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Part No. 120 REV J 04/12

This manual covers the servicing and general maintenance requirements for Aquafine Ultraviolet Water Treatment equipment.

DISINFECTION • TOC REDUCTION • OZONE DESTRUCTION • CHLORINE/CHLORAMINE DESTRUCTION



Optima HX Series
Installation & Operation Manual

⚠ CAUTION

It is imperative that those responsible for the installation of this equipment, as well as operating personnel, read this manual and carefully follow all instructions and guidelines. **EQUIPMENT OPERATORS AND INSTALLERS MUST COMPLY WITH OPERATIONAL SAFETY REQUIREMENTS.**

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PURPOSE & SCOPE

The purpose of this manual is to provide instructions for the operation of the Optima HX Series, a UV water treatment system and intended for personnel that have a working knowledge of servicing electrical and mechanical equipment.

WARNING

- Remove all electrical power to the unit before servicing the unit. The electrical panel is an electrical hazard. Death can result if the proper safety precaution are not obeyed. All electrical power to the equipment, including power from the signal and control systems must be completely isolated.
- Never service the system under pressure. The treatment chamber must be valved off from the water source, the pressure released, and then the system drained.
- Never look at UV lamps! The lamps produce harmful radiation and will damage the eyes and skin. Always use protective gear.



FIG. A OPTIMA HX 04CDL WITH UV MONITORING SYSTEM



DESCRIPTION

THE OPTIMA HX SERIES

The Optima HX product line is designed to offer the latest in low pressure UV technology over a wide range of application flow rates. It includes the critical quality and performance features that have made Aquafine the standard in UV water treatment.

The most basic differentiation within the HX product line is the designation "HX" or "HX-U". "HX" units come with the cylinder and electrical enclosure mechanically attached together. "HX-U" units have a remote enclosure that is suitable for wall mounting. Beyond this distinction, the HX product line is offered with a variety of configurations and options to suit your particular needs.

KEY FEATURES

- All wetted components made from 316L SS
- UV & Temperature Monitoring System
- 150psig (10.34bar) rated treatment chamber
- Designed with state-of-the-art Multiple Point Source Summation (MPSS) and Computational Fluid Dynamics (CFD) mathematical models
- Lamp Status Indicator
- Running Time Meter

UNIT DESCRIPTION

Elements to identify the Optima HX Series are:

1. Socket Cover
2. Quartz Sleeves & Lamps - *located inside*
3. Treatment Chamber
4. Control Cabinet
5. Sample Port - *optional*
6. Drain Port
7. End plate



FIG. A OPTIMA HX SERIES UNIT IDENTIFIED ELEMENTS

SOCKET COVERS

The socket cover on the end of the treatment chamber provides protection of the lamp socket assemblies.

TREATMENT CHAMBER

The UV treatment chamber is manufactured from 316L stainless steel. O-rings, or gasket end plates are located on both ends (except A & B style units), which contain the stainless steel nipples and lamp socket retainer assemblies.

SAMPLE PORTS

Two optional ports are available for obtaining water samples pre and post UV chamber. Sanitary sampling valves should be installed on the ports.

DRAIN PORT

The treatment chamber is provided with a drain port to drain the cylinder completely. A drain valve should be installed on the port.

END PLATE

Treatment chambers greater than 4" inches in diameter are provided with 2 removal end plate assemblies. The end plates are installed with sealing gaskets/O-rings, located between the socket cover and the end plate.



DESCRIPTION

QUARTZ SLEEVES & LAMPS

The quartz sleeves and lamps fit inside the UV chamber. The lamp sockets connect to the lamps, creating a water resistant seal and a vibration proof grip. The socket cover on either end of the chamber protects the lamp socket assemblies from the environment. The Single-ended (SE) lamp assembly is depicted below.

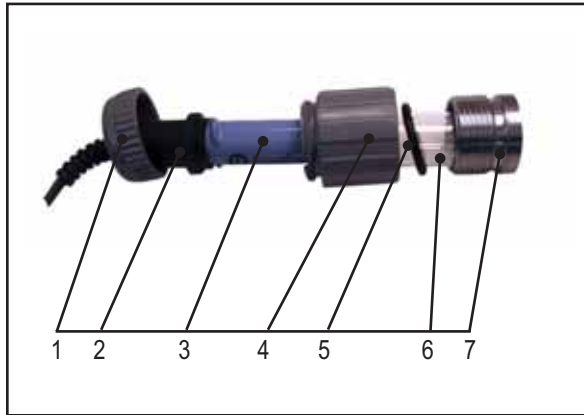


FIG. B SE LAMP SOCKET ASSEMBLY IDENTIFIED ELEMENTS

Elements to identify the Lamp Socket Assembly are:

1. SE Lamp Cap
2. SE Lamp Socket
3. UV Lamp
4. Compression Nut
5. O-ring
6. Quartz Sleeve
7. End Plate Nipple

STANDARD CONTROL PANEL

The control panel contains the ballast(s) and controller for the unit. Different electrical configurations are available. The UV G400 controller is shown below in a carbon steel cabinet, both optional in the Optima HX series.

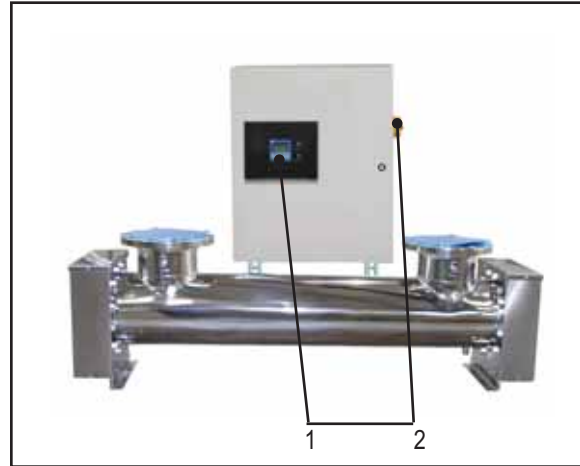


FIG. C CARBON STEEL CABINET WITH UV-G400

Elements to identify the Control Panel are:

1. UV G400 controller (or standard UV & Temperature Monitoring System)
2. Main Power Switch - *isolates all electrical power to unit*

INSTALLATION GUIDELINES

The following are the guidelines and procedures for installing the Optima HX and HX - U Series.

LOCATION

- A. Install the UV treatment unit in a horizontal position in a sheltered, well ventilated area. Ambient temperatures surrounding the unit should be between 35° (2°C) and 110°F (43°C).
- B. Operating water temperature should be between 40°F (4°C) to 80°F (27°C).
- C. Protect the equipment from the environment. Do not expose the equipment to direct water spray.
- D. As an ultraviolet UV treatment unit does not introduce any chemical residue within the water, it is desirable to install the unit as close as possible to the point-of-use in order to avoid potential recontamination by discharge pipes, fitting, etc.
- E. The base of the UV treatment unit should be mounted on suitable support to avoid undue strain on the unit or related pipes and fittings.
- F. Allow sufficient service access clearance, at least 72" (183cm) of clearance on the lamp-changing end of the unit. At the opposite end, there should be a minimum of 24" (61cm) of clearance for maintenance. *Refer to mechanical drawings.* Clearance for servicing the electrical cabinet should be allowed.

ELECTRICAL POWER

- A. The power requirements for each unit depends on the number and type of lamps used in the treatment chamber. The overall power consumption of each unit is indicated on the equipment nameplate decal on the unit. The unit's circuit breaker, or main fuse, provides primary over-current protection. *Refer to wiring diagram.*
- B. UV Performance is line voltage sensitive. Line voltage should be $\pm 5\%$ of rating shown on the electrical nameplate decal. Voltage outside these limits will affect the performance of the UV equipment.
- C. Control wiring should reference the appropriate wiring diagram. Control wiring is based upon customer requirements and installed options.

Should your requirements differ, please contact your local Aquafine representative or Aquafine Customer Service.

- D. During service and maintenance, the electrical power must be removed.

