLAMP RING RETAINER and rotate clockwise to secure the UV LAMP in place
- 4 Re-fit the TWISTLOK+ PLUG. This is done by first lining up and engaging the contacts then rotating the locking ring  $\frac{1}{4}$  turn clockwise to secure in place



## DRAINING THE UV CHAMBER

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



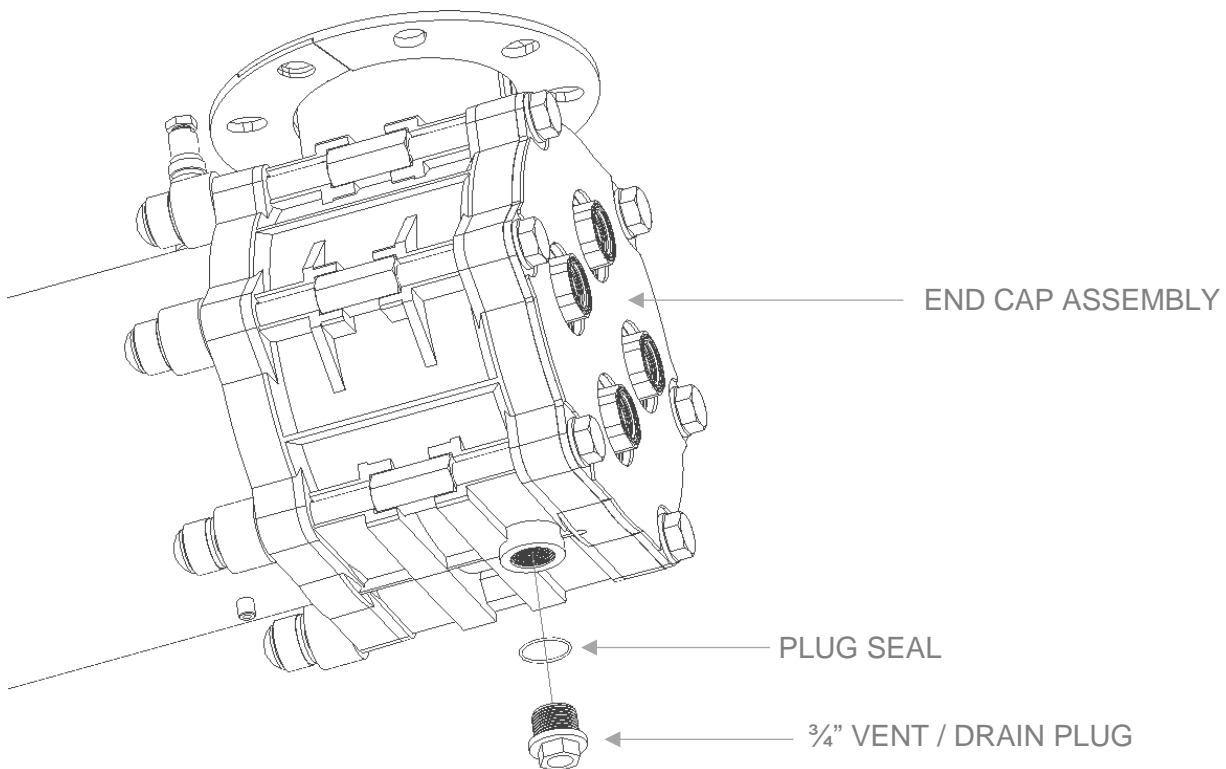
### Drain / Vent Plug Removal

Ensure the UV system is isolated from power and flow before carrying out this process

- 1 Unscrew the VENT / DRAIN PLUG from the END CAP ASSEMBLY. There is one VENT / DRAIN PLUG at each end. Make sure the PLUG SEAL is accounted for
- 2 Allow the water to fully drain from the system

### Drain / Vent Plug Installation

- 1 Screw the VENT / DRAIN PLUG into the END CAP ASSEMBLY. Ensure the PLUG SEAL is properly located on the VENT / DRAIN PLUG. This should be tightened to 10 Nm / 7.5 lbf. ft.
- 2 Once any other work is carried out reapply flow to the UV chamber and check that there are no leaks present





## QUARTZ THIMBLE MAINTENANCE

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



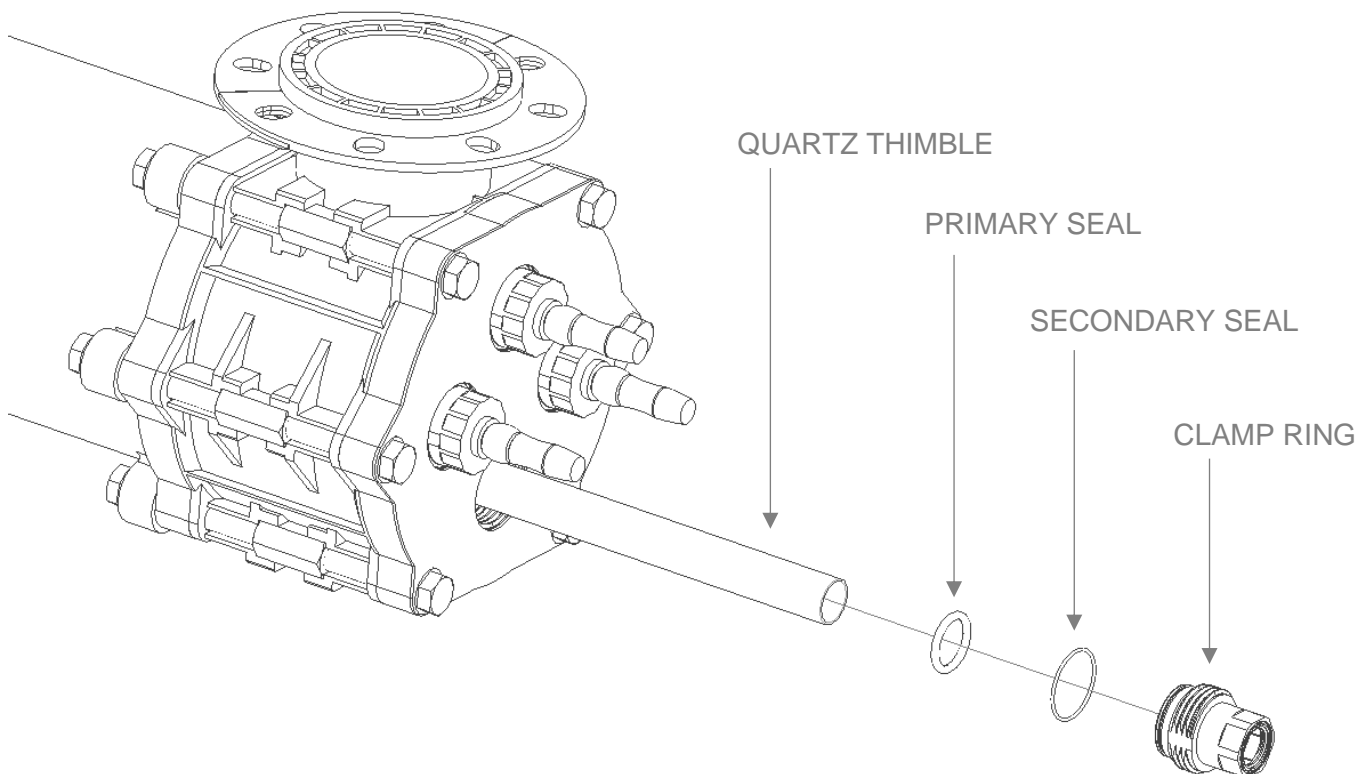
### Quartz thimble Extraction

Ensure the UV Chamber is isolated from flow and drained before carrying out any maintenance work

- 1 Follow the **UV Lamp Extraction** procedure detailed in the previous subsection
- 2 Unscrew the CLAMP RING and remove. The CLAMP RING may initially feel difficult to unscrew, this will be the SECONDARY SEAL doing its job and this is normal
- 3 Remove the PRIMARY SEAL from around the QUARTZ THIMBLE
- 4 Carefully remove the QUARTZ THIMBLE keeping it parallel to the UV chamber to avoid damage

### Quartz sleeve Installation

- 1 Carefully slide the new/cleaned QUARTZ THIMBLE into the hole in the end flange, keeping it parallel with the UV Chamber so it locates in the opposing flange. If a wiping system is installed, ensure the sleeve is gently guided through the wiper ring.
- 2 Ensure the SOFT SEAT & SPRING are removed from the old QUARTZ THIMBLE and placed into the new one
- 2 Install the PRIMARY SEAL over the QUARTZ THIMBLE, and ensure the SECONDARY SEAL is installed on the CLAMP RING. Ensure the seals are in good condition and replace as necessary. Screw the CLAMP RING into place over the quartz sleeve, this should be tightened to 20 Nm / 15 lbf. ft. or hand tight plus  $\frac{3}{4}$  turn.
- 3 Follow the **UV Lamp Installation** procedure detailed in the previous subsection



## UV SENSOR MAINTENANCE

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



### UV Sensor Removal

Ensure the UV system is OFF before any maintenance is carried out on the UV sensor

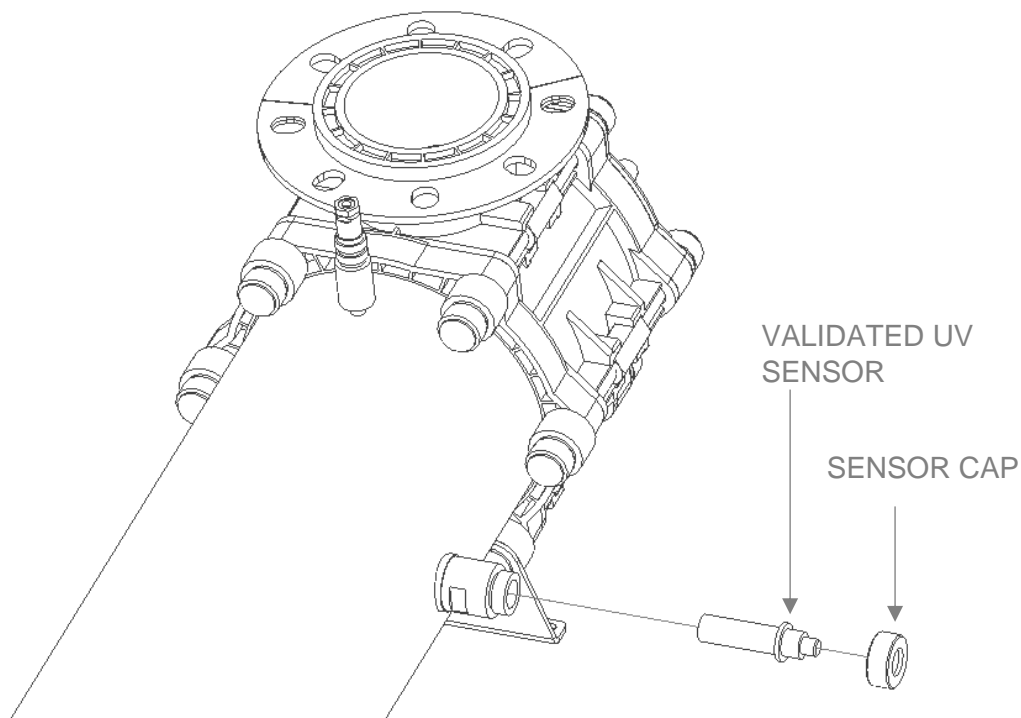
- 1 Unscrew UV Sensor cable connector from the VALIDATED UV SENSOR
- 2 Unscrew the SENSOR CAP from the SENSOR WINDOW HOUSING
- 3 Remove the VALIDATED UV SENSOR from the SENSOR WINDOW HOUSING

### UV Sensor Installation

Ensure all components are clean and dry, especially ensure that no dirt or debris gets onto the window of the UV Sensor as this may affect readings.

Cleaning of the UV Sensor should be carried out regularly and carefully. This can be done via CIP, manual wiper action (if fitted), or upon removal of the UV sensor. Approved are common non-abrasive cleaners. Weak acids can be used for stubborn fouling

- 1 Install the VALIDATED UV SENSOR into the SENSOR WINDOW HOUSING
- 2 Screw the SENSOR CAP onto the SENSOR WINDOW HOUSING
- 3 Screw the UV Sensor cable connector from the VALIDATED UV SENSOR



## UV SENSOR WINDOW MAINTENANCE

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



### UV Sensor Window Removal

Ensure the UV system is OFF before any maintenance is carried out on the UV sensor Window