PLUMBING

- A. Limit overhead piping load to 25lbs (11.3kg), for 2" & 3", 50lbs (23kg), for 4" and 75lbs (34kg), for 6" or above. Additional bracing and supports should be installed on any additional piping and valves in order to reduce the stress on the treatment chamber Inlet/Outlet nozzles.
- B. Verify the location is free from vibration, which could be caused by proximity to heavy equipment and the erratic or improper pumps. Excessive vibration will damage internal electrical components and cause premature failure of the UV lamps.
- C. Each unit has been designed with a 1/2" drain connection. Install a drain valve and pipe to drain.
- D. Install sample port valves, if equipped.
- E. If your piping system is subject to impulse pressure resulting in a "water hammer" condition, a surge tank or other means must be provided to remove this condition; otherwise the extreme momentary pressure may rupture and fracture the quartz sleeves.
- F. All units are rated for a maximum operating pressure of 150psig (10.3bar).
- G. Ultra pure water users have reported that over time, exposure to ultraviolet light may photochemically degrade nonmetallic piping materials, including most or all fluoro-polymers, resulting in a material breakdown and/or structural failure. Should your water application and piping material be so classified, we recommend that you install "UV light traps" to isolate any susceptible material from direct exposure to the ultraviolet light. Install the UV light trap to the inlet/outlet of the UV treatment chamber prior to the connection of any non-metallic piping.
- H. Provide isolation valves on the inlet and outlet nozzles.



NOTE: *It is imperative that the unit be properly grounded for safe and proper operation. FAILURE TO PROPERLY GROUND THE UV TREATMENT UNIT AUTOMATICALLY VOIDS ALL EQUIPMENT WARRANTY.*



INSTALLATION

Isolation valves will allow safe maintenance of the equipment.

- I. After installation of quartz sleeves, always pressure test the system prior to installation of the UV lamps and applying electrical power. During pressure testing, DO NOT stand in direct line with quartz sleeves.
- J. Before start-up, flush the UV unit and discharge piping to rinse out debris left from installation.
- K. The UV chamber should be filled with water.



INSTALLATION

DE QUARTZ SLEEVE INSTALLATION

The following are the guidelines and procedures for units with double-ended quartz sleeves.

1. Remove all power to the UV unit. Depressurize the system and isolate all piping.
2. Wear clean cotton gloves to prevent contamination of the quartz sleeves.
3. Carefully remove each quartz sleeve from the factory packaging. *Handle these with care, as they are fragile.*
4. Visually inspect all quartz sleeve for cracks or damage. Do not install damaged quartz sleeves.
5. Remove the socket covers on the ends of the treatment chamber. *See Fig A*
6. Place the end of the quartz sleeve into the threaded nipple and slowly push the sleeve into the chamber through the second endplate. Repeat for all quartz sleeves.
7. Install the compression nut and O-ring by placing the O-ring into the internal relief of the compression nut below the threaded are. The O-ring should fit into the compression nut. *See Fig B*
8. Place the compression nut and O-ring onto the end of the quartz sleeve until the end of the quartz sleeve touches the end of the compression nut. Some pushing and twisting may be required. Deionized water may be used as a lubricant. *See Fig C*
9. Tighten the compression nut approximately 1/2 turn after the threaded nipple and O-ring make contact. Repeat this procedure for the second endplate.
10. Slowly pressurize the system and fill the chamber with water to check for leaks. If there are leaks in any compression nut assembly, depressurize the system and use the compression nut tool to slightly tighten the leaking compression nut assembly.
11. Retest until a leak-free installation is verified.
12. You are now ready to install the UV lamps.

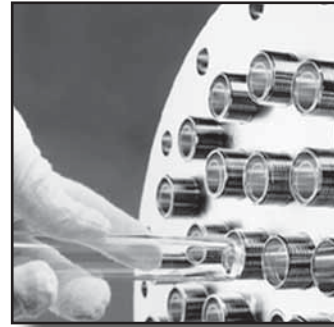


FIG. A QUARTZ SLEEVE INSTALLATION

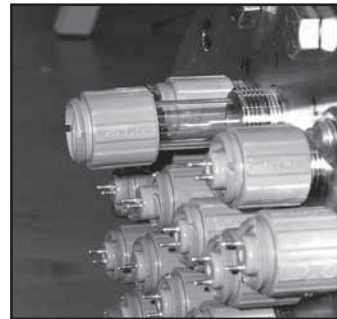


FIG. B COMPRESSION NUT ASSEMBLY

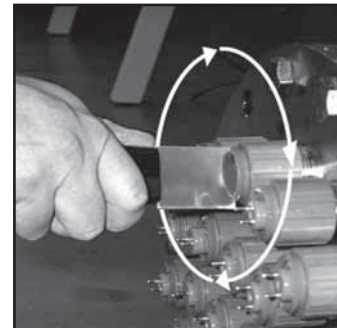


FIG. C COMPRESSION NUT TOOL



INSTALLATION

SE UV LAMP INSTALLATION

The following procedures are for units manufactured with Single-ended (SE) lamp design. Once it has been verified that there are no leaks in the system, the unit is ready for UV lamp installation.

1. Remove all power to the UV unit. Depressurize the system.
2. Wear clean cotton gloves to prevent contamination of the UV lamps.
3. Carefully remove each UV lamp from the factory packaging. *Handle these with care, as they are fragile.*
4. Visually inspect all lamps for cracks or damage. Do not install damaged lamps.
5. Using both hands, *slowly* insert the lamp into the quartz sleeve by pushing one end of the lamp with one hand, while continuing to support the lamp in a level horizontal position with the other. *This is very important; if not installed properly, lamp or quartz sleeve breakage will occur.*
6. Twist the lamp into the locking mechanism of the compression nut. This ensures that the lamp is secure within the quartz sleeve. *See Fig A*
7. Each lamp socket is identified number label that corresponds to each lamp position. Match the lamp socket and connect to the appropriate lamp. *See Fig B*
8. The pins in the lamp must be pushed down to fit securely into the lamp socket connector.
9. Rotate and screw the lamps socket cap into place. Only hand tightening is required. **DO NOT OVERTIGHTEN!** *See Fig C*
10. Install the compression nuts and caps on the second endplate and tighten by hand.



FIG. A INSERT LAMP INTO QUARTZ SLEEVE



FIG. B IDENTIFIED LAMP SOCKET NUMBER



FIG. C SCREW RETAINER CAP ONTO COMP. NUT

CAUTION

NOTE: *Prior to energizing the lamps and ballasts, ensure there is no leaking water into the quartz sleeves and comp. nut cavity. High voltage is present at the lamp pins and receptacles of the lamp connectors during operation. Prolonged flooding of a quartz sleeve and comp. nut cavity can cause premature lamp failure due to repeated arcing, overheating of the lamp connector cable and may result in a meltdown of the cable insulation.*



OPERATIONAL GUIDELINES

1. Release the pressure in the UV treatment chamber before attempting to remove the protective covers and sealing items.
2. Disconnect all power to the UV unit before servicing. The unit operates on high voltage and *should only be serviced by qualified personnel*.
3. Do not allow the unit to overheat by operating without water flow. Standard flow rates are based on water temperatures of 40°F (4.4°C) to 80°F (26.7°C). For applications outside these temperatures, *contact customer service for assistance*.
4. Intermittent operation is allowed as long as the water temperature does not exceed 80°F (26.7°C); optional devices are available to prevent this problem. Should the unit be used for batch flow operations, it can be turned “ON” and “OFF” manually. Make sure the unit is allowed to warm up for at least 3 minutes before use, and make sure the unit is turned “OFF” after each session.
5. Do not allow the flow to exceed the maximum rated capacity.
6. DO NOT electrically cycle the unit more than 3 “ON/OFF” cycles in a 24 hour period. Cycling more than this will reduce End-of-Life output and/or premature lamp failure.



NOTE: DO NOT look at lighted UV lamps. DO NOT operate the UV lamps outside of the UV treatment chamber. **EXPOSURE CAN SEVERELY BURN AND DAMAGE EYES AND SKIN!**

POWERING UP

Prior to turning on the UV unit, the following must be verified:

- A. The UV chamber should be filled with water. The flow of water for the initial filling should not exceed 50 GPM. Failure to comply may result in quartz sleeve breakage. Ensure there are no system leaks and no piping connection leaks.
- B. All earth ground connections are properly made.
- C. All lamp connections are properly made.
- D. The socket cover is secured to the end of the UV treatment unit.
- E. All excess air has been removed from the chamber.
- F. Verify that all incoming power conductors, including the ground conductor, are properly terminated.
- G. Verify that the primary over-current protection device, molded case circuit breaker (MCCB) is in the closed position.
- H. Turn the main power disconnect switch to the “ON” position. The enclosure fans, UV Vision-2000 display screens and the ballasts will be energized.
- I. Using a digital multi-meter (DMM), verify that the correct voltages are present at terminal block TB-IN and terminal No.1L on the isolator switch and/or between TB-3HI and TB-4NI. Measure the voltages for L-N.
- J. For local ON/OFF control, push the START/STOP button of the UVG400 controller. To turn the individual treatment chamber “ON” and “OFF” manually, LOCAL option of the “operator control options” should be selected. *Refer to Controller section of this manual.*
- K. For remote ON/OFF control, set the UV G400 controller to REMOTE mode. For remote operation of the unit, the enclosure is provided with an isolation relay. This HOA relay is controlled by a customer-supplied voltage source (24V DC maintained) which is to be wired to a connection point within the enclosure. Opening or closing the 24V DC will energize and de-energize the HOA relay and the individual treatment chamber will be turned ON/OFF accordingly.
- L. When the ballasts are energized and all the lamps are turned “ON”, a green “SYSTEM ON” indicator light underneath the UV G400 controller display will illuminate. If one or more lamps are not operating, a red “SYSTEM FAULT” indicator light will illuminate.





UV & TEMP MONIT. SYSTEM DESCRIPTION

UV & TEMPERATURE MONITORING SYSTEM

The UV & Temperature Monitoring System is a measuring and indicating device to be used with Aquafine products for the measurement and fault indications of UV intensity and temperature communicated from the detector. Remote kits are available for all models and retrofit kits are available for Aqualogic, RBE and the CSL series.

The UV & Temperature Monitoring System consists of 3 main components, the Monitoring Station, the Detector and the cable with the connector.

KEY FEATURES

- Optional NIST traceable UV Detector calibration with certificate.
- Withstands non-operating temperatures of 250°F (121°C) for steam sterilization at a maximum pressure of 100psi (6.9bar)
- Irradiance and percent readout options.

MONITORING STATION

The Monitoring Station has been designed to operate in industrial environments. As a standard, the system is installed in a UV system control cabinet to protect from water and dust. If used remotely, it must be installed in a properly sealed container to prevent the electronics from being exposed to adverse conditions such as water and dust.

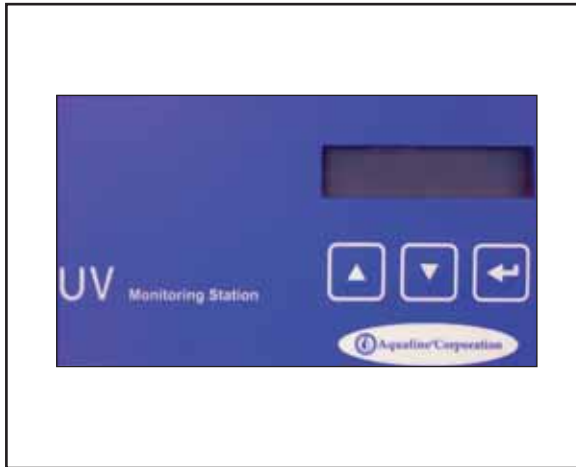


FIG. A UV MONITORING STATION FACEPLATE

The customer interface terminals are located on the back of the Monitoring Station faceplate. The elements to identify are: See Fig. B.

1. Analog OUT (4 terminals)
2. Detector IN (6 terminals)
3. Low UV Alarm Relay (6 terminals)
4. High Temp Alarm (6 terminals)
5. Input Power (3 terminals)

NOTE: Terminal definitions are described on the rear of the terminals.

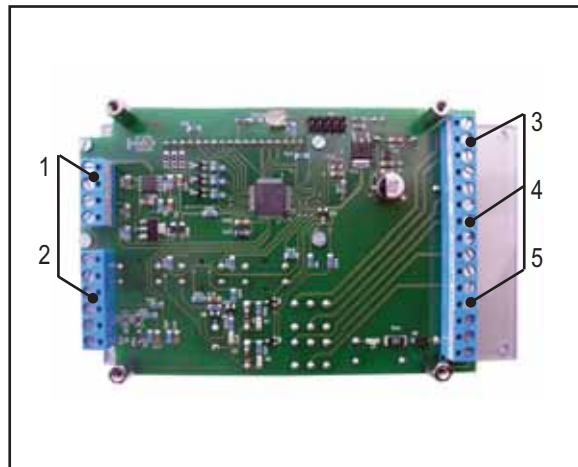


FIG. B UV MONITORING STATION, BACKSIDE

UV DETECTOR

The NIST (optional) calibrated UV Detector is packaged together with the cable in the same box. When opening the box, please note that the Certificate of Calibration is included with each unit. This certificate indicates the serial number of the Detector and provides information on the expiration date of the unit. Keep the certificate in a safe place.

The NIST-traceable calibration is good 12 months after the Detector is installed. Aquafine Corporation recommends sending the Detector back for recalibration before the expiration date is reached.

The Detector is provided with an O-ring. This O-ring is necessary to create the proper seal. Be sure that the O-ring is present when installing the Detector into the treatment chamber. See Fig. C on following page.



UV & TEMP MONIT. SYSTEM DESCRIPTION

All the Detector components are hermetically sealed in a stainless steel housing. The assembly of the unit is done under dry nitrogen gas to eliminate the presence of oxygen and water. The components of the Detector include: See Fig. C.

1. Connector
2. UV Detector Housing
3. O-ring

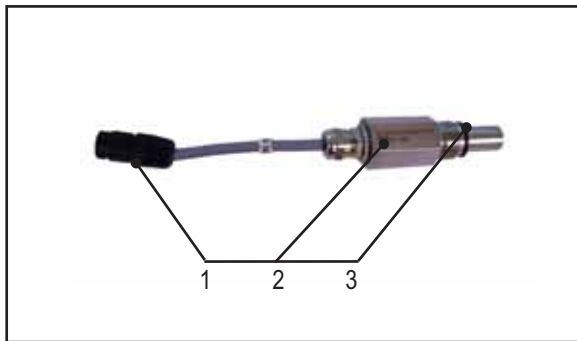


FIG. C UV DETECTOR

Install the Detector by screwing the Detector housing into the Detector port on the treatment chamber. Tighten with the appropriate wrench.

CABLE

The cable provided with the Detector is 10ft long. A 30ft cable is available as an option. On one end the cable has a IP- 65 grade connector which attached to the Detectors connector after the Detector housing has been installed.

Depending on the model of the Aquafine UV system where the detector is being installed, the length of the cable may be excessive. The cable can be cut after determining the length necessary to connect the Detector to the Monitoring Station. After cutting the cable, remove approximately 1 1/2 inches of vinyl insulator to expose braided shield. Separate the internal wires from the braided shield. Twist the braided shield to form a wire. Six insulated wires plus some non-insulated strands (shield) will be exposed. Cut the portion of the blue wire exposed (this wire is not used by the system). Strip a small portions of the remaining 5 wires and twist the bare strands together. The cable is now ready to be connected to the controller.



UV & TEMP MONIT. SYSTEM OPERATION

UV & TEMPERATURE MONITORING SYSTEM

There will be an BEEP sound as the unit is initialized. The Monitoring station is a combination UV and temperature controller. The signals from the detector are displaying the UV intensity and water temperature. Each of values may have a corresponding alarm set point.

A lighted LCD screen and three flush push buttons are on the faceplate. Buttons to identify the controller are: See Fig. A.

1. UP arrow
2. DOWN Arrow
3. ENTER - access to MAIN MENU and OPTIONS

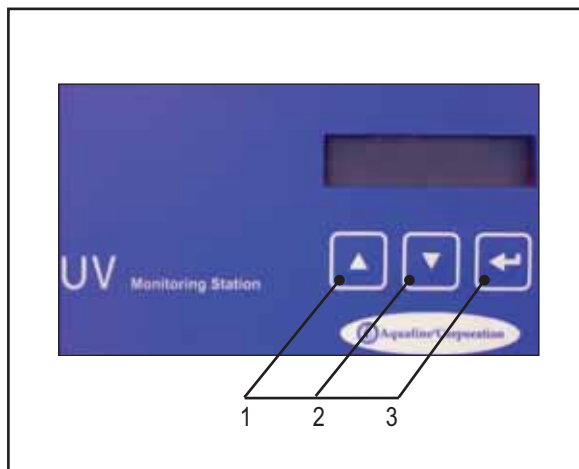


FIG. A UV MONITORING STATION FACEPLATE

Main Menu Screen

The first line of the main menu screen indicates the UV intensity in relative or absolute units. The second line indicates water temperature in °F or °C.



Alarm Display Screen

The first line of the alarm display indicates the relative UV intensity alarm set point. The second line indicates temperature alarm set point. This display is accessed by pressing the UP arrow when in the main display.