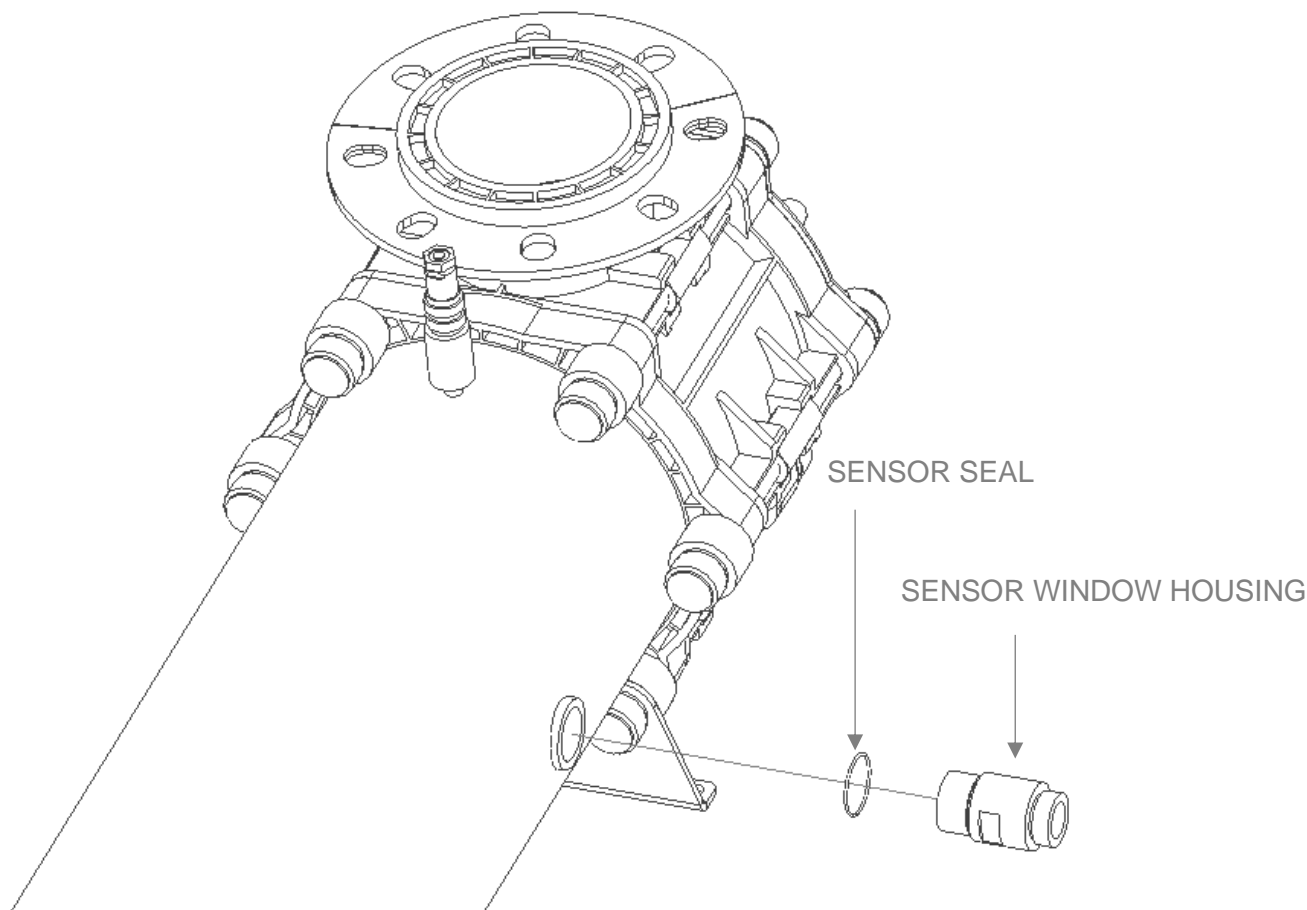
- 1 Follow the **UV Sensor Removal** procedure detailed in the previous subsection
- 2 Unscrew the SENSOR WINDOW HOUSING, ensuring the SENSOR SEAL is accounted for
- 3 The condition of the SENSOR SEAL should be checked and replaced if required

### UV Sensor Installation

Ensure all components are clean and dry, especially ensure that no dirt or debris gets onto the window of the SENSOR WINDOW HOUSING as this may affect readings

Cleaning of the SENSOR WINDOW HOUSING should be carried out regularly and carefully. This can be done via CIP, manual wiper action (if fitted), or upon removal of the SENSOR WINDOW HOUSING. Common non-abrasive cleaners should be used. Weak acids can be used for stubborn fouling

- 1 Ensure the SENSOR SEAL is correctly fitted onto the SENSOR WINDOW HOUSING
- 2 Screw the SENSOR WINDOW HOUSING back into the UV chamber
- 3 Follow the **UV Sensor Installation** procedure detailed in the previous subsection



## UV CHAMBER MAINTENANCE

### UV Chamber Access

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



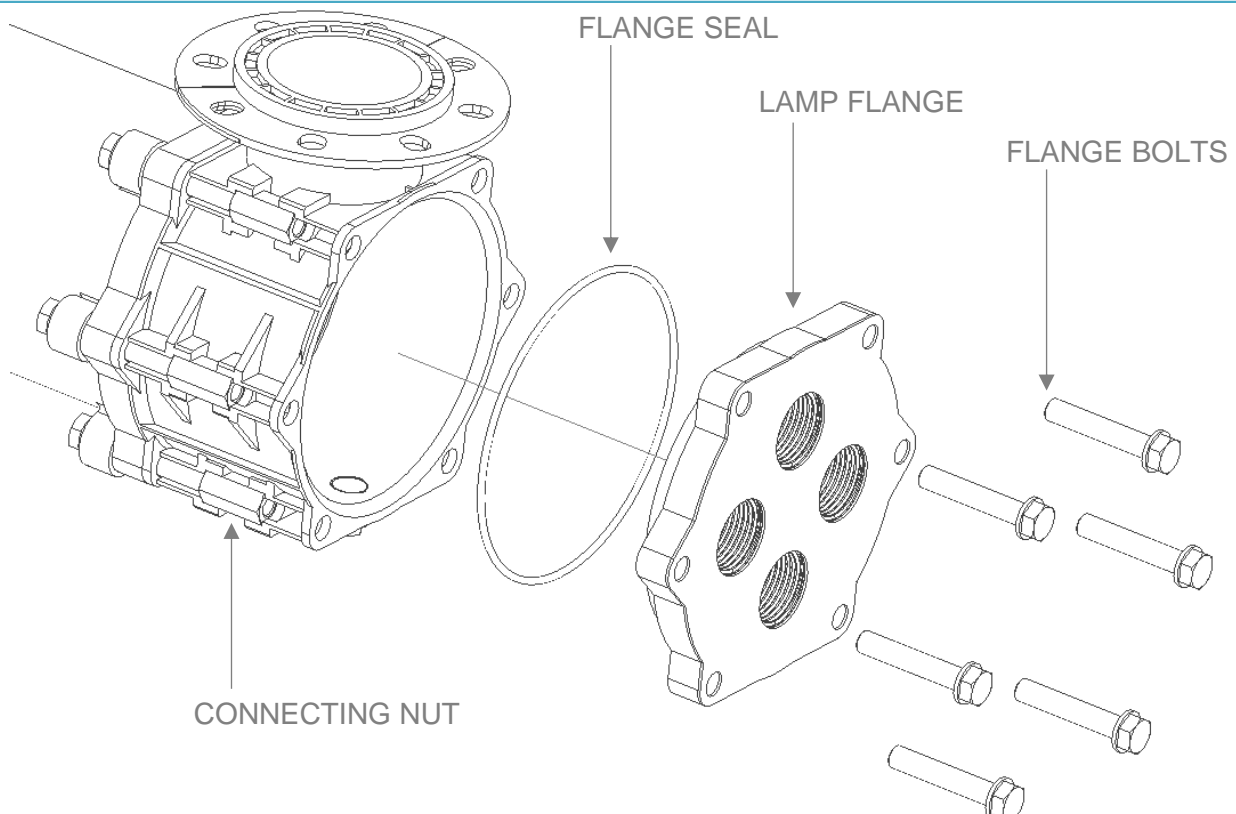
### Lamp Flange Removal

It may be required to gain access to the inside of the UV chamber to maintain internal components, clean the system, or remove debris. Ensure the UV Chamber is isolated from flow and drained before carrying out any maintenance work

- 1 Follow the instructions above to remove the UV LAMPS and QUARTZ THIMBLES
- 2 Remove the hex head FLANGE BOLTS, using a spanner to ensure the CONNECTING NUTS do not spin when doing this.
- 3 The LAMP FLANGE can then be removed, there is no need to remove the cover label as this time
- 4 The FLANGE SEAL should also be removed

### Lamp Flange Installation

- 1 Install the FLANGE SEAL on the rear side of the LAMP FLANGE. Replace the FLANGE SEAL if required
- 2 Install the LAMP FLANGE back onto the chamber, ensuring that the bolt holes are aligned between the parts.
- 3 Re install the FLANGE BOLTS, ensuring they are tightened evenly to apply the correct pressure to the FLANGE SEAL. These should be tightened to 20 Nm / 15 lbf. ft. for TI-2200 & TI-4200 models and 10 Nm / 7.5 lbf. ft. for TI-1200 models



## UV CHAMBER MAINTENANCE

### UV Chamber Branch Orientation Adjustment

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.



### Branch & Flange Assembly Removal

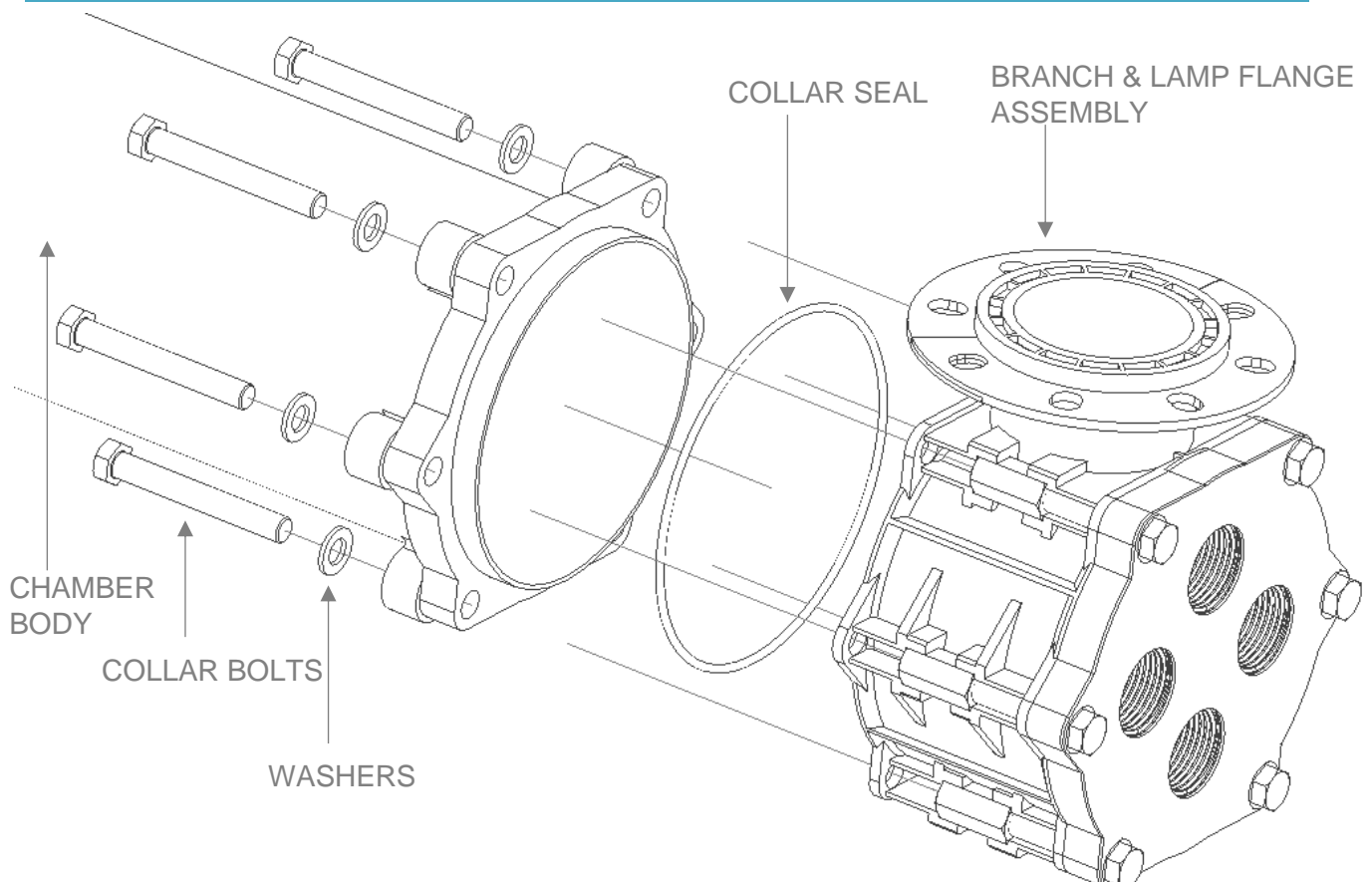
The UV Chamber can be adjusted to allow for alternate Branch Inlet / Outlet orientations. Ensure the UV Chamber is isolated from flow and drained before carrying out any maintenance work

- 1 Follow the instructions above to remove the UV LAMPS and QUARTZ THIMBLES
- 2 Remove the hex head COLLAR BOLTS, using a spanner to ensure the CONNECTING NUTS do not spin when doing this. Ensure the WASHERS are accounted for
- 3 The BRANCH and LAMP FLANGE assembly can then be removed, there is no need to remove the cover label as this time
- 4 The COLLAR SEAL should also be removed

### Branch & Flange Assembly Installation

The UV Chamber can then be rebuilt with the desired Branch Inlet / Outlet orientation

- 1 Install the COLLAR SEAL over the CHAMBER BODY. Replace the COLLAR SEAL if required
- 2 Install the BRANCH and LAMP FLANGE assembly back onto the chamber in the desired orientation, ensuring that the bolt holes are aligned between the parts
- 3 Install the COLLAR BOLTS and WASHERS, ensuring they are tightened evenly to apply the correct pressure to the COLLAR SEAL. These should be tightened to 20 Nm / 15 lbf. ft. for TI-2200 & TI-4200 models and 10 Nm / 7.5 lbf. ft. for TI-1200 models



## UV CHAMBER MAINTENANCE

### UV Chamber Clean in Place (CIP)

Please refer to the Health & Safety Section at beginning of the manual for Symbol explanations. These are to be adhered to when carrying out the following maintenance procedures.