SETUP

Software set up procedure will require accessing the main menu.

MAIN MENU

This process is started by depressing the “ENTER” button, and then entering the password.

The password “1234” is entered by:

1. a) Depressing the UP arrow will cycle to each digit.
2. b) When the digit is achieved – Depress the DOWN arrow to move to the next digit position.
3. c) Repeat procedure until all four digits indicate the correct password.
4. d) Then depress ENTER.
5. e) The Display will indicate “MAIN MENU”.

ACCESSING PARAMETERS

From the “MAIN MENU” the following parameters can be accessed. To modify or change these parameters follow the steps described in “Setting Parameters”.

1. The UV intensity display, (“UV DISPLAY”)
 - A. RELATIVE – Display of relative intensity 0-100%
 - B. ABSOLUTE – Display absolute intensity 0-5000 $\mu\text{w}/\text{cm}^2$



UV & TEMP MONIT. SYSTEM OPERATION

2. The UV intensity alarm set point (“UV ALARM”)
 - A. ON (set point) – To enable UV alarm (DEFAULT)
 - B. EDIT – Select UV alarm set point 20-90%
 - C. OFF – disable UV alarm
3. Setting the UV 100% value, (“UV 100% LEVEL”)
 - A. DIRECT– Sets 100% UV (current value of absolute intensity)
 - B. EDIT – Sets 100% to entered absolute intensity value
4. The temperature display, (“TEMP DISPLAY”)
 - A. FAHRENHEIT - select temperature unit of measurement
 - B. CELSIUS - select temperature unit of measurement
 - C. OFF - disable temperature measurement
5. The temperature alarm set point, (“TEMP ALARM”)
 - A. 120°F (49°C) - set temp alarm to 120°F (DEFAULT)
 - B. 170°F (77°C) - set temp alarm to 170°F
 - C. OFF – disable temperature alarm

SETTING PARAMETERS

The following steps will specify how to set each parameter of the monitoring station. After a parameter is set, the operator will be instructed to select “RETURN” once or twice to return to the operating screen. The operating screen will have the UV intensity displayed on the first line, and the temperature displayed on the second line.

Setting UV Intensity Display (Absolute $\mu\text{w}/\text{cm}^2$ or Relative %)

1. Access “Main Menu”
2. Use the UP/DOWN arrows to scroll to “UV DISPLAY” in the sub-menu – “ENTER”
3. Use the UP/DOWN arrows to scroll to “RELATIVE” in sub menu – “ENTER” or “ABSOLUTE” as indicated – “ENTER”
4. The display will indicate “MAIN MENU” with sub

menu indicating “UV DISPLAY”

5. Use the UP/DOWN arrows to scroll to “RETURN” – “ENTER”
6. The display should be at the main operating screen indicating UV intensity and temperature

Setting UV Alarm Setpoint

The alarm point will be a number between 20-90%. The selection is typically based upon the lamp type and operating conditions. Typical alarm set point values for equipment with HX lamps are 80% and with standard lamps, 60%.

1. Access “Main Menu”
2. Use the UP/DOWN arrows to scroll to “UV ALARM” – “ENTER”
3. Use the UP/DOWN arrows to scroll to “EDIT” – “ENTER”
4. Use the UP/DOWN arrows to scroll to preferred UV alarm threshold percentage – “ENTER”
5. Verify main menu line indicates “UV ALARM” and the sub menu indicates “ON(XX %)”
6. Note the ‘XX’ indicates selected value
7. Use the UP/DOWN arrows to scroll to “RETURN” – “ENTER”
8. Then again scroll to “RETURN” – “ENTER”
9. The display should be at the main operating screen indicating UV intensity and temperature

Setting 100% UV

Typically the UV Monitoring station intensity is set to 100% UV when new lamps and quartz sleeves have been installed and the system is operating under “normal operating conditions” (flow, temperature and water quality).

1. Use the UP/DOWN arrows to scroll to UV 100% LEVEL” is indicated in the sub menu – “ENTER”
2. The main menu will indicate “UV LEVEL”
3. Use the UP/DOWN arrows to scroll to “DIRECT” in the sub menu – “ENTER”



UV & TEMP MONIT. SYSTEM OPERATION

4. The main menu will indicate "UV LEVEL", the sub menu will display an actual UV intensity value – "ENTER"
5. The "MAIN MENU" will be displayed, with sub menu displaying "UV 100% LEVEL"
6. Use the UP/DOWN arrows to scroll to "RETURN" – "ENTER"
7. The display should be at the main operating screen indicating UV intensity and temperature
6. Then again scroll to "RETURN" – "ENTER"
7. The display should be at the main operating screen indicating UV intensity and temperature

Setting Temp. Units (°F or °C)

1. Access "Main Menu"
2. Use the UP/DOWN arrows to scroll to "TEMP DISPLAY" – "ENTER"
3. Use the UP/DOWN arrows to scroll to desired temperature °F, °C or OFF. – "ENTER"
4. Verify main menu line indicates "MAIN MENU"
5. Use the UP/DOWN arrows to scroll to "RETURN" – "ENTER"
6. The display should be at the main operating screen indicating UV intensity and temperature

Setting Temp. Alarm Setpoint

The temperature alarm point is normally set to 120°F. High temperature units are special equipment in which the set point is 170°F. If the temperature alarm is set to OFF, this will disable the temperature control feature and damage to the unit can occur.

1. Access "Main Menu"
2. Use the UP/DOWN arrows to scroll to "TEMP ALARM" – "ENTER"
3. Use the UP/DOWN arrows to scroll to 120°F (default) , 170°F or OFF – "ENTER"
4. Verify display indicates main menu indicates "MAIN MENU", and the sub menu indicates "TEMP ALARM"
5. Use the UP/DOWN arrows to scroll to "RETURN" – "ENTER"

ALARM INDICATIONS

Low UV Alarm

When the detector measures UV below the low UV alarm set point, the controller will activate the following:

1. There will be an audio alarm once every second for 30 seconds.
2. The LCD screen flashes blue. The screen will remain flashing BLUE until the UV Intensity level adjusts above the threshold or the alarm is disabled.
3. The low UV output relays will change state.
4. To disable the alarm, refer to "Setting UV Alarm Setpoint" and use the UP/DOWN arrows to scroll to OFF.

High Temp. Alarm

When the detector senses a temperature above the high temperature set point, the controller will actuate the following:

1. There will be an audio alarm once every second for 30 seconds.
2. The LCD screen flashes RED. The screen will remain flashing RED until the temperature alarm is corrected.
3. The temperature output relays will change state.
4. To disable the alarm, refer to "Setting Temp. Alarm Setpoint" and use the UP/DOWN arrows to scroll to OFF.





UVG400 DESCRIPTION

UV VISION-2000 SERIES

The UV Vision-2000 Series system consists of two main components. The Controller and the Multiplexer Printed Circuit board (MUX). Both components are connected via a 6 conductor cable.

The MUX board processes individual lamp operations into a digital signal. Each of the signals are then processed together into the Controller. There are several types of MUX boards, the design installed into the unit is based upon the quantity of lamps in the system.

Two microprocessor based controllers are available, the UVG400 and the UVTS600. Each model is based upon the user interface and features. The following will cover the operation of the UVG400.



FIG. A UV VISION-2000 SERIES™ G400 MODEL

KEY FEATURES

1. Graphic screen display.
2. Low UV Alarm set point.
3. End of Lamp Life Alarm set point.
4. Local/Remote Operation





UVG400 OPERATION

UVG400 CONTROLLER

The UVG400 controller can operate a single UV unit. The controller should be preset at the factory to operate the number of UV lamps and configured options.

The system consists of two main components: The controller and the Multiplexer board (MUX). There is one MUX board per UV unit, which digitizes each lamp signal.



FIG. A UV VISION-2000 SERIES™ G400 MODEL

CONTROLS/SCREENS

The controller has four main buttons for operating, not including the arrows for toggling, ESCAPE for returning to the home screen and the set button for setting an action. They are all easily identifiable on the controller face. The following identifies the four main buttons and describes the screens corresponding with each.

Button to identify the Controller are:

1. START/STOP
2. STATUS
3. MAINTENANCE
4. SETUP

START/STOP

The START/STOP is a touch button switch which activates the lamps.

1. Pressing the START/STOP will switch the UV lamps ON or OFF if the "Local" option is selected.

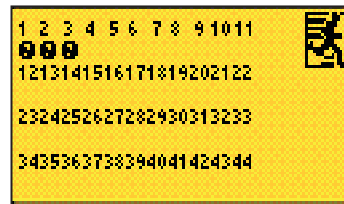
STATUS

The main function of this multiple menu is to view the status of the system.

1. Pressing the STATUS key will navigate into the System Status menus.
2. Continue pressing the STATUS key and you will view through three screens: Lamp Status Table, Alarm Status and Lamp Profile.

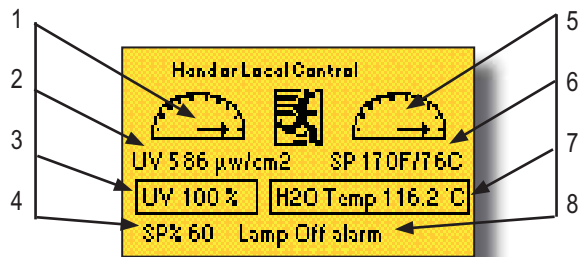
Lamp Status Screen

This screen provides a visual indication of the operational status of each UV lamp.



When the lamp is operating, the symbol below the lamp number will be filled, as seen above. When the lamp is not operating, it will be empty.

Alarm Status Screen - if detector option included



1. Relative UV Display
2. Absolute UV Intensity Display
3. Relative UV Intensity Display
4. UV Alarm Set Point
5. Relative Temperature Display
6. Water Temperature Alarm Set Point
7. Actual Water Temperature
8. System Status/Alarm Message



UVG400 OPERATION

1. **Relative UV Display** - this graphic is a representation of the 0-100% relative UV output.
2. **Absolute UV Intensity Display** - the absolute UV output is displayed in this area.
3. **Relative UV Intensity Display** - the relative UV output is displayed in this area.
4. **UV Alarm Set Point** - UV alarm set point is displayed.
5. **Relative Temperature Display** - this graphic is a representation of the 0-250°F temperature scale.
6. **Water Temperature Alarm Set Point** - this is the water alarm set point of the system.
7. **Actual Water Temperature** - the system water temperature is displayed.
8. **System Status/Alarm Message** - system text messages are displayed in this location. Listed below are the alarm text messages.

Alarm Text Messages

- A. **SYSTEM OK** - displayed when no alarms are present.
- B. **LOW UV ALARM** - activates when UV is below UV alarm set point.
- C. **1000 HOURS TO LAMP REPLACE** - activates when accumulated hours are within 1,000 hours of the lamp replacement set point.
- D. **TIME TO CHANGE LAMPS** - activates when accumulate lamp hours exceeded lamp replacement set point.
- E. **ENCLOSURE TEMP TO HIGH** - activates when the cabinet temperature has exceeded its set point. *If option provided.*
- F. **WATER TEMP TO HIGH** - activates when the water temperature has exceed its set point.
- G. **LAMP OFF ALARM** - activates when one or more UV lamps is not operating.

Alarm Status Screen - if Detector not included



Lamp Profile Display Screen



Screen displays lamp operating hours and cycles along with the current operating controls mode.

MAINTENANCE

The maintenance menu is typically used by service personnel only. The main features are the resetting of the lamp hours, setting the UV sensor to 100%, viewing the parts list and other software information.

1. Pressing the MAINT. key will navigate into the system maintenance menu.
2. This selection has been password protected to prevent unauthorized resetting of the software.
3. Enter password "1234".
4. The MAINT. menu will be displayed.
5. Pressing the ESC. key at any time will exit the MAINT. menu.
6. Continue pressing the MAINT. key to view through the entire maintenance menu.

Lamp Data/System Screen



UV G400 OPERATION

This menu allows the display of the two timers on the UV unit and resetting of the lamp timer. Lamp Data is the current operating hours and numbers of cycles on the lamps. Total run data is the total operating hours on the UV unit, and cannot be reset.

Depressing the SET key will reset the lamp hours and cycles to "0". This is completed when new lamps are installed.

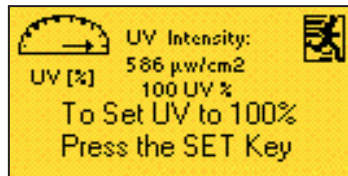
Parts List Screen



Parts List:	
Bulb H 120/240	41634 - 1
Lamp 30 STD SE	17998
Ozone ring - EPDM	4253
Ozone sleeve 60x25 SE	16791

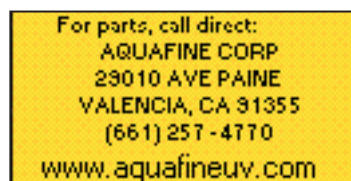
Views consumable spare parts based upon software selection and SETUP menu.

UV Detector Set RelativeUV to 100% Screen



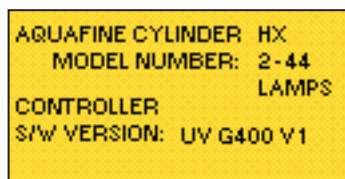
This menu sets the relative UV to 100%. Depressing the SET key will set the relative detector.

Aquafine Contact Screen



This screen displays information for contacting Aquafine for spares parts and service.

SOFTWARE SCREEN



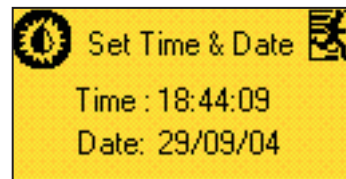
This screen provides the current software information.

SETUP

The set up menu is typically completed at the factory. The user generally will not have to reset the features inside this menu.

1. Pressing the SETUP key will navigate into the system SETUP menu.
2. This selection has been password protected to prevent unauthorized setting of the software.
3. Enter password "1234".
4. The SETUP menu will be displayed.
5. Pressing the ESC. key at any time will exit the SETUP menu.
6. Continue pressing the SETUP key to view through the entire setup menu.

Set Time & Date Screen



This menu allows the local time and date to be set for date stamping and trending functions.

Set Up Display 1 Screen



For UV units which have the Detector installed, "Set Temperature Reading To" option will display the temperature within the treatment chamber either in °F or °C.

The operator control offers two options, LOCAL and REMOTE. If LOCAL is selected, the UV unit can be operated by the START/STOP button. If REMOTE is selected, the UV unit can be operated by the remote contact ONLY.

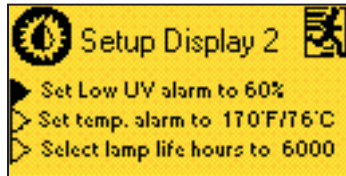


UV G400 OPERATION

ON/OFF UV Detector would be "ON" if a UV Detector is installed, and "OFF" if not.

- Press the UP/DOWN arrows to scroll the menu options.
- Depressing the SET key toggles between °F or °C, LOCAL or REMOTE and ON/OFF.

Set Up Display 2 Screen



SET LOW UV ALARM allows the setting of the low level UV Alarm. *Used with Detector option.*

SET TEMPERATURE ALARM allows the setting of the low level Temperature Alarm. *Used with Detector option.*

SELECT LAMP LIFE HOURS allows the lamp life to be set according to the manufacturers rated lamp life. When the lamp hours reach the set point, the "System Fault" RED indicator will be displayed.

- Press the UP/DOWN arrows to scroll the menu options.
- Depressing the SET key toggles between the selections.

Set Up Display 3 Screen

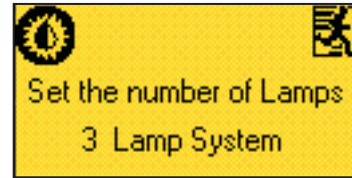


This menu is used with any unit containing a MUX board.

The PARTS LIST SETUP enables the end user to select the replaceable parts installed within the unit (i.e. ballasts, O-rings, lamps, etc.) This same menu will appear when you press the MAINT. function key and enter the correct password. It is also located at the back of this manual.

- Press the UP/DOWN arrows to scroll the menu options.
- Depressing the SET key toggles between the selections.

Set Number of Lamps Screen



This sets the software to match the number of lamps installed in the UV unit.

Pressing the SET key increases or decreases the number of lamps.



MAINTENANCE

RECOMMENDED MAINTENANCE GUIDELINES

The following provides users of Aquafine UV treatment equipment with recommendations and procedures that will maximize the efficiency, consistency, reliability and longevity of the equipment. Once the equipment is properly installed and fully operational, this will provide time-oriented guidelines for:

1. Performance monitoring.
2. Recognizing the need for time based preventative measures.
3. Organized analysis of performance, based on your particular operational environment.
4. Establishing optimum parameters for periodic replacement of vital components.