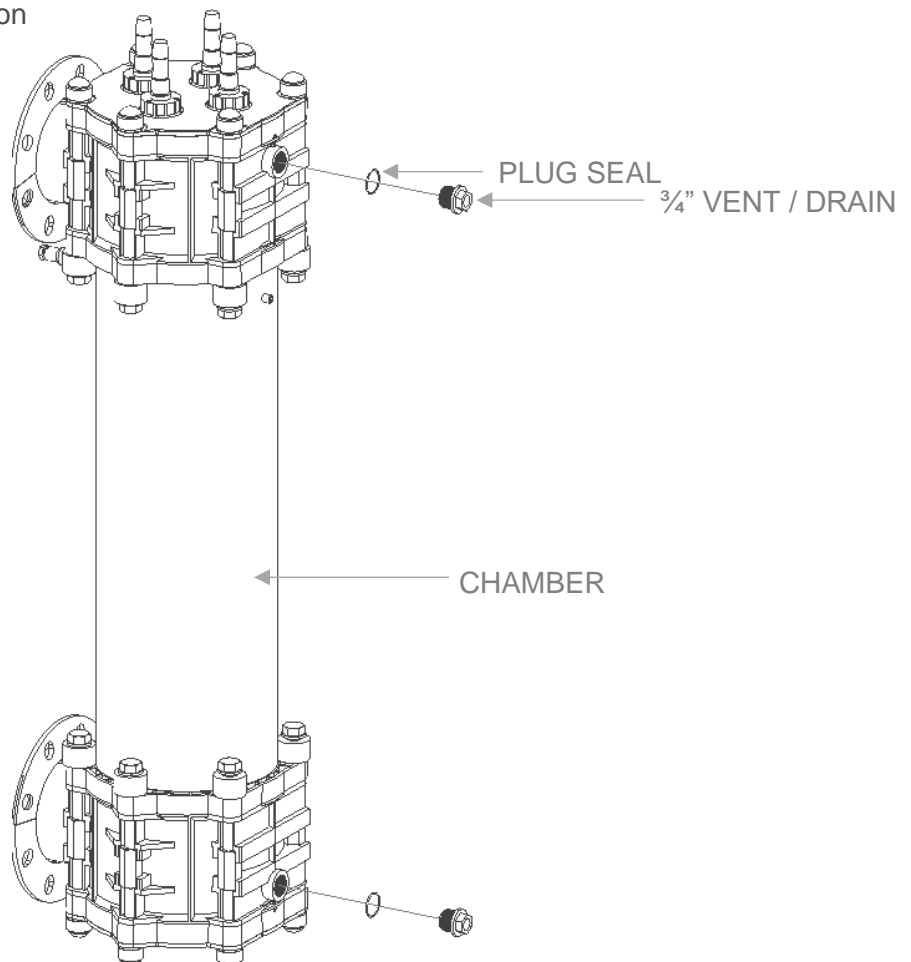


### CIP Instructions

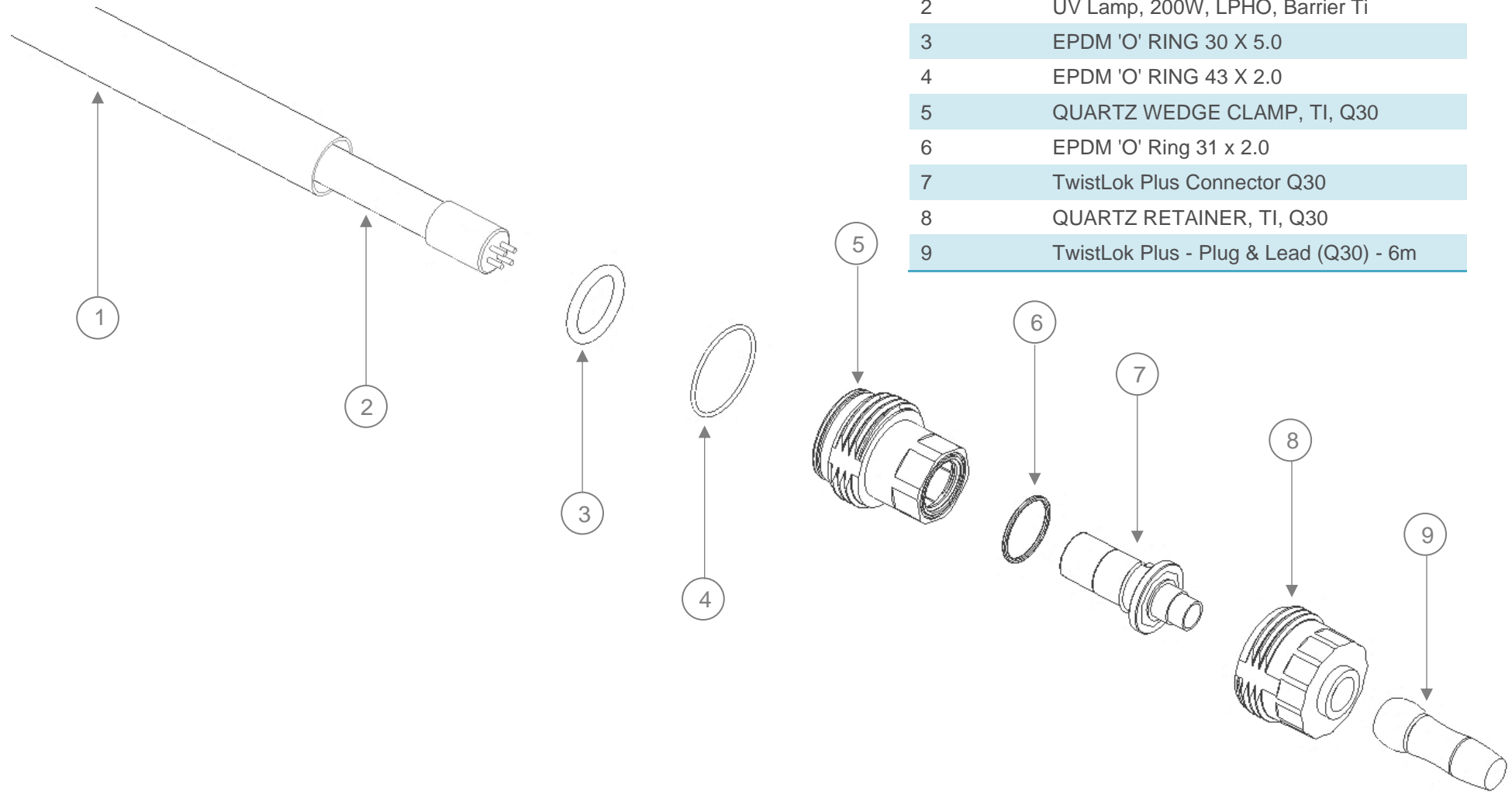
Follow previous instructions for stopping the UV system, isolating from power and flow, and draining the UV CHAMBER

- 1 Unscrew the VENT / DRAIN PLUGS from the END CAP ASSEMBLIES. There is one VENT / DRAIN PLUG at each end. Make sure the PLUG SEAL is accounted for
- 2 It is recommended to use a weak acid such as Phosphoric or Citric acid at concentrations of 2 - 10% for the cleaning solution.
- 3 Connect the CIP equipment (not supplied) to the 3/4" threaded ports, using the bottom as the inlet and top as the outlet
- 4 Circulate the cleaning fluid through the CHAMBER ASSEMBLY for approximately 15-30 mins
- 5 When complete rinse the CHAMBER ASSEMBLY with water. Store the cleaning fluid for reuse or dispose according to local guidelines for the specific solution used
- 6 Screw the VENT / DRAIN PLUG into the END CAP ASSEMBLY. Ensure the PLUG SEAL is properly located on the VENT / DRAIN PLUG. This should be tightened to 10 Nm / 7.5 lbf. ft.
- 7 Reapply flow to the UV CHAMBER and check that there are no leaks present

**NOTE:** Take appropriate safety precautions applicable to the cleaning solution used. Consult the relevant MSDS for more information

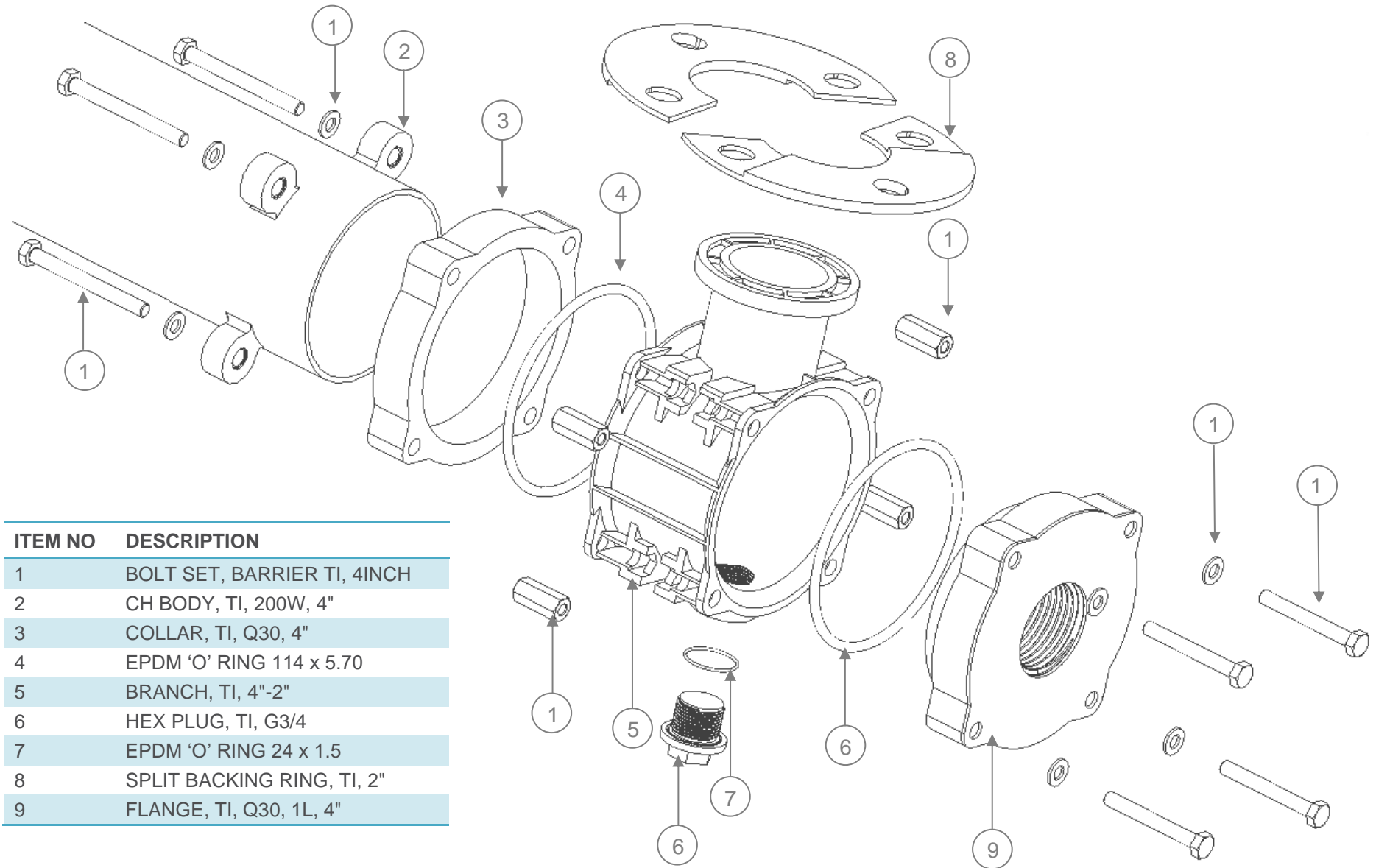


## LAMP & QUARTZ ASSEMBLY



ITEM NO	DESCRIPTION
1	Quartz Thimble QTH-30 X 1025
2	UV Lamp, 200W, LPHO, Barrier Ti
3	EPDM 'O' RING 30 X 5.0
4	EPDM 'O' RING 43 X 2.0
5	QUARTZ WEDGE CLAMP, TI, Q30
6	EPDM 'O' Ring 31 x 2.0
7	TwistLok Plus Connector Q30
8	QUARTZ RETAINER, TI, Q30
9	TwistLok Plus - Plug & Lead (Q30) - 6m

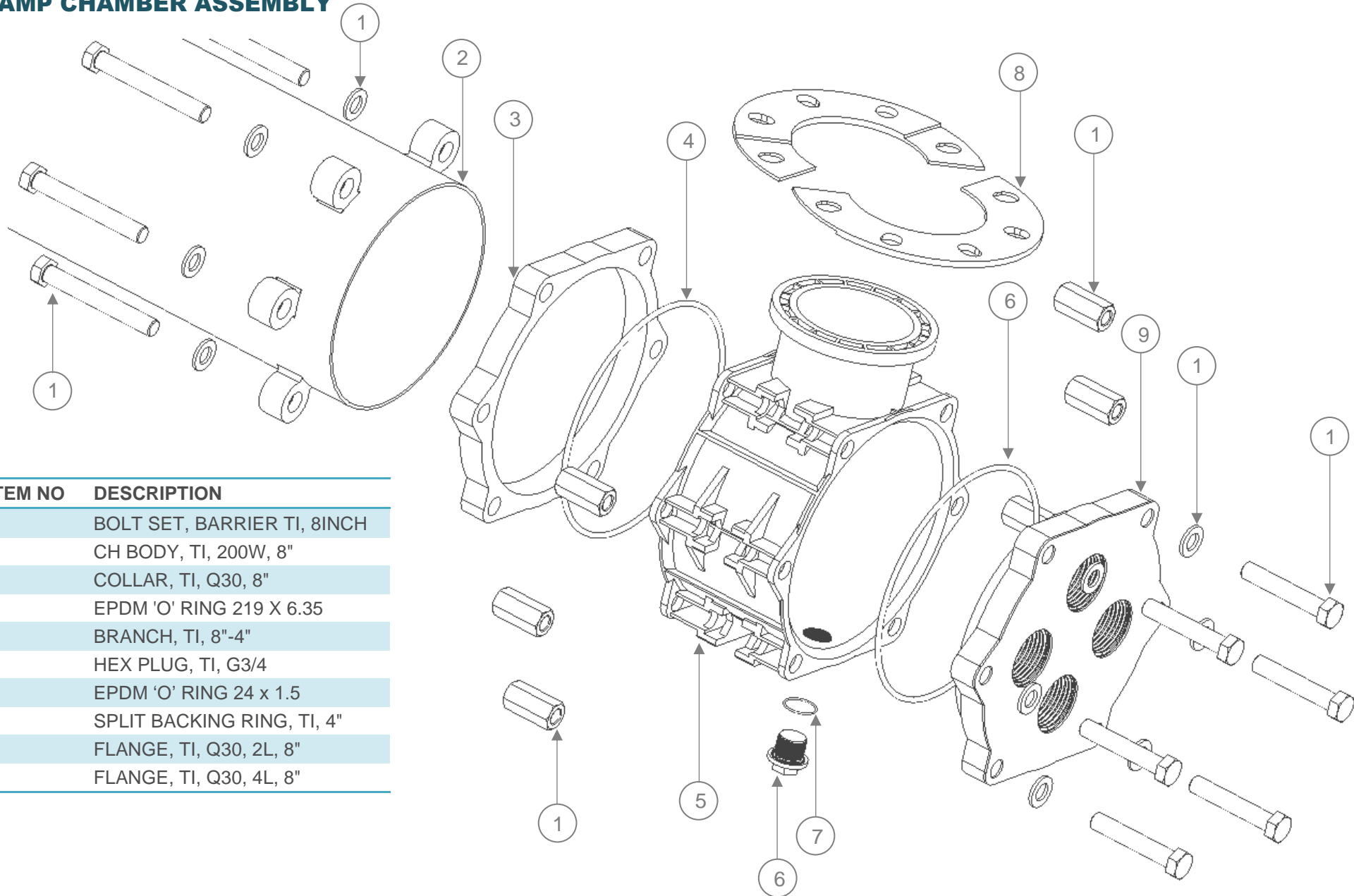
## 1 LAMP CHAMBER ASSEMBLY



ITEM NO	DESCRIPTION
1	BOLT SET, BARRIER TI, 4INCH
2	CH BODY, TI, 200W, 4"
3	COLLAR, TI, Q30, 4"
4	EPDM 'O' RING 114 x 5.70
5	BRANCH, TI, 4"-2"
6	HEX PLUG, TI, G3/4
7	EPDM 'O' RING 24 x 1.5
8	SPLIT BACKING RING, TI, 2"
9	FLANGE, TI, Q30, 1L, 4"



## 2 & 4 LAMP CHAMBER ASSEMBLY



ITEM NO	DESCRIPTION
1	BOLT SET, BARRIER TI, 8INCH
2	CH BODY, TI, 200W, 8"
3	COLLAR, TI, Q30, 8"
4	EPDM 'O' RING 219 X 6.35
5	BRANCH, TI, 8"-4"
6	HEX PLUG, TI, G3/4
7	EPDM 'O' RING 24 x 1.5
8	SPLIT BACKING RING, TI, 4"
9	FLANGE, TI, Q30, 2L, 8"
9	FLANGE, TI, Q30, 4L, 8"

## SPARE PARTS

Standard consumable spare parts for the Barrier™ Ti UV systems are available as kits for simplified ordering and maintenance.

Individual replacement parts are available for order in the event of loss or breakage of a component.

See contact information at the end of this manual to identify your local contact for genuine spares and replacements.

### Spares Kits

MODEL	SEAL KIT PN		WIPER SEAL KIT PN		PREVENTATIVE MAINTENANCE KIT PN	
TI-1200-4	W3T614853	1003-8529	-	-	W3T614859	1003-8558
TI-2200-8	W3T614854	1003-8530	W3T614856	1003-8532	W3T614991	1003-8559
TI-4200-8	W3T614855	1003-8531	W3T614857	1003-8533	W3T614993	1003-8560

## Replacement Components

### *Lamp & Quartz Assembly*

ITEM NO	DESCRIPTION	PN
5	QUARTZ WEDGE CLAMP, TI, Q30	W3T597924 1003-8549
7	TWISTLOK PLUS CONNECTOR Q30	W2T874964 1000-3291
8	QUARTZ RETAINER, TI, Q30	W3T597925 1003-8551

### *1 Lamp Chamber Assembly*

ITEM NO	DESCRIPTION	PN
1	BOLT SET, BARRIER TI, 4INCH	W3T612346 1003-8554
3	COLLAR, TI, Q30, 4"	W3T597717 1003-8534
5	BRANCH, TI, 4"-2"	W3T597718 1003-8536
6	HEX PLUG, TI, G3/4	W3T597922 1003-8546
8	SPLIT BACKING RING, TI, 2"	W3T597913 1003-8544
9	FLANGE, TI, Q30, 1L, 4"	W3T597912 1003-8538

### *2 & 4 Lamp Chamber Assembly*

ITEM NO	DESCRIPTION	PN
1	BOLT SET, BARRIER TI, 8INCH	W3T612347 1003-8555
3	COLLAR, TI, Q30, 8"	W3T597915 1003-8535
5	BRANCH, TI, 8"-4"	W3T597916 1003-8537
6	HEX PLUG, TI, G3/4	W3T597922 1003-8546
8	SPLIT BACKING RING, TI, 4"	W3T597919 1003-8547
9	FLANGE, TI, Q30, 2L, 8"	W3T610434 1003-8539
9	FLANGE, TI, Q30, 4L, 8"	W3T597918 1003-8540

## Spectra 3 Membrane Operation

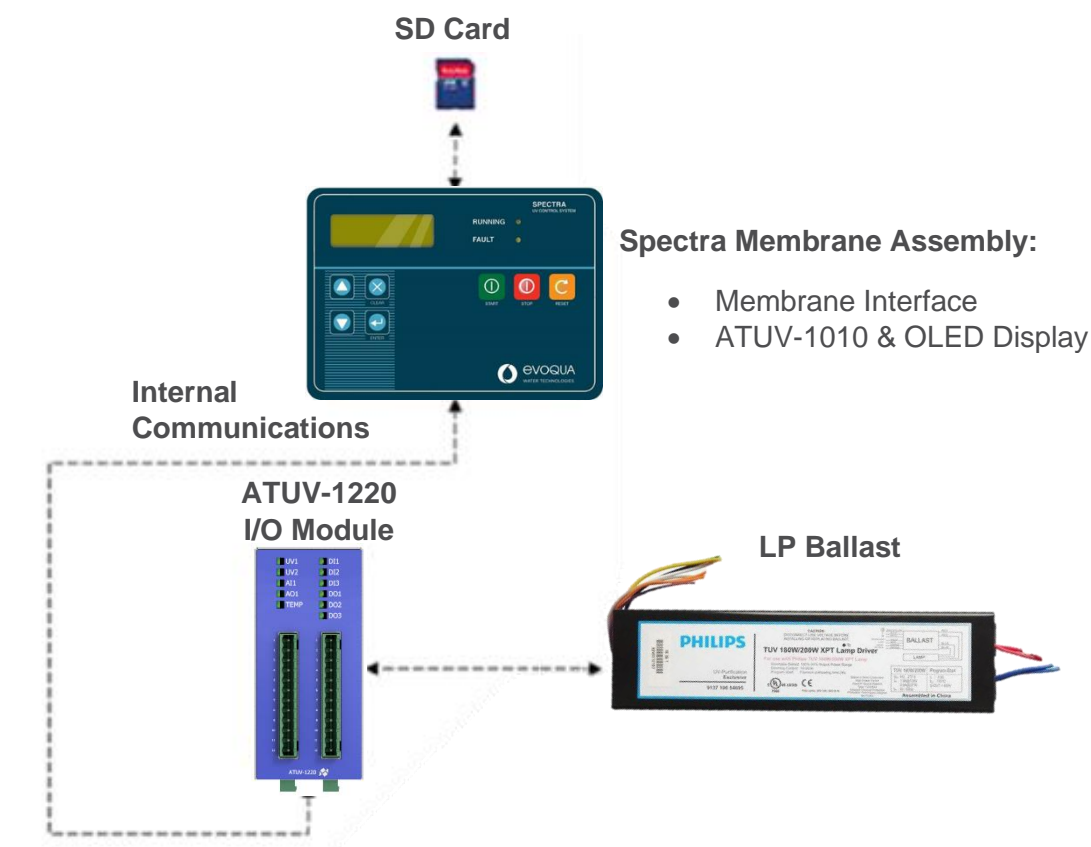
### SPECTRA MEMBRANE CONTROL SYSTEM

Spectra is an automated control system developed by **Evoqua** to control and monitor the operation of its UV Disinfection systems.

### COMPONENTS

The Spectra Control system consists of the following components:




- Spectra Membrane (ATUV-1010)
- ATUV-1220 (I/O Module)
- LP Ballast



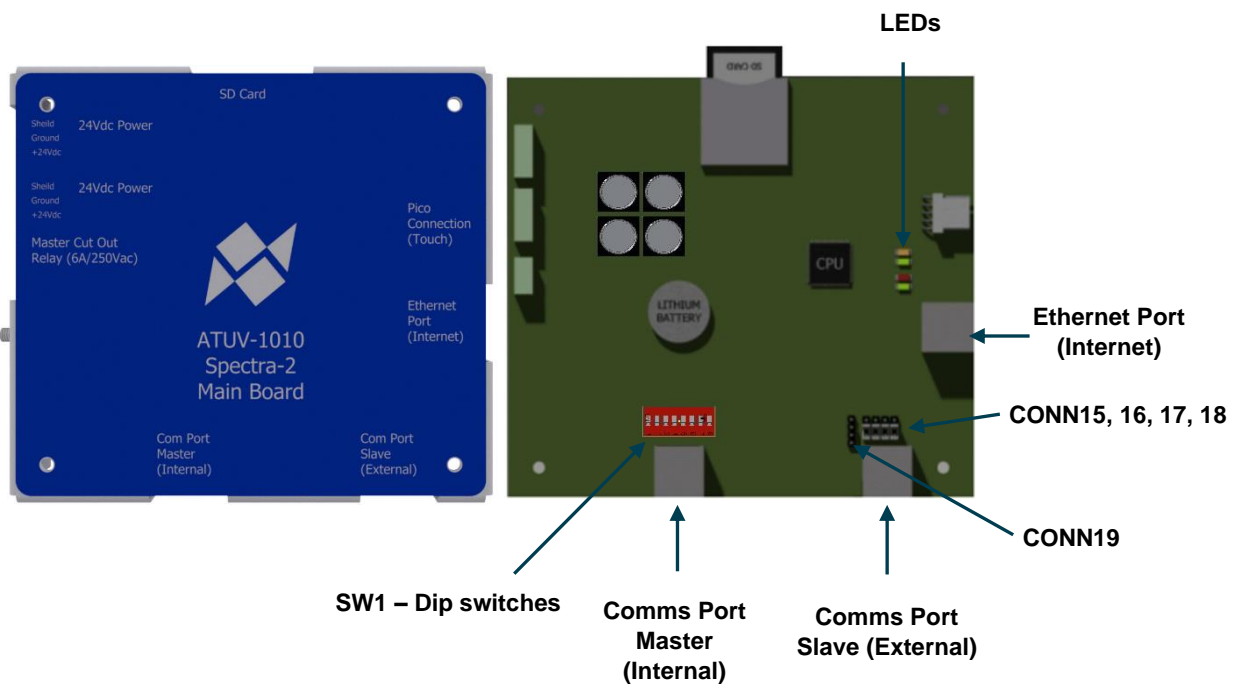
## Spectra Membrane

Spectra control panels are operated via the front utilising a 4-line OLED display and a pushbutton membrane:



Feature	Description
	<p>Pressing the Start button activates the start-up sequence, turning on the lamp(s).            Note: Pressing Start will have no effect if:</p> <ul style="list-style-type: none"> <li>• A critical or fatal fault is active</li> <li>• Restrike timer (see below) is running</li> <li>• Spectra is in remote/comms control mode</li> </ul>
	<p>Pressing the Stop button will turn off the lamp(s) and start the re-strike timer. This timer will inhibit the lamp(s) from being struck again for a defined period (usually 6-8 minutes) to allow a sufficient cool down time otherwise a strike failure may occur.</p>
	<p>The Reset button is used to re-set any faults that have occurred. If a fault is displayed it is good practice to record the fault and the time/date, then reset the fault (if possible unless the fault still exists) and attempt to restart the unit once.</p>
<b>RUNNING LED</b>	<p>Illuminates when system is in Running Mode. Flashes quickly in Start-up Mode. Flashes slowly if system is waiting for a signal from the Process Interlock.</p>
<b>FAULT LED</b>	<p>Illuminates when there is a fault. If this LED is on but no fault is displayed, scroll through using the up and down arrows until the fault is displayed.</p>

## ATUV1010 – Main Board



The ATUV-1010 board controls all critical operations including the system operation and customer communications and is the central part of the Spectra control system. All external modules including ATUV-1220, LP Ballast and ATUV-1040 (If fitted) are connected via an internal communications network. The ATUV-1010 also has a removable SD card used for storing various files for the Spectra to operate.

### *Comms Port Master (Internal)*

This connection provides communications from the ATUV-1010 (Mainboard) to the ATUV-1220 (I/O Module) LP Ballast and ATUV-1040 (If fitted) via a RJ45 connection.

### *Comms Port Slave (External)*

This connection provides communications from an external Modbus RTU device (master) with the Spectra operating as a slave device with use of an RJ45 connection using Modbus Protocol. The master device should initiate communications, while the Spectra responds to requests accordingly for data or an action to be taken. The Spectra can be assigned a MODBUS SLAVE ADDRESS ranging from 0-99 when being used as a slave on a network. For further information, please refer to the **Modbus Communication** Section.

### *Ethernet Port (Internet)*

This connection enables the system to monitor and review the Spectra data over the internet. This can be achieved by either using an Ethernet connection with internet access or a Wi-Fi adapter to connect to a Wi-Fi with internet access.

### LED's

The Main board has 4 that are used for status indication.

From Top to Bottom:

LED	Description	Status	Indication
3	(Internal Use Only)		
4	This LED indicates if there is power to the Spectra	ON	Power to the Spectra
		OFF	No power to the Spectra
1	This LED indicates the software status	ON	Software successfully loaded & running correctly
		OFF	Software load fault
		FLASHING	Software loading
2	This LED indicates the status of the SD card	ON	SD card healthy
		OFF	SD card not healthy or not found

### Headers

The ATUV-1010 has various headers which are used to configure the communications internally and externally.