Keep in mind that operating conditions can differ substantially for identical UV models even within the same building due to such variables as:

- Water quality (tap water, DI water, pH level, chemical content, solids, etc.)
- Entering water temperature
- Flow rate (high, low or constant)
- Process status (continuous, intermittent)

Because of these variable, each UV unit may have to be serviced differently. For instance, those with continuous high flow, or with lower quality water require more frequent cleaning of the quartz sleeves than those exposed to cleaner water, lower flow rates and/or intermittent usage.

Regarding UV lamp replacement, the rule is to replace the lamps every 8,000 hours or every 24 months, whichever comes first. Meaning, units which are continuously used for 24 hours a day, will reach 8,000 hours within 375 days, or slightly over 1 year. This excludes HX lamps, which have a lamp life of 9,000 hours.

The following table represents the recommended Preventative Maintenance (PM) for the equipment.

PREVENTATIVE MAINTENANCE SCHEDULE			
MAINTENANCE	INITIAL START-UP	DAILY/MONTHLY	ANNUALLY
OPERATING CONDITIONS	X		X
CLEANING THE UNIT	X		X
QUARTZ SLEEVE MAINTENANCE	X	X	X
CLEANING THE DETECTOR WINDOW	X	X	X
INSPECTION FOR LEAKS	X	X	X
SET DETECTOR 100%	X		X
INSPECTION FOR LAMP OPERATION	X	X	X
REPLACEMENT OF UV LAMPS			X
LAMP SOCKET INSPECTION			X
COOLING FAN INSPECTION	X	X	X



The most important consideration for proper installation, operation and maintenance of any piece of equipment is operator safety. The following caution statements directly relate to operator safety. Please review with all applicable personnel to ensure continuous compliance.



MAINTENANCE

SAFETY REQUIREMENTS

The following safety requirements are mandatory. Failure to carefully follow them can cause injury to the operator and damage to the UV unit.

OPERATING CONDITIONS

- A. Never look at lighted ultraviolet lamps. Never operate the ultraviolet lamps outside the UV treatment chamber. *UV lamp exposure can severely burn and damage eyes and skin.*
- B. Properly ground the UV treatment unit. *Failure to do so can result in severe electrical shock hazard.*
- C. Provide watertight piping and compression nut seal. Failure to do so can cause damage to electrical components, as well as create an electrical hazard to operating personnel.
- D. Disconnect power before servicing unit. The UV lamps and electrical components are operated with high voltage electrical power. *DO NOT* attempt to service the UV treatment unit without first disconnecting power to the unit. Shut off the source of power at the equipment main panel breaker and use appropriate tag-out or lockout procedures to prevent accidental power-up by other personnel. *Only qualified personnel should perform service.*
- E. Remove pressure before servicing unit. The UV unit has components under pressure.



Never operate the unit for more than 20 minutes without flow of water. Elevated water temperatures can be dangerous and damaging to the unit. Do not exceed three (3) "START/STOP" cycles per 24-hour period; otherwise lamp filaments will be subjected to excessive thermal stress, which could cause premature failure.

SAFETY REQUIREMENTS TO BE OBSERVED AT ALL TIMES

CLEANING THE UNIT

1. Depending on the environment of the installation, clean the exterior surfaces of the UV treatment chamber, and electrical enclosure. The frequency of cleaning will be dependent upon the environmental condition. In some cases, it may be necessary to clean the unit from once a month to yearly.
2. Use a soft cloth with soap and water, or any commercial stainless steel cleaner.
3. Avoid scratching the display screen.
4. Interior of the electrical cabinet should be inspected for debris. Any dirt, dust or external material should be removed with a vacuum. The electrical terminal should be cleaned with a commercial electrical contact cleaner.

QUARTZ SLEEVE MAINTENANCE

As water passes through the UV treatment unit, debris and other matter in the water will settle and deposit on the quartz sleeves. This will impair the ability of the ultraviolet rays to penetrate into the water. Therefore, it is imperative to determine a cleaning schedule for the quartz sleeves. The frequency will depend on the specific type of water being processed, such as its turbidity, flow rate, and on the duty cycle, i.e. 24 hour continuous or intermittent at planned or random intervals. Replacement of the quartz sleeves should be completed every 2 years of operation.

Inspect the quartz sleeves one month after the first installation for a good indication of the degree of contamination you can expect over subsequent or longer periods. Then you will be able to determine a reasonable schedule for periodic cleaning.

If the water has been conditioned through deionization, reverse osmosis or distillation, the cleaning frequency can be set at once per year. If clear, fresh water is used, the cleaning frequency should be anywhere from once every thirty days to once every six months. With super clean water, this can be extended even further. Determine cleaning frequency by visually inspecting any one quartz sleeve to see how much debris or film has settled on the outside of it.

Clean In Place (CIP) cleaning is sometimes effective in the removal of debris from the sleeves. A test should be completed to determine the effectiveness of a CIP cleaning. After a chemical CIP has been completed, the quartz sleeves should be visually inspected for the removal of material. If CIP is not effective, then a manual cleaning or replacement of the sleeves will be required.



MAINTENANCE

CLEANING THE QUARTZ SLEEVES

Visually inspect the quartz sleeve thirty days after use to see if any debris or film has settled on the outside. If dirty, use the following procedures. Should this be insufficient, they should be replaced.

1. Turn off the water to the unit.
2. Disconnect the electrical circuit.
3. Drain the UV treatment chamber.
4. Remove the socket cover.
5. Wear clean gloves to prevent contamination of the quartz sleeves and UV lamps.
6. Remove retainer caps and lamp sockets.
7. Remove UV lamps from inside the quartz sleeves.
8. Using the compression nut tool, loosen the compression nuts and carefully remove the quartz sleeves.
9. Wash the quartz sleeves with mild soap and water. Rinse in clean, hot water.
10. The UV Detector window should be cleaned during the quartz sleeve cleaning and maintenance.

CLEANING THE DETECTOR WINDOW

1. Shut off the flow and release the pressure.
2. Shut off all power to the UV unit.
3. Remove the cable by twisting the connector terminal counterclockwise. The connector will slide off.
4. Unscrew the Detector.
5. Use a lint-free cloth with alcohol and very carefully wipe the lens face on the front of the Detector.
6. Replace the Detector and the cable.
7. Turn the power "ON" and resume operation.

INSPECTION FOR LEAKS

To ensure there are no leaks, a visual inspection of the treatment chamber should be made. The source of any leaking should be found and repaired.

Visually inspect the bottom pans at both ends of the cylinder for dripping water. If a leak is detected, follow this procedure:

1. Shut off all electrical power. Shut off source power at the facilities main panel and use appropriate tag-out safety procedures to prevent accidental power-up by other personnel.
2. Remove the socket cover from the leaking end.
3. Determine whether the leak comes from one or more of the lamp socket nipples (leaking quartz tube), or from the main end plate gasket.

IF TUBE QUARTZ TUBE IS LEAKING

- Release the pressure. Open the drain valve connected to the bottom fitting of the cylinder and drain fluid from the chamber until water level is below the leaking tube.
- Unscrew the lamp socket and lamp from leaking nut.
- Remove compression nut and O-ring from the end of the quartz tube.
- Place new O-ring into the leaking compression nut and reassemble all parts mentioned above in the reverse order.
- Refill the treatment chamber to test all seals before restoring electrical power.

IF END PLATE O-RING IS LEAKING

- Do not use any gasket compounds and make sure the O-ring and all seal surfaces are clean before reassembling.
- Torque the perimeter bolts evenly approximately 5-10 ft/lbs. above their present torque, using a cross-symmetrical tightening progression. *See the torque label on the end plate.*
- If that does not stop the leaking, the gasket/O-ring may require replacement. Remove all UV lamps.
- Remove all quartz sleeves.
- Remove end plate O-ring.
- Replace O-ring and then reassemble all components



The most important consideration for proper installation, operation and maintenance of any piece of equipment is operator safety. The following caution statements directly relate to operator safety. Please review with all applicable personnel to ensure continuous



MAINTENANCE

in reverse order.



NOTE: *Failure to perform quartz sleeve cleaning maintenance may cause inadequate UV treatment and low sensor values. The quartz sleeve maintenance is very important to the overall operation of the equipment. If the quartz sleeves are not properly*

SET DETECTOR 100%

See Controller section: Setting UV Detector to 100%.

INSPECTION FOR LAMP OPERATION

A visual check of the Lamp Status screen should be made.