#### COMM Port Master (Internal Use Only)

SW1 – Dip Switches: These dip switches are for internal use only and should not be altered.

#### COMM Port Slave (External)

CONN15, 16, 17, 18: These pins are used to reverse the polarity of Rx and Tx. As standard, headers should be placed on bottom 2 pins as illustrated in the image above. (For more information, refer to the Modbus Communication section).

#### Wire Interface

CONN19: These pins are used to select between 4 wire interface and 2 wire interface. (For more information, refer to the Modbus Communication section).

## SD Card

The SD card stores everything the Spectra needs to function. It stores all the systems variables, the menu structure, the version of Spectra program and log files (if enabled).

atg_V4-13a	06/08/2019 07:20	File folder	
Documents	16/08/2019 12:59	File folder	
LOGS	24/11/2017 06:23	File folder	
menu	06/08/2019 07:20	File folder	
settings	06/08/2019 07:20	File folder	
Bootloader.afx.S19	07/05/1980 04:02	S19 File	161 KB
FlashLoader.afx.S19	12/02/2014 16:51	S19 File	163 KB
kernelcrc	07/05/2019 11:49	Text Document	1 KB
Spectra2.afx.S19	07/05/2019 14:49	S19 File	590 KB

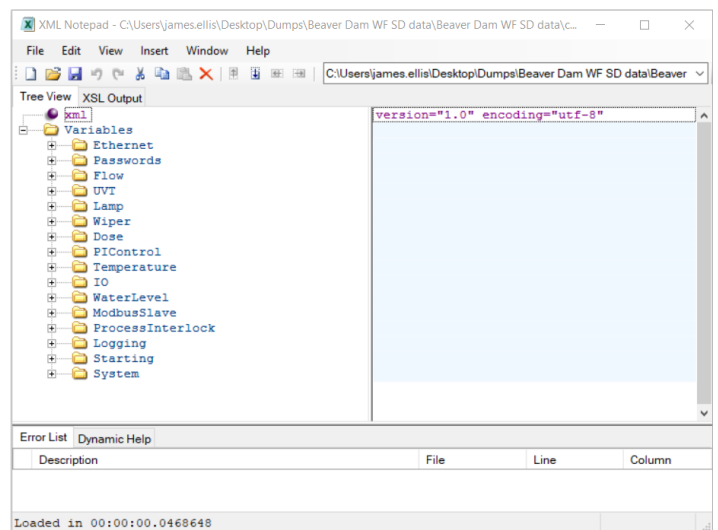
XML Notepad 2007 software is required to edit certain information and variables (.xml files) and can be downloaded for free from the Download Centre on the Microsoft website.

## SD Card Files

### Setting Files

The following file stores the system parameters:

**Config.xml** - This file stores all the system parameters. Current variables can be altered using XML Notepad simply by opening the file and selecting the desired variable to be changed from the relevant location. For example, see illustration below for editing Flow Rate:



**Note:** When the desired variable/s has been altered, save, and close the file.

### Menu Files

This folder stores all the information relating to the menu structures that appear on the 4-line OLED display. This information is factory set and should not be altered.

### Software Files (Also located on the Root of the SD Card)

This folder contains the Spectra Software programs. These files should not be altered.

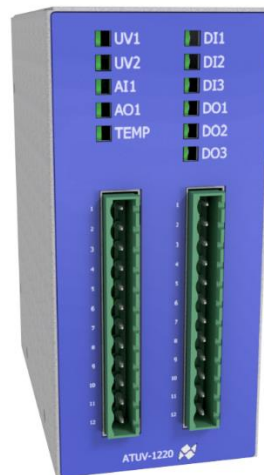
### Log Files

The following files are not of use to the user but may be used in the unlikely event of a malfunction.

**Logfile (1).csv** - These files store all the data logs. Each CSV file will contain 1000 records with the latest file being the highest number (For example once Logfile1 reaches 1000 records then Logfile2 will be created.)

## I/O Module (ATUV-1220)

The I/O Module is the main interface module and is located inside the panel consisting of various Analogue/Digital inputs and outputs:



### LEDs

The Digital Input & Output LED lights illuminate when energised and extinguish when de-energised.

For the **Analogue Inputs (UV1, UV2 & AI1)**, each LED indicates the following:

Condition	Range
ON	> 3.5 mA
Flashing	> 2mA, < 3.5 mA
OFF	< 2mA

For the **Analogue Outputs**, the following LED's indicate:

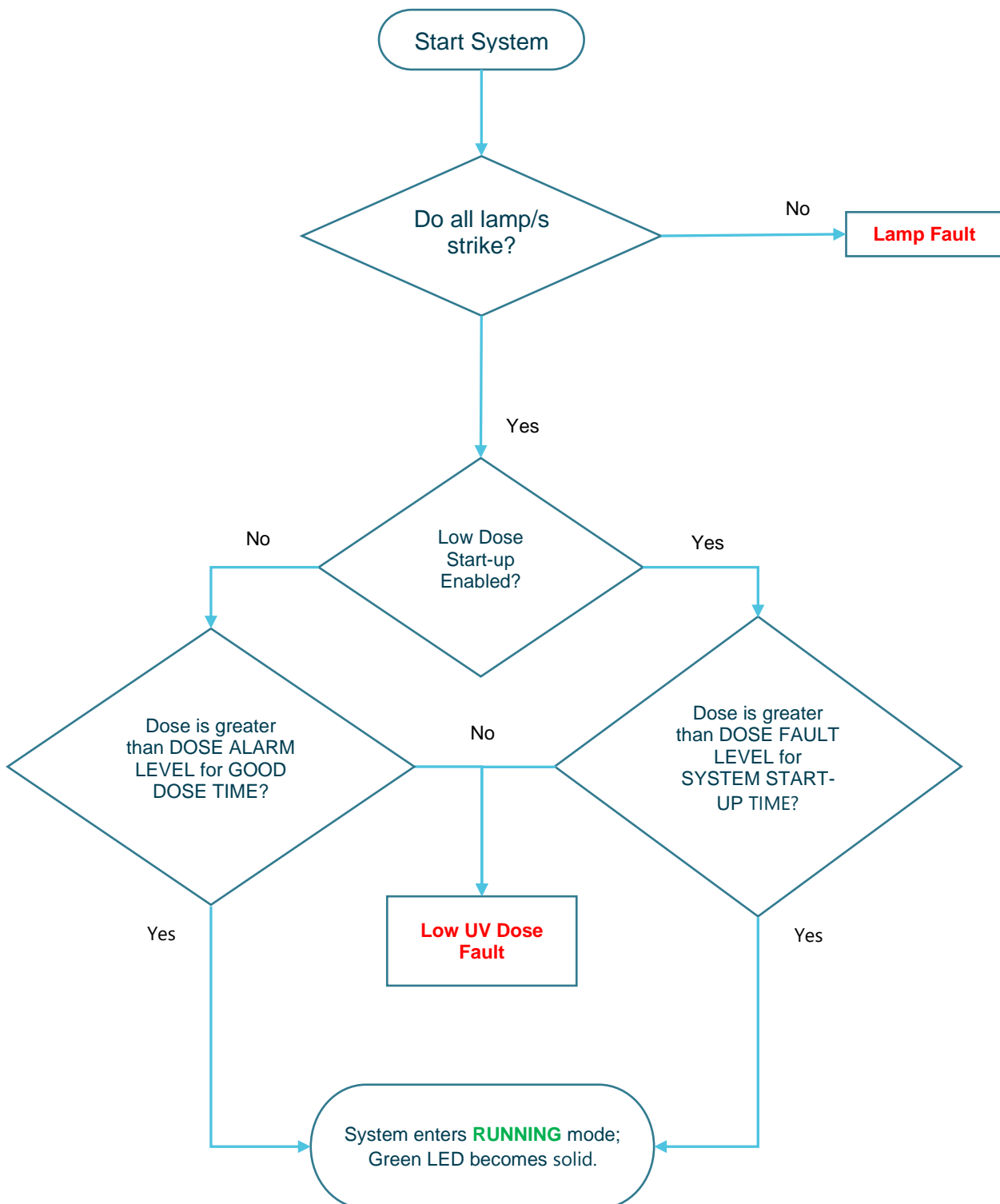
Output	Status
AO1	Communications to the ATUV-1010 (mainboard) is healthy

To ensure the system is healthy, AO1 LED should be illuminated.



## Start-up Sequence

The following conditions must be achieved for the system to go into Running Mode:



## Spectra Operation

### MAIN SCREENS

Additional functions of the Spectra are accessed via the keypad on the Membrane. The keypad has the buttons Up, Down, Enter and Clear which allow the operator to scroll through the screens, enter values and select various control options.

#### Menu Navigation



Use these keys to scroll up and down the menu



Press this key to enter the Menu or variable



Pressing this button moves back up one level in the menu structure. When ready to exit the screen, pressing this button will take you back to the Main information screens

#### Modifying Variables



Use these keys to modify / select the relevant variables



Press this key to accept the changes made to the variable



Pressing this button returns you to the previous screen without accepting the changes made

The main information screens shown below can be scrolled through using the up and down arrows. These screens provide details about the systems running condition including lamp current, flow rate and UV Dose.

Pressing Enter on certain screens will give more information, e.g. pressing enter on the lamp current screen will show the individual lamp information (e.g. lamp current, hours and strikes) if more than one lamp is in use, the up and down arrows can be used to view other lamps information.

**NOTE:** Pressing the Clear button will always move back out of the current menu to the previous screen. Should more than one fault occur, the fault screen with the highest priority will be displayed. Pressing DOWN on the keypad accesses the lower priority screens. Once the cause of the alarm or fault has been rectified, pressing the reset button on the front membrane will reset the alarm.

## NAVIGATING THE MAIN INFORMATION SCREENS

Dose: 0.00 mj/cm2  
 Flow: 0.00 m3/hr  
 Chamber Temp: 24 C  
 \*


\* Log Inactivation/UVT/UV Intensity visible if function is enabled



UV Intensity:  
 mW/cm2  
 mA  
 0.0 %



Lamp Power  
 0.0 %

Press  for additional Lamp Information


Lamp 1  
 0 hours  
 0 strikes



Date: \*\*/\*\*/\*\*\*\*  
 Time: \*\*:\*\*:\*\*  
 SN: \*\*\*\*\*  
 System Hours: 126





Operator Menu  
 Press Enter Key

Press  to enter the Operator Menu  
 This menu contains easy access Operator adjustable parameters (Refer to Operator Menu Screens section)



Setup Menu  
 Press Enter Key

Press  to enter the Setup Menu  
 This Menu contains Operator adjustable parameters (Refer to Setup Menu Screens section)

Hold  to enter the Engineering Menu  
 This menu contains Engineer adjustable parameters

## Fault & Priority Screens

The table below describes the 4 different types of priority screens that the Spectra displays; Fatal Faults, Critical Faults, Non-Critical Alarms, and Restrike Timer

Priority Screen Descriptions
<b>Fatal Faults</b> - Shuts the system down and will require a manual reset to restart the system
<b>I/O Communications Watchdog</b> Communications to the common IO module has been lost
<b>Local Stop Fault</b> The unit has been stopped using the local stop button when selected to remote run. Press reset to allow the unit to restart from remote.
<b>Critical Faults</b> - Shuts the system down and will require a manual reset to restart the system
<b>Control Panel Over Temperature</b> Control Panel has exceeded its CONTROL PANEL TEMP FAULT set point.
<b>UV Chamber Over Temperature</b> Chamber Temperature has exceeded FAULT TEMPERATURE set point.
<b>Ballast/Lamp Fault</b> Ballast / Lamp fault causing lamp to fail to strike/while running
<b>Low UV Dose</b> Actual Dose is less than DOSE FAULT LEVEL for low dose time.
<b>Process Interlock Shutdown</b> The Process Interlock input has de-energised whilst unit was running.
<b>SD Card Not Inserted</b> SD card is not inserted or corrupt
<b>I/O Module Not Calibrated</b> ATUV-1220 requires calibrating
<b>I/O Modules Less Than Expected</b> Number of I/O modules detected less than specified
<b>Flow Meter Out of Range</b> The flow meter input is outside the 4mA and 20mA tolerances
<b>Non-Critical Alarms</b> – Displays the Fault/Alarm but will allow the system to continue running
<b>Process Interlock Interrupt</b> The Process Interlock input has de-energised whilst unit was running. The unit will re-start after the signal is regained and the re-strike period has elapsed.
<b>Low UV Dose</b> Actual Dose is less than DOSE ALARM LEVEL for low dose time.
<b>Lamp Approaching End of Life</b> Lamp run hours have exceeded lamp life set point and should be replaced.
<b>UV Chamber Over Temperature</b> Chamber Temperature has exceeded ALARM TEMPERATURE set point.
<b>Power Loss When Running</b> Power to the system has been lost while the lamp(s) were running
<b>Other Priority Screen – Restrike Timer</b>
<b>Re-Strike Timer Running</b> Indicated the restrike time remaining until the lamps can be re-struck

## Operator Menu Screens

This menu screen contains easy access operator adjustable parameters:

MENU	VARIABLE
Operator	System Control Mode
	Fixed Flow Rate
	Flow Meter Source

### OPERATOR > SYSTEM CONTROL MODE

**Description:**

Used to select how to start/stop the system either locally or remotely

Selectable Values	* Local	System can only Start/Stop by pressing Start on the Spectra
	Remote	System can Start/Stop remotely via a closed hardwired signal into a DI on ATUV-1220. Can still be stopped locally via the Spectra for emergency purposes.
	Comms	System can Start/Stop via external comms. Can still be stopped locally via the Spectra for emergency purposes.

### OPERATOR > FIXED FLOW RATE\*

**Description:**

This value will be used as the flow rate during the start-up period. If no flow meter is set up this value will be used as the constant flow rate.

Selectable Values	0-9000	m <sup>3</sup> /hr
	0-943.5	BPM
	0-57.1	MGD
	0-39624.5	GPM
	0-216	MI/d
	0-2499.5	l/s

\*For default Fixed Flow Rate refer to Product Flow Information Table in the Installation, Commissioning & Calibration Section

### OPERATOR > FLOW SOURCE

**Description:**

Used to select what flow meter value is to be used when the system is in running mode. During start-up FLOW RATE will always be used

Selectable Values	* FIXED	Fixed Value
	ANALOGUE	4-20 mA Flow Meter Input
	COMMS	Flow Signal via Comms

## Setup Menu Screens

The Setup Menu Screens allow the operator to alter the way the system will run by changing the system variables

**Warning – Altering variables can stop the system working correctly: only suitably qualified persons should alter any of the system variables**

- To enter the setup menu screen as an operator, press enter on the set-up screen
- Enter the **ATG** Password using the up and down arrows and the enter key
- Pressing clear at any point will return you back you to the main screens

MENU	VARIABLE	MENU	VARIABLE
FLOW	Fixed Flow Rate	COMMS and I/O	Digital Input 1 Source
	Flow Units		Digital Input 2 Source
	Flow Source		*
	Flow Meter Max		Digital Output 1 Source
LAMP	Restrike Time		Digital Output 2 Source
	Reset Individual Lamp hours		Modbus Slave Address
	Reset All Lamp Hours		DHCP
DOSE	Dose Units		IP Settings
	Dose Set-Point		DNS
	Dose Alarm		PROCESS INTERLOCK
	Dose Fault	Process Interlock Action	
	Good Dose Time	Process Interlock Delay	
	Low Dose Time	UVT	UVT Source
	Low Dose End Time		Fixed UVT
	Low Dose Start-up		UVT Meter Max
	Intensity Units	MISCELLANEOUS	Auto Restart
	UV Sensor Max		Change Password?
UV Dose Max	Time		
TEMPERATURE	Temperature Units		Date
	Chamber Temperature Alarm		Load Defaults
	Chamber Temperature Fault		
	Chamber Temperature Alarm Dead-band		
	Panel Temperature Fault		


\*Note: IO available changes per model; see *IO Field Wiring Guide* section (pages 61-63) for more information

## NAVIGATING THE SETUP SCREEN

Set-up Menu  
Press Up or Down




Flow  
Press Enter to Access

Press  to change Flow Parameters




Lamp  
Press Enter to Access

Press  to change Lamp Parameters



Dose  
Press Enter to Access

Press  to change Dose Parameters



Temperature  
Press Enter to Access

Press  to change Temperature Parameters



Comms & I/O  
Press Enter to Access

Press  to change Comms & I/O Parameters




Process Interlock  
Press Enter to Access

Press  to change Process Interlock Parameters



UVT  
Press Enter to Access

Press  to change UVT Parameters



Misc.  
Press Enter to Access

Press  to change Miscellaneous Parameters

## SETUP MENU - PARAMETER DESCRIPTIONS

### Flow

#### FLOW > FIXED FLOW RATE

**Description:**

This value will be used as the flow rate during the start-up period. If no flow meter is set up this value will be used as the constant flow rate.

Selectable Values	0-9000	m <sup>3</sup> /hr
	0-943.5	BPM
	0-57.1	MGD
	0-39624.5	GPM
	0-216	MI/d
	0-2499.5	l/s

\*For default Fixed Flow Rate refer to Product Flow Information Table in the **Installation, Commissioning & Calibration** Section

#### FLOW > FLOW UNITS

**Description:**

Used to select which flow units are required.

Selectable Values	* m <sup>3</sup> /hr	Cubic metres per hour
	BPM	Barrels per minute
	MGD	Million gallons (US) per day
	GPM	Gallons (US) per minute
	MI/d	Million litres per day
	l/s	Litres per second

#### FLOW > FLOW SOURCE

**Description:**

Is used to select what flow meter value is to be used when the system is in running mode. During start-up FLOW RATE will always be used.

Selectable Values	* STATIC FLOW	Fixed Value
	COMMS	Flow Signal via Comms
	FLOW METER	4-20mA Flow Meter Input

#### FLOW > FLOW METER MAX

**Description:**

Used to convert flow meter input (in mA) to the actual flow rate. The flow meter reading at 20 mA should be entered.

Selectable Values	* 0-9000	m <sup>3</sup> /hr
	0-943.5	BPM
	0-56.9	MGD
	0-39624.5	GPM
	0-216	MI/d
	0-2499.5	l/s



## Lamp

---

### LAMP > RESTRIKE TIME

Description:

Used to set the time required for the lamp to cool sufficiently to allow re-strike.

Selectable

0 – 60

Minutes

Values

---

### LAMP > RESET INDIVIDUAL LAMP HOURS > RESET LAMP # HRS

Description:

Is used to reset individual lamp life hours and strikes upon replacing a specific lamp. Use the up and down arrows to scroll through the different lamps and press enter to select Yes to reset the hours for that particular lamp.

Selectable

Yes

Values

No

---

### LAMP > RESET ALL LAMP HOURS

Description:

Is used to reset lamp life hours and strikes for all lamps. Press Enter to select Yes to Reset ALL lamp hour counters.

Selectable

Yes

Values

No

---

## Dose

### DOSE > DOSE UNITS

**Description:**

Working DOSE units can be selected.

\* mJ/cm<sup>2</sup>

Selectable Values J/m<sup>2</sup>

J/cm<sup>2</sup>

### DOSE > DOSE SET-POINT

**Description:**

Used to set the target Dose. (Used for control mode)

Selectable Values 0 – 5,000 mJ/cm<sup>2</sup>

0 – 50,000 J/m<sup>2</sup>

0.00 – 5.00 J/cm<sup>2</sup>

### DOSE > DOSE ALARM

**Description:**

When the measured dose drops below the alarm value for LOW DOSE TIME, the unit will display a non-critical alarm and will continue to run.

Selectable Values 1 – 5,000 mJ/cm<sup>2</sup>

1 – 50,000 J/m<sup>2</sup>

0.01 – 5.00 J/cm<sup>2</sup>

### DOSE > DOSE FAULT

**Description:**

When the measured dose drops below the fault value for LOW DOSE TIME, the unit will display a critical alarm and will shut down. DOSE FAULT LEVEL must be less than DOSE ALARM LEVEL

Selectable Values 0 – 5,000 mJ/cm<sup>2</sup>

0 – 50,000 J/m<sup>2</sup>

0.00 – 5.00 J/cm<sup>2</sup>

### DOSE > GOOD DOSE TIME

**Description:**

The measured Dose must be greater than the ALARM LEVEL for the GOOD DOSE TIME in order for the system to switch into Running mode.

(This value is usually set to 15)

Selectable Values 0 – 120 Seconds

### DOSE > LOW DOSE TIME

**Description:**

This variable sets the length of time the measured dose can drop below the Alarm or Fault values before activating the Alarm or Fault.

(This value is usually set to 30)

Selectable Values 0 – 60 Seconds

---

**DOSE > LOW DOSE END TIME****Description:**

Sets the length of time a measured good dose must be seen in order to end the low dose timer and set the system back to normal running conditions.

Selectable \* 1-15 Seconds  
Values

---

---

**DOSE > LOW DOSE STARTUP****Description:**

Used to define whether the system will go into running mode if the measured dose is greater than FAULT LEVEL but less than ALARM LEVEL.

If enabled the unit will go into running mode once FAULT LEVEL has been exceeded for 5 mins, but the Low dose alarm activate if ALARM LEVEL is not reached.

(This value is usually set to Disabled)

Selectable \* Disabled  
Values Enabled

---

---

**DOSE > INTENSITY UNITS****Description:**

Working INTENSITY units can be selected.

Selectable \* mW/cm<sup>2</sup>  
Values W/m<sup>2</sup>

---

---

**DOSE > UV SENSOR MAX****Description:**

Used to convert UV sensor input to the actual UV intensity.

The UV reading at 20 mA should be entered.

Selectable 0 – 1,000 mW/cm<sup>2</sup>  
Values 0 – 10,000 W/m<sup>2</sup>

---

---

**DOSE > UV DOSE MAX****Description:**

The value selected equates to 20mA output.

Used if the Analogue Output is set to **DOSE**.

Selectable 0 - 5000  
Values

---

## Temperature

### TEMPERATURE > TEMP UNITS

Description:

Displayed temperature units can be selected.

Selectable	Degrees Celsius	°C
Values	Degrees Fahrenheit	°F

### TEMPERATURE > CHAMBER TEMP ALARM

Description:

Temperature at which a non-critical alarm is generated if the UV Chamber Temperature exceeds this value

Selectable	0 -120	°C
Values	32 – 248	°F

### TEMPERATURE > CHAMBER TEMP FAULT

Description:

Temperature at which a critical alarm is generated if the UV Chamber Temperature exceeds this value.

This value is usually set to 46°C - If this value is set too high it could lead to damaged equipment or injury!

Selectable	0 -120	°C
Values	32 - 248	°F

### TEMPERATURE > TEMP ALARM D-B

Description:

Temperature reduction required below alarm temperature level before temperature output re-opens

Selectable	0 -120	°C
Values	32 – 248	°F

### TEMPERATURE > PANEL TEMP FAULT

Description:

Temperature at which a critical alarm is generated if the Control Panel Temperature exceeds this value.

This value is usually set to 70°C - If this value is set too high it could lead to damaged equipment or injury!

Selectable	0 -120	°C
Values	32 – 248	°F

## Comms & I/O

COMMS		> DIGITAL INPUT(S)
Description: Used to select the digital input function on DI1 or DI2		
Selectable Values	NONE	
	* REMOTE START/STOP	Used to start & stop the system remotely
	BOOST	Used to force the lamps to 100% power when the Digital input is energised on the ATUV-1220
	RESET ALARM	Used to Reset any faults that have been rectified
	LOW POWER	Used to reduce the power of the lamps. This will only happen once the system is in running mode and the control mode delay timer has expired
	PROCESS INTERLOCK	If activated the system will respond to the Process Interlock input, stopping the system from running. If selected, please refer to PROCESS INTERLOCK MODE & PROCESS INTERLOCK ACTION for further set-up of this output.

\*DI1 is set to this input as Default

COMMS		> DIGITAL OUTPUT(S)
Description: Used to select the digital output function on DO1 or DO2		
Selectable Values	NONE	
	TEMP ALARM*	Energises when the Temperature Alarm Level is reached
	REMOTE	Energises when the system is set to run in Remote mode
	DOSE HLTH*	Energises when the measured dose is above the Alarm Level
	SYS RUN	Energises when the system is running
	SYSTEM READY	Energises when the following conditions exist: NO critical faults are present, and the re-strike timer is NOT running
	SYSTEM READY REMOTE	Energises during these conditions: NO critical faults present; the re-strike timer is NOT running and Remote IS selected.
	LAMP / BALLAST FAILURE	Energises when a Lamp Fault has been generated
	LOW DOSE ALARM*	Energises when the measured dose is above the Alarm Level
	NON-CRITICAL ALARM HEALTHY	Energises when no Non-Critical Alarms are present
	CRITICAL FAULT HEALTHY	Energises when no Critical Alarms are present
	OPEN VALVE	Energises when the system enters Running Mode (Refer to Start-up Sequence)

---

**COMMS > MODBUS SLAVE ADDRESS**

## Description:

Address used for external communications via Modbus  
(This value is usually set to "1")

Selectable 1-99  
Values

---

---

**COMMS > DHCP ENABLED**

## Description:

This is used to setup the internet connectivity: If enabled Dynamic Host Client Protocol is active and the network controller will assign the system an IP address.  
(This value is usually set to "Enabled")

Selectable \* Enabled  
Values Disabled

---

---

**COMMS > IP SETTINGS**

## Description:

This is used to display the internet connectivity settings.

Selectable	IP Address	xxx:xxx:xxx:xxx
Values	Subnet Mask	xxx:xxx:xxx:xxx
	Default Gateway	xxx:xxx:xxx:xxx

---

---

**COMMS > DNS**

## Description:

This is used to setup the internet connectivity: If set to 0 then the Gateway DNS Server will be used, this is the normal setting.

Selectable xxx:xxx:xxx:xxx  
Values

---

## Process Interlock

### P. INTERLOCK > PROCESS INTERLOCK MODE

**Description:**

Set whether process interlock function is activated.

If activated the system will respond to the process interlock input.

\* DISABLED

Selectable  
Values

RUNNING

Process interlock feedback will only be required when the system has entered running mode

FULL

System must see interlock feedback before starting

### P. INTERLOCK > PROCESS INTERLOCK ACTION

**Description:**

Defines the action to be taken if the process interlock signal is removed.

Selectable  
Values

INTERRUPT

This will temporarily stop the system until the signal is regained. (Note: The re-strike timer must also have expired in order for the system to restart)

SHUT DOWN

This will stop the system until the signal is regained and is manually restarted using the SPECTRA control interface.

### P. INTERLOCK > PROCESS INTERLOCK DELAY

**Description:**

Set the time the PROCESS INTERLOCK input (DI8) must be broken before the interlock action is generated

Selectable  
Values

0 – 180

Seconds

## UVT

### UVT > UVT SOURCE

**Description:**

Used to select which UVT valve is used from which source.

	Disabled	
Selectable	Comms	UVT valve via Comms
Values	Analogue	4-20mA meter input via AI1
	Static	Fixed valve

### UVT > FIXED UVT

**Description:**

Used to select the fixed UVT valve.

Selectable	0-100	%
Values		

### UVT > UVT METER MAX

**Description:**

Used to convert the UVT meter input (in mA) to the actual UVT. The UVT meter reading at 20mA should be entered.

Selectable	0-100	%
Values		



## Miscellaneous

### MISC. > AUTO RESTART

#### Description:

Defines whether the system will attempt to restart after a power failure when the lamp/s were running. If a power failure does occur while the system was running, it will generate a POWER LOSS WHEN RUNNING alarm. This value is usually set to DISABLED.