NOTE: *The Lamp Out Alert alarm and function will not activate after the first 30 seconds of operation after the lamps have been turned "ON".*

REPLACEMENT OF UV LAMPS

The UV lamps are rated for 8,000 hours or every 24 months, whichever comes first. This means that the units, if continuously used for 24 hours a day, will reach 8,000 hour limit within 365 days, or slightly over 1 year. This excludes HX lamps, which have a lamp life of 9,000 hours. After this time, the lamp glass will photo chemically change and no longer allow sufficient 254 N.M. short wave UV, the germicidal ray of the lamp, through the glass to effectively kill bacteria.



NOTE: *Failure to replace the ultraviolet lamps on a timely basis of at least once every 8,000 hours may cause the equipment to fail. With intermittent use, in no case should the UV lamps be used for more than 24 months, regardless of the number of hours of operation, due to normal operational degradation*

LAMP SOCKET INSPECTION

When replacing lamps, inspect the lamp socket contacts and related hardware. They should be inspected for corrosion of the metal contact, deterioration of the metal or burning.

1. Be sure all power to the equipment is disconnected.
2. Inspect the condition of the socket retainer caps. If they show signs of cracking or any chemical degradation, they should be replaced.
3. Inspect the condition of the lamp socket (resilient boot) and the metal lamp contact imbedded in the end with the lip seal.
4. Metal contacts must be clean, free of corrosion and straight.
5. Resilient boots must be clean, free of cracks and free of any chemical degradation.
6. Lip seals must be pliable, unbroken and fit snugly over the ceramic lamp sockets.
7. The wires must be clean, with all insulation and no signs of brittleness.

If none of the descriptions are prevalent, replace entire lamp socket assembly.

COOLING FAN INSPECTION

While the unit is in normal operating mode, check to see that there is airflow at the exhaust ports and that no obstructions are present. If there is no airflow, the fan(s) should be replaced immediately.

LED DISPLAY MAINTENANCE - ANALOG

NOT APPLICABLE TO ALL UNITS

If an LED bulb does not light after you replace a UV lamp, you need to verify the electrical output of the ballast connected to that specific UV lamp. This is done by testing the ballast open circuit voltage and should be performed by an electrician or qualified facilities personnel. Follow these recommended procedures:

1. Shut the power to the UV unit "OFF".
2. Remove the socket cover.
3. Identify the faulty UV lamp, which corresponds to the number on the LED display.



MAINTENANCE

4. Remove the lamps socket(s) from the faulty UV lamp base.
5. Use a voltmeter and set an operating range at >700VAC.
6. Measure the open circuit voltage. For single-ended (SE) UV lamps, connect the voltmeter across the receptacles of the lamp socket. For double-ended (DE) and High Temperature (HT) unit UV lamps, connect one end of the voltmeter to one end of the lamp socket and the other end of the voltmeter to the opposite end of the lamp socket.
7. Turn the power to the UV unit "ON".
8. Record the reading.
9. Shut the power to the UV unit "OFF".
10. The open circuit voltage for the ballasts will be 450-850V..

REPLACEMENT OF BALLASTS

Ballast replacement is not part of the UV units routine maintenance. However, in the event that the ballast needs to be replaced, the following procedure should be followed:

1. Shut the power to the UV unit "OFF".
2. Locate the old ballast to be replaced. Refer to the electrical diagram if necessary.
3. Isolate the old ballast from the rest of the system by disconnecting the ballast connector.
4. Remove and discard the old or defective ballast.
5. Install the new ballast.
6. Reconnect the ballast connector(s).
7. Turn the power to the UV unit "ON".

CAUTION

NOTE: *If the voltage reading is zero, or a number above or below the acceptable range, this indicates a ballast fault and the ballast connected to the faulty UV lamp must now be replaced. If the reading is in the acceptable range, but the LED does not light,*

SAMPLE PROCEDURES

1. Prior to taking the water sample, have on hand an adequate supply of sterile bottles. These should be obtained from a source laboratory and should have been autoclaved and contained within a plastic outer wrapping.
2. The inside diameter of a sample valve may not exceed 1/4" (6mm) to ensure proper velocity. Prior to taking a sample, it's imperative that the test sample valve be fully opened under full pressure for a full three and a half minutes. Temporary tubing or some other material may be used to direct the water into a container or drain to avoid unnecessary spillage.
3. After the valve has been left fully open for three and a half minutes, reduce the flow to a reasonable stream of water (not less than 50% of full flow). Continue flowing to drain 3 additional minutes.
4. Remove any temporary tubing used for flow diversion.
5. Open the sterile bottle. Holding the cap in a down position, the operator should then hold his breath while taking the sample so as to avoid atmospheric contamination of the sample. The operator must also not allow any fingers to touch the inside of the cap or neck of the bottle.
6. After the water sample has been taken, the cap should be immediately secured on the sample container.
7. The sample container should be labeled and placed in a plastic wrapping and must be taken to the laboratory for plating as soon as possible. Processing should begin within 3 hours of sample collection and should comply with accepted standard methods.



MAINTENANCE

MEASURING PERFORMANCE

Every UV unit should be tested periodically to verify actual efficiency. Regardless of the intended application or any optional equipment that may have been provided with the unit, the most accurate and dependable procedure is to conduct post-UV sample analysis in accordance with standard testing methods.

OBTAINING PROPER WATER SAMPLES

Our experience has shown that the vast majority of unsatisfactory post-UV bacteriological samples are directly related to improper sample taking techniques. There are a variety of commercial sample collection apparatuses available. Should you choose one, be sure to follow the manufacturer's recommended procedures.

Optional sample unit fittings on both the intake and discharge UV chamber flange risers can be provided. We recommend you use the fittings to collect "before and after UV" water samples to eliminate the possibility of contamination by nearby piping, fittings, etc. We recommend you select a valve with a discharge orifice no larger than 1/4" (6mm).

REPLACING/CLEANING THE AIR FILTER

An air filter, provided for select units, is located at the bottom of the enclosure.

Visually inspect the air filter every 30 days or sooner, depending on the environment of the site installation, to see if any debris or film has settled. If the filter is dirty, the following procedures are provided:

1. Remove the filter. *See Fig. A*

For remote enclosures: Pull the air filter from intake fan shroud on the underside of the enclosure.

For fixed enclosures: The air filter is held in place by a bracket fixed to the bottom of the enclosure. Using both hands, reach around and locate the filter by touch. Pull the air filter towards you, out of the bracket. *See Fig. B and C*

2. For cleaning, use a soft sponge with soap and water, or any commercial stainless steel cleaner.
3. Replace filter after air drying.



FIG. A REMOVE THE FILTER



FIG. B REACH FOR FILTER

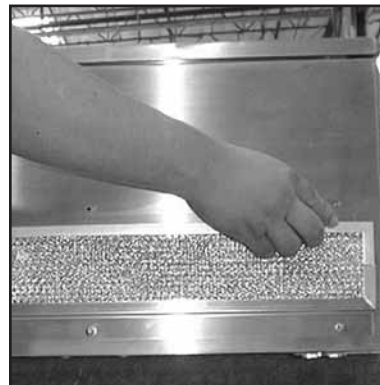


FIG. C LOCATE FILTER BY TOUCH

UV & TEMP. MONIT. SYSTEM TROUBLESHOOTING

RED SCREEN		
SYMPTOM	PROBABLE CAUSE	REMEDY
Screen is flashing RED	Water temperature is above Set Point	If the water temperature is above the Set Point, the screen will flash RED.
	Loose connection on cable	A loose or disconnected connection can result in a false reading. There are five connections. The terminal connections are color coded to the corresponding wires.
	No supply voltage to the detector	Measure the supply voltage to the detector. The voltage between the RED wire and the BLACK wire should be 5V DC. If there is no voltage, the PCB may be defective.
	Detector temperature signal is out of specification.	Measure the voltage between the WHITE wire and the BROWN wire. The voltage should be 0-.25V DC. The voltage will depend upon the water temperature. The voltage should be 20mV/de °F, if the water is 70°F, then the corresponding voltage would be 0.7.
BLUE SCREEN		
SYMPTOM	PROBABLE CAUSE	REMEDY
Screen is flashing Blue	The Irradiance is below the Set Point	Check the UV Alarm Set Point setting and the current UV display. If the display reading is less than the Alarm Set Point, the screen will flash BLUE. Readjust the Set Point.
	Loose connection on cable	A loose or disconnected connection can result in a false reading. There are five connections. The terminal connections are color coded to the corresponding wires.
	No supply voltage to the detector	Measure the supply voltage to the detector. The voltage between the RED wire and the BLACK wire should be 5V DC. If there is no voltage, the PCB may be defective.
	Detector UV Irradiance signal is out of specification.	Measure the voltage between the GREEN wire and the BLACK wire. The voltage should be 0-5V DC. The voltage will depend on the UV output. If the UV is 1,000 uW/c ² , the corresponding voltage would be 1.0V DC.
TESTING THE DETECTOR		
SYMPTOM	PROBABLE CAUSE	REMEDY
Measure with Voltmeter on DC	Supply voltage to the detector	Measure the supply voltage to the detector. The voltage should be between the RED wire and BLACK wire should be 5V DC. If there is no voltage, the PCB may be defective. <i>continued...</i>