Selectable \* DISABLED  
Values ENABLED

### MISC. > CHANGE PASSWORD?

#### Description:

Change the operator user password. This value is usually set to "atg".

A-Z Use the up and down arrows to select the required letter, press enter to accept and move on to the next letter.

### MISC. > SET TIME

#### Description:

Used to set the real time clock. If the Online Data logging feature is being used, the time will automatically sync to the server clock.

Note: This can only be set when the restrike timer is not running

TIME = 24:00:00 Use the up and down arrows to select the required number, press enter to accept and move on to the next character.  
The clock is a 24-hour clock and can be altered depending on time zone.

### MISC. > SET DATE

#### Description:

Used to set the Time and Date and can be altered depending on the time zone. If the Online Data logging feature is being used, the time will automatically sync to the server date.

Note: This can only be set when the restrike timer is not running

DATE=30/12/2015 Use the up and down arrows to select the required number, press enter to accept and move on to the next character.  
The date is of the format: DD/MM/YYYY

### MISC. > LOAD DEFAULTS?

#### Description:

Resets the system to the factory defaults.

Selectable \* NO  
Values YES

### MISC. > LANGUAGE

#### Description:

Select language and default units.

\* EN (US)  
Selectable EN (UK)  
Values DE  
FR

## Integration

This section details how the Spectra control system can be integrated with other equipment on site to provide flexible and reliable operation. Field connections should be run through the gland plate at the bottom of the panel enclosure and terminated directly into the IO module(s).

### ANALOGUE INPUTS

Spectra has one Selectable Analogue Input which operates on a 4-20mA input signal (AI1).

Analogue Input	Description
UVT	<p>This option is available if there is a Transmittance meter being used. The UV Transmissivity determines how well the UVC light will penetrate the water being treated. The higher the UVT, the more effective the UVC is for the deactivation of pathogens. By connecting a 4-20mA UVT input, the Spectra is able to display the UVT of the water being treated that is being passed through the chamber.</p> <p><b>Note:</b> This reading is for information only and has no impact on the operation of the system</p>
Flow Meter	<p>Flow plays a vital role in determining the UV Dose. If the water being treated passing through the chamber varies in flow, the calculated UV Dose will also be affected. By connecting a 4-20mA flow meter, the Spectra is able to determine a more accurate UV dose reading. The <b>FLOW SOURCE</b> set to 'Analogue' and the <b>FLOW METER MAX</b> inputted on the Spectra.</p>

## DIGITAL INPUTS

Spectra has multiple selectable digital inputs available for use with volt free contacts with a signal voltage of 24 VDC. Commonly used options are described here. For the full list please see the Comms & IO section, page 53.

Digital Input	Description
Remote Start/Stop	<p>The remote Start / Stop action allows remote volt-free contacts to mimic the action of the normal front panel <b>START</b> and <b>STOP</b> pushbuttons. If the system is set to remote and the volt free contact is closed the UV system will be permitted to run and continue to run if the signal is still present. If the external signal is removed the UV lamp will be stopped (if running). The system cannot be started using the <b>START</b> pushbutton whilst in remote but can be stopped. Stopping the system locally whilst in remote will cause a critical fault (Local Stop Fault) which will need to be locally reset.</p>
Process Interlock	<p>The Process Interlock opto-isolated input enables an external device (switch, pump, etc.), to stop the running of the UV lamp/s. If the volt free contact is closed the UV system will be permitted to run.</p> <h3>Process Interlock Action</h3> <p>The Process Interlock Action describes HOW the system wants to respond when the signal has been lost:</p> <ul style="list-style-type: none"><li>• If <b>PROCESS INTERLOCK - INTERRUPT</b> has been set and the external signal is lost, the UV lamp will be stopped (if running) causing a Non-Critical Alarm to appear on the spectra (Process Interlock Interrupt) and not allowed to start again until the PI signal is regained and the restrike time has elapsed Note: if Remote is enabled, the remote signal will also have to be present for the system to re-start</li><li>• If <b>PROCESS INTERLOCK - SHUTDOWN</b> has been set and the external signal is lost, the UV lamp will be stopped (if running) causing a Critical Fault (Process Interlock Shutdown) to appear on the Spectra and not allowed to start again until the Critical Fault has been reset locally.</li></ul> <h3>Process Interlock Mode</h3> <p>The Process Interlock Mode describes WHEN the system responds to the signal loss:</p> <ul style="list-style-type: none"><li>• If the Process Interlock Mode is set to <b>NONE</b>, this function is disabled</li><li>• If the Process Interlock is set to <b>FULL</b>, the system will stop the UV lamp/s from running if the system is in start-up or running mode</li><li>• If the Process Interlock is set to <b>RUNNING</b>, the system will only stop the UV lamp/s from running if the system is in running and ignores if the signal has been lost if the system is in start-up.</li></ul>

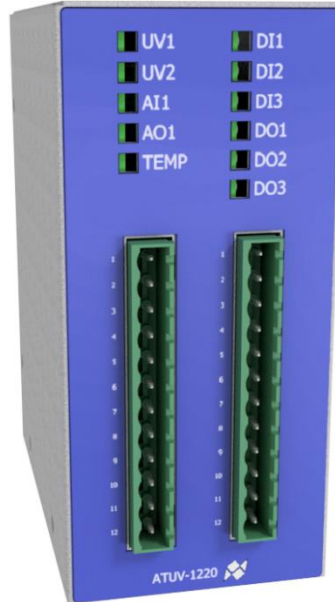
## DIGITAL OUTPUTS

Spectra has multiple selectable digital outputs available for use. These are volt free contacts and are suitable for 250 VAC 3 A maximum. Commonly used options are described here. For the full list please see the Comms & IO section, page 53.

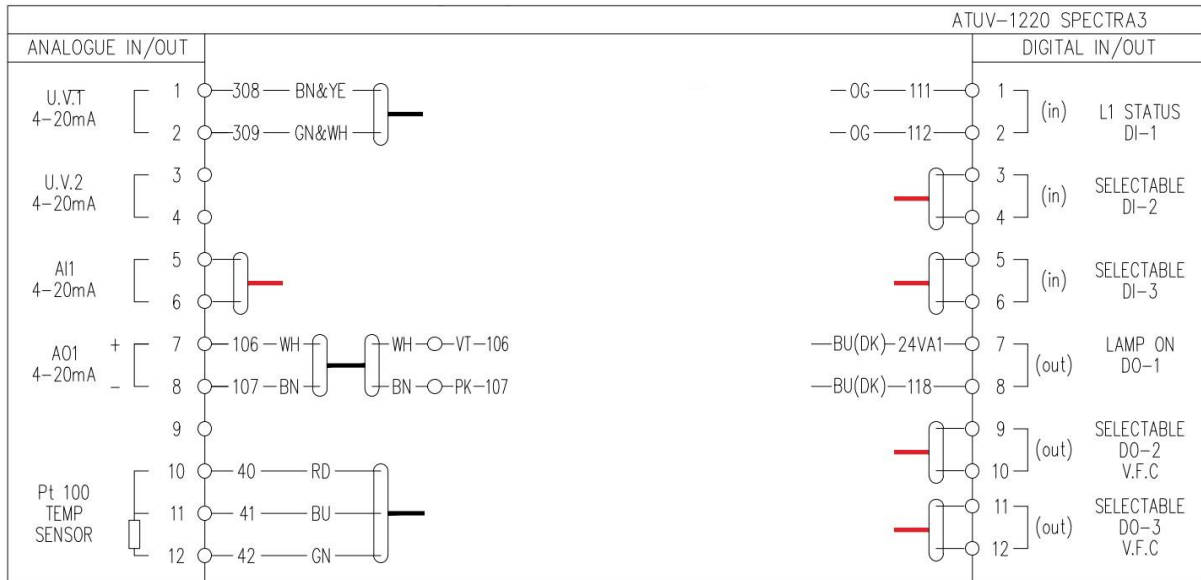
Digital Output	Description
Open Valve	Spectra can signal the opening & closing of valves if being used in conjunction with the UV system. When the system enters <b>RUNNING</b> mode, this output will energise causing the valve to open (operated by motor, air actuated, etc.), in turn causing the valve to close when the signal has been lost.
Temperature Alarm	A bleed on relay can be used in conjunction with one of the Spectra Selectable Digital Outputs. If the <b>SELECTABLE DIGITAL OUTPUT</b> is set to <b>TEMPERATURE ALARM</b> , and the chamber temperature exceeds its Alarm Set-point value, it will cause the Digital Output to energise. If connected, this will be able to signal a bleed valve to open, either allowing air trapped in the chamber to escape or to allow flow to pass through the chamber, consequently reducing the temperature without reaching the shutdown temperature ( <b>FAULT TEMP</b> ). This Digital Output will de-energise when the chamber temperature falls below the Dead-band Value (normally 5°C/F), thus closing the bleed valve.
Critical / Non-Critical Healthy	Both Digital Output signals indicate if a Critical Fault or Non-Critical Alarm has been experienced. The Digital Output energises when the Fault / Alarm has occurred.
Running	This Digital Output signal provides an indication that the system is running. This output energises as soon as the lamp/s strike or are running.
Dose Healthy	This Digital Output signal provides an indication that the Dose is Healthy and will energise when the Dose is above the <b>DOSE ALARM LEVEL</b> for <b>GOOD DOSE TIME</b> .

## I/O FIELD WIRING GUIDE

Please refer to the field wiring diagrams below for further information on how to integrate the Barrier™ Ti System control panels into the site plant room. Red wires designate possible connections available to the customer. This is shown for each of the Barrier Ti models as the IO available changes per model.



### TI-1200-4 IO MODULE 1

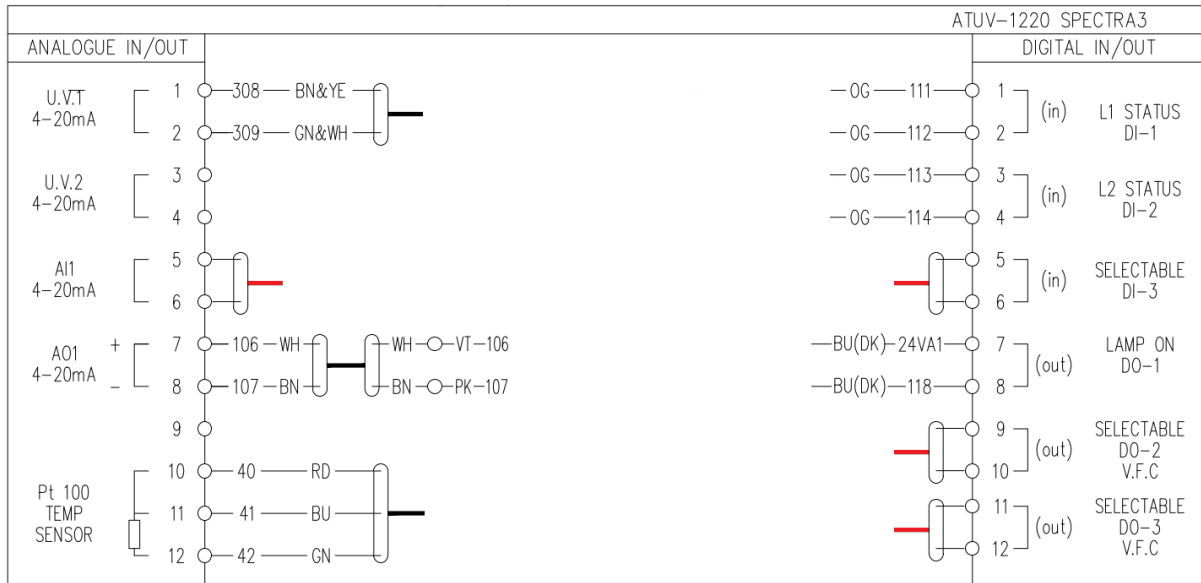


#### I/O AVAILABLE

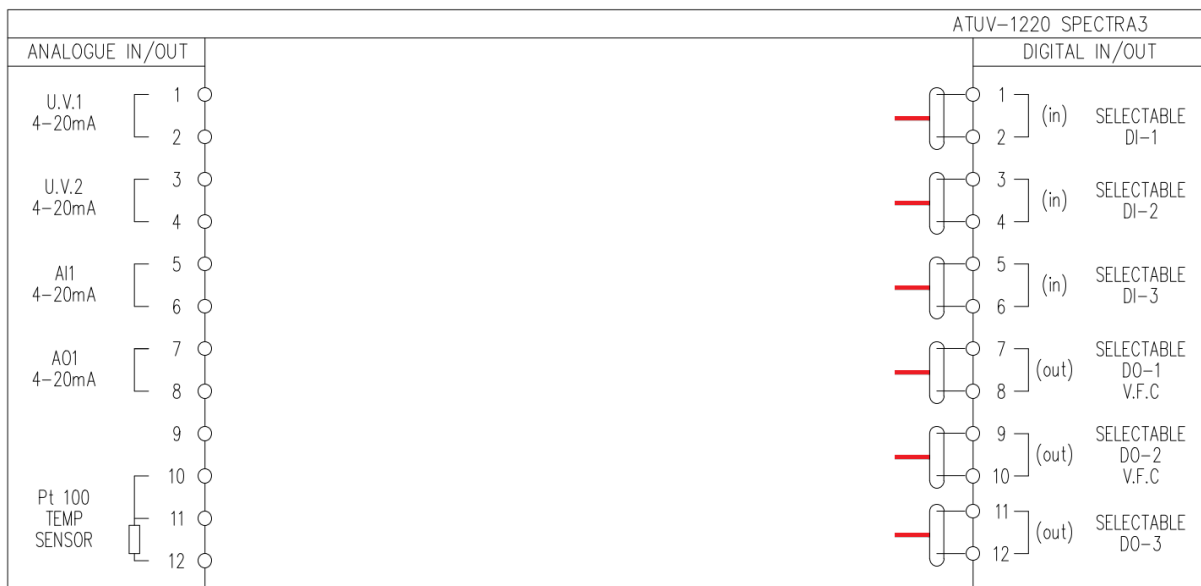
Analogue Input	1
Digital Input	2
Digital Output	2

## TI-2200-8

### IO MODULE 1



### IO MODULE 2



#### I/O AVAILABLE

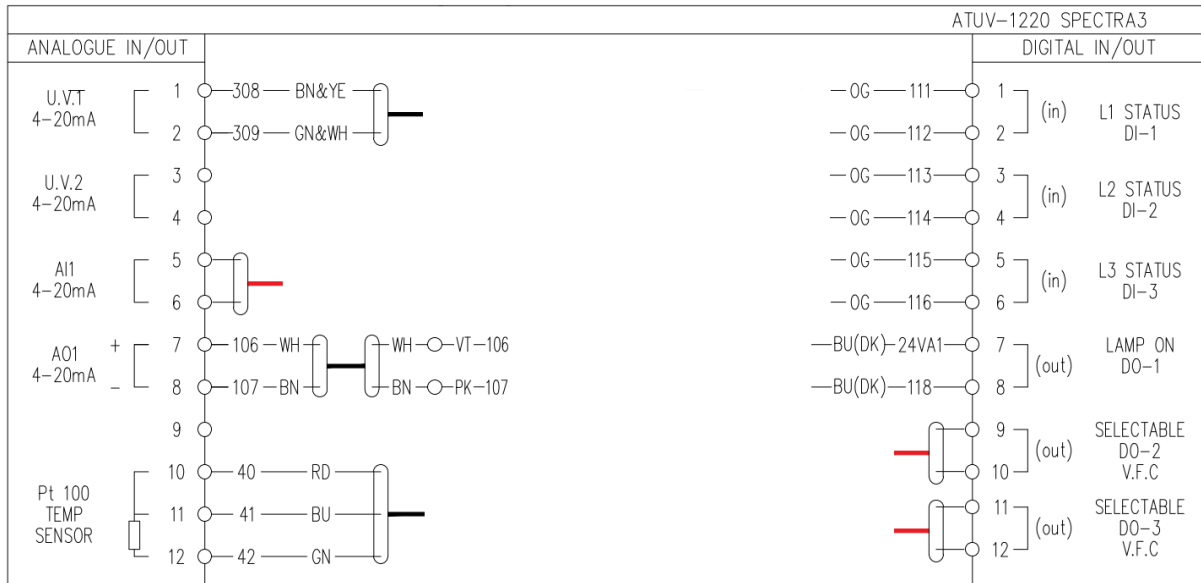
Analogue Input 1

Digital Input 4

Digital Output 5

## TI-4200-8

### IO MODULE 1



### IO MODULE 2



#### I/O AVAILABLE

Analogue Input 1

Digital Input 2

Digital Output 5

## Troubleshooting

Should a fault occur, please see below for troubleshooting guide.

**NOTE:** Should more than one fault occur, the fault screen with the highest priority will be displayed. Pressing DOWN on the keypad accesses the lower priority screens. Once the cause of the alarm or fault has been rectified, pressing the reset button on the front membrane will reset the alarm.

### *System does not operate*

<b>Message</b>	
<i>No Message</i>	
<b>Possible Cause</b>	<b>Possible Solutions</b>
Mains Supply if OFF	Ensure there is power to the system
Incorrect Supply Voltage	Ensure the correct voltage is being supplied to the system
Faulty 24VDC Power supply	Ensure the 24VDC power supply LED is energized (healthy), and 24VDC +/- 1V is being measured from the output

### *No CRC Was Found*

<b>Message</b>	
<i>No Kernel CRC Found</i>	
<b>Reasons</b>	<b>Possible Solutions</b>
SD card not inserted upon power on	Ensure the SD card is inserted correctly
The Spectra2.afx.S19 file is missing from the SD card	Ensure the Spectra2.afx. file is located in the root of the SD card

### *Lamp Fault*

<b>Message</b>		
<i>Lamp Fault</i>		
<b>Reasons</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
Lamp did not strike upon start-up  Or  Lamp extinguished while running	Faulty UV lamp	Check for visible damage to UV lamp (e.g. cracks in lamp)
	Faulty Connection	Check for visible damage to lamp cables and connections, or incorrect wiring
	Lamp On Relay is not energising	Ensure DO1 energises on the ATUV-1220 when starting the system
	Inconsistent power supplied to the system	Check the power to the system is not experiencing any voltage dips.
	Other large equipment is starting	If other large equipment is starting (e.g. pump) when the UV system is starting, the voltage across the UV lamp may dip long enough (milli-seconds) for the arc to decay.



<b>Message</b>		
<i>Low Dose Alarm Or Low Dose Fault</i>		
<b>Reason</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
<b>Dose Drops below Alarm Level/Fault Set-points</b>	Fouling/deposits blocking UV light to the Sensor	<p>Check the Quartz window for deposits on the inside or outside. Any coating can reduce the amount of UV light passing through to the UV Sensor.</p> <p>Check for fingerprints on both the Quartz &amp; UV Lamp. If the Quartz &amp; UV Lamp are handled without gloves, the grease/fatty deposits from the skin can etch themselves onto the surfaces once the lamp is struck.</p>
	UVT of the water has decreased	Ensure water quality is within specification for the UV system installed
	Aging of the Lamp	Check the UV Lamp run time and replace lamp if necessary. UV Intensity decreases as the lamp ages.
	An increase in flow (if flow meter is fitted)	Check the Flow Rate flowing through the system. If a flow meter is enabled, an increase in flow will decrease the Dose. Also check the FLOW METER MAX variable is not set higher than the maximum flow the chamber will experience.
	Dose Alarm/Fault levels are set too high	Check that DOSE ALARM LEVEL and DOSE FAULT LEVEL are set to the correct values.
	UV Probe is not properly connected	Check there is a sensible value displayed on the screen. With the system stopped 4mA should be displayed. The UV1 LED on the ATUV-1220 should also be illuminated (indicating a healthy signal)
	As the wiper (if fitted) sweeps across the quartz, the UV intensity reading may dip	Check the LOW DOSE TIME value is correct. Carry out a sweep of the quartz to see if it affects the Dose long enough to generate a fault/alarm.
	Air trapped between the sensor and lamp/s	Ensure any air trapped in the chamber is remove as air trapped within the system will not allow UV Light to pass through correctly.
Possibility of a Faulty probe	Check for visible damage to the probe & probe cable	

### Control Panel Over-Temperature

Message		
<i>Control Panel Over Temperature</i>		
Reason	Possible Cause	Possible Solutions
The temperature inside panel has exceeded the thermostat cut-out temperature	No air circulation inside panel	Ensure fan filter is not blocked
	Faulty Fan	Check Fan rotates when DO1 on the ATUV-1220 is energised. Check for any loose or damaged connections
	High ambient temperature	Ensure the ambient temperature is not higher than allowed operating temperature

### Chamber Over-Temperature

Message		
<i>Chamber Over-Temperature Alarm Or Chamber Over-Temperature Fault</i>		
Reason	Possible Causes	Possible Solutions
Chamber temperature reading has exceeded temperature Alarm set-point	Very slow or static flow through chamber	Check Fluid is flowing through the system at a reasonable flow. Check Manual/Auto Valves are Open
	Temperature Fault / Alarm levels set too low for application	Check the initial temperature of fluid flowing through the system Check the Fault/Alarm Set-Points are set to the correct/reasonable value
Or Chamber temperature reading has exceeded temperature Fault set-point	Faulty Connection	Check for visible damage to the temperature probe & probe cable. Check the resistance across the red/blue and green wires to the temperature sensor (see below for resistance values). Check there is a sensible value displayed on the screen and the TEMP LED on the ATUV-1220 is illuminated (indicating a closed signal)

### Power Loss While Running

Message	
<i>Power Loss While Running</i>	
Reason	Possible Solutions
The system was running upon power failure or was turned off.	Check for power failure to the UV System Check the power supply for any dips/surges in voltage

### Lamp Approaching End of Life

Message	
Lamp Approaching End of Life	
Reason	Possible Solutions
The lamp life timer has exceeded the recommended run hours	The system has a timer that counts how long the lamp has been running. Once this time is exceeded the UV Lamp should be changed & the Lamp Run hours reset.

### Resetting Lamp hours

To Reset the Lamp hours after a Lamp change:

Enter the Operator Menus (Refer to the Set-up Screen Menus – Operator Menus) and scroll down to the LAMP MENU screen and press enter.

- To **Reset hours on all Lamps**, select **RESET ALL LAMPS** by pressing enter on the menu and confirm with Yes.
- To **Reset Individual Lamp hours**, select **RESET INDIVIDUAL LAMP HOURS** and **RESET LAMP # HOURS** will appear. Scroll up/down to select the desired Lamp and press enter to select Yes to reset the hours for that particular lamp.

### Local Stop Fault

Message	
Local Stop Fault	
Reason	Possible Solutions
System has been stopped from the Spectra HMI while in remote	If the system is running in remote, pressing the Stop button on the Spectra will still stop the system creating a Fatal Fault. This cannot be reset over the Modbus communications network. Pressing the Reset button on the Spectra will restart the system if the remote run signal is still present & the re-strike timer has elapsed.

### Process Interlock

Message	
Process Interlock Interrupt or Process Interlock Shutdown	
Reason	Possible Solutions
Process Interlock signal has been lost while running/start-up	Check signal from the Process Interlock device. e.g. Pump is running – Flow Switch has operated etc. Check the DI on the ATUV-1220 is on when the signal from the Process Interlock is active Check Process Interlock Delay time is set to an appropriate time. Check for visible damage to signal cables

### *I/O Communications Watchdog*

<b>Message</b>	
<i>I/O Module Watchdog Error</i>	
<b>Reason</b>	<b>Possible Solutions</b>
Communication to the ATUV-1220 has been lost	Check ethernet connections from the spectra to the ATUV-1220 and the LED AO1 is illuminated Ensure there is power to the module.

### *I/O Modules Less Than Expected*

<b>Message</b>	
<i>I/O Modules Less Than Expected</i>	
<b>Reason</b>	<b>Possible Solutions</b>
The Number of I/O's enabled on the spectra has does not the actual amount of lamps modules required	Check the ATUV-1220 address' correspond to the Number of I/O's enabled on the Spectra (Please refer to the Spectra Operations & Maintenance manual for details) Check Ethernet connections between Spectra & ATUV-1220

### *Flow Meter Out of Range*

<b>Message</b>		
<i>Flow Meter Out of Range</i>		
<b>Reason</b>	<b>Possible Causes</b>	<b>Possible Solutions</b>
The flow meter input (AI1 on the ATUV-1220) is outside the 4mA and 20mA tolerances	Faulty signal	Ensure the signal from the device to the Spectra is within 4 & 20 mA.
	Faulty connection	Check all cable connections and ensure AI1 LED is illuminated indicating a signal above 3.5 mA.

## GENERAL PRODUCT WARRANTY FOR UV SYSTEMS

Thank you for purchasing a quality Evoqua Water Technologies product. For optimum and efficient operation, it is important that your Evoqua equipment is regularly maintained and serviced as described in your Operation and Maintenance Manual. We offer you two levels of warranty:

### **STANDARD WARRANTY:**

Evoqua products carry a manufacturer's warranty against defects in materials (excluding consumables) and/or workmanship whilst owned by the "Original Purchaser" and is restricted to "Original Intended Use" as defined below, for a minimum period of 12 months from date of commissioning or 18 months from date of shipment, whichever is sooner.

### **5 YEAR WARRANTY:**

Evoqua products carry a manufacturer's 5 year extended warranty against defects in materials (excluding consumables) and/or workmanship whilst owned by the "Original Purchaser" and is restricted to "Original Intended Use" as defined below, providing the units are registered with us upon commissioning. The extended warranty is valid for 5 years (60 months) from commissioning or 5 ½ years (66 months) from date of shipment, whichever is sooner and is subject to correct storage. This warranty shall be valid only on units maintained to the manufacturer's schedules, with genuine manufacturer's parts for a period of five (5) years from registration upon commissioning, by an accredited Evoqua service engineer and/or Evoqua approved service provider, details of which can be provided upon request by Evoqua and/or its representative agents.

"Original Purchaser" is defined as that party or entity which purchases Evoqua products from Evoqua, or an authorized Evoqua agent/dealer as shown by the original sales receipt/invoice. This warranty does not apply to previously owned Evoqua products, and is specific to the particular product sold, as identified by product serial number and original invoice. The warranty can be transferred subject to re-commissioning being carried out by the manufacturer and any alterations/design changes/repairs being completed before re-instatement.

"Original Intended use" is defined below as the application, industry type, and specified location the Evoqua product was originally designed for, using information provided by you, the customer, during the quotation phase and verified upon commissioning.

### **EXCEPTION AND/OR EXCLUSIONS:**

This warranty shall not apply to the Evoqua products which have been subjected to misuse, neglect, alteration, modification, attachments or incorrect maintenance, either caused by the original purchaser, shipping, storage, fire, flood, vandalism, change in application, acts of God and any other unforeseen circumstance out of the control of Evoqua.

**For further support please contact your local authorised service provider, or contact our head office in your region:**

**To arrange a service or commission:**

**North America**

E: [ets-uv.service@xylem.com](mailto:ets-uv.service@xylem.com)

T: (1) 877-885-4628

**Rest of World**

E: [customerservice.uk@xylem.com](mailto:customerservice.uk@xylem.com)

T: 0300 124 0500

**For genuine spare parts:**

**North America**

E: [ets-uv.service@xylem.com](mailto:ets-uv.service@xylem.com)

T: (1) 877-885-4628

**Rest of World**

E: [sparesdisinfection.uk@xylem.com](mailto:sparesdisinfection.uk@xylem.com)

T: 0300 124 0500

**For any other queries:**

**North America**

E: [ets-uv.service@xylem.com](mailto:ets-uv.service@xylem.com)

T: (1) 877-885-4628

**Rest of World**

E: [info.uk@xylem.com](mailto:info.uk@xylem.com)

T: 0300 124 0500