TROUBLESHOOTING *UV & TEMP. MONIT. SYSTEM*

TESTING THE DETECTOR		
SYMPTOM	PROBABLE CAUSE	REMEDY
Measure with Voltmeter on DC	Check the temperature output	Measure the voltage between the WHITE wire and the BROWN wire. The voltage should be between 0-2.5V DC. At 70F°, V=0.7V DC At 80F°, V=0.8V DC At 90F°, V=0.9V DC
	Check the UV output	Measure the voltage between the GREEN wire and the BLACK wire. The voltage should be 0-5.0V DC. The voltage will depend upon the UV output . At 500µW/cm², V=0.5V DC At 2,000µW/cm², V=2.0V DC At 4,000µW/cm², V=4.0V DC At 5,000µW/cm², V=5.0V DC
WATER TEMP. ALARM		
SYMPTOM	PROBABLE CAUSE	REMEDY
Unit does not shut OFF when water temp. is above 120°F	Temp. Alarm point set to 170° F	Reset Temp. Alarm SET POINT to 120° F
	Lost Temp. Signal	Check cable connection between detector and Monitoring Station.
	Temp. Alarm Set Point is OFF	Reset Temp. Alarm Set Point to 120° F
UV ALARM		
SYMPTOM	PROBABLE CAUSE	REMEDY
UV Alarm does not operate	UV Alarm Set Point set incorrectly	Reset Alarm Set Point to 0-100%
	UV Alarm Point is OFF	Reset UV Alarm Set Point to ON (0-100%)



UV G400 TROUBLESHOOTING

SYSTEM ALARM MESSAGE		
MESSAGE	PROBABLE CAUSE	REMEDY
System OK	Activates when there are no system alarms	
Lamp OFF alarm	UV lamp	Activates when one or more UV lamps in not ON. The UV lamps should be inspected for damage. Replace UV lamp(s).
	Ballast	Ballast may be defective.
	Enclosure temperature (<i>option</i>)	When enclosure temperature has reached its set point, system will automatically shut OFF. Check that cooling fans are operating. Fan filter blockage.
	Water temperature	When enclosure temperature has reached its set point, system will automatically shut OFF and restart when temperature has cooled to 20°F. Let system cool, or allow cooler water to enter the treatment chamber.
Time to change lamps	Lamp operating hours	The lamp operating hours has reached the Alarm Set Point. Replace lamps and reset the lamp operating hours.
1,000 hours to lamp replacement	Lamp operating hours	Activates when lamp run hours are within 1,000 hours of lamp replacement set point. Prepare to change UV lamps.
Low UV Alarm	UV lamps	As the UV lamps age, the lamps solarize. Lamps should be replaced after specified lamp life, which is determined by lamp life. Please note, lamps will remain lit many hours after specified lamp life, but the UV out put will decline.
	Quartz sleeves/Detector fouling	In raw water applications (non RO/DI), minerals or debris will attach to the quartz sleeves. The material will block the transmission of the UV energy into the water. The quartz sleeves must be replaced or cleaned. CIP does not always properly clean the quartz sleeves.
	Water quality	Any changes in the water transmission or quality will cause the sensor reading to change. In some applications where the water is blended, the transmission properties can change.



TROUBLESHOOTING *UV G400*

SYSTEM ALARM MESSAGE		
MESSAGE	PROBABLE CAUSE	REMEDY
Low UV Alarm	Temperature	UV output of the lamps is sensitive to temperature. If the UV sensor is set with a water temperature of 70°F and the operational temperature is 50°F, the sensor reading will be less. The Detector should be set to the “normal” operating temperature.
	Low UV Alarm Set Point wrong	Reset Alarm Set Point.
High Temperature Warning	Water temperature	Water temperature is approaching the Alarm Set Point. Provide cooler water.
Water Temperature Too High	Water temperature	Water temperature has reached its set point. System will automatically shut OFF and restart when temperature has cooled to 20°F. Let system cool, or allow cooler water to enter the treatment chamber.
	Defective Detector	Check the Detector temperature display and the water temperature.

SYSTEM NOT OPERATING		
SYMPTOM	PROBABLE CAUSE	REMEDY
System Not Operating	Defective Detector	The Detector provides a temperature signal to the controller. If the system has a Water Temperature Too High warning and the water temperature is below the set point, the detector may be defective.
	Blown fuse/circuit breaker	Check main fuse or circuit breaker. A complete inspection to determine the cause of failure should be completed.
	Control fuses	There are two fuses for the controller, AC and 24V DC. Both fuses need to be checked. On multiple units (skids), each unit has an individual 24V DC fuse.



UV G400 TROUBLESHOOTING

SYSTEM NOT OPERATING		
SYMPTOM	PROBABLE CAUSE	REMEDY
System Not Operating	Power to the Unit	Main power to the unit should be checked.
	GFI (option)	Some UV units are equipped with a GFI. Resetting the GFI will restore power to the unit.
	Local/Remote Operation	If the unit has been set to operate in Remote mode, the START/STOP button will not start the unit.
	Lamp Fault (option)	Inspect and check lamp socket connection.
	High water temperature (option)	If "Water Temperature Too High" message is displayed, the unit will not start. The water temperature must be below 20°F below the set point to restart.

LEAKING		
SYMPTOM	PROBABLE CAUSE	REMEDY
Leaking	Compression nut	Inspect the compression nut and O-ring to insure that they are installed properly.
	Over pressure limit	System pressure greater than the design pressure will cause the sealing material to fail.
	Gasket failure	The gasket or O-rings should be inspected for deterioration. These materials can be subjected to damage by UV, Ozone and heat.
	O-rings	The gasket or O-rings should be inspected for deterioration. These materials can be subjected to damage by UV, Ozone and heat. Reinstall and replace the O-ring.
	Sealing material	The gasket or O-rings should be inspected for deterioration. These materials can be subjected to damage by UV, Ozone and heat.
	"Water Hammer"	"Water hammer" pressure can be 5-10X higher than the static pressure of a water system and can cause leaking and/or breakage to the quartz sleeves.



TROUBLESHOOTING UV G400

LEAKING		
SYMPTOM	PROBABLE CAUSE	REMEDY
Leaking	Broken quartz sleeves	Inspect the ends of the sleeves for cracks and chips. Any broken sleeves should be replaced.

LAMP FAILURE		
SYMPTOM	PROBABLE CAUSE	REMEDY
Premature lamp failure	Leaking/water in quartz sleeve	If water is present in the quartz sleeve, repair the leak immediately. Water can cause the lamp socket to arc, corrosion on the lamp pins, burning of the lamp sockets and damage to the ballast and LED components.
	Lamp cycling	Systems in which the UV is turned ON and OFF frequently (more than 4X) will cause the lamp filament damage.
	Electrical power	Low/High equipment power will cause damage to the electrical equipment. The electrical power should be within 5% of the name plate voltage. Small transformers may be required to boost low voltages.
	Heat	Excessive heat from no flow conditions can damage the lamps.
	Mechanical vibration	Vibration from “water hammer”, pumps and unsupported piping can cause excess stress to the lamp filament and equipment.
	Electrical connection	Vibration can cause the electrical connections to become loose. All connections should be inspected and repaired if damaged.

LAMP SOCKET BURNING		
SYMPTOM	PROBABLE CAUSE	REMEDY
Lamp socket burning	Defective lamp	If the lamp is not manufactured correctly, the lamp can overheat. Aquafine has found that if the lamp filament is not coated correctly with a special “Barium” coating, the lamp filament will overheat. Eventually, heat generated from the lamp will be transferred onto the ceramic lamp base, which is in contact with the lamp socket and cap - causing, overtime, burning to the lamp socket and cap. Replace the lamp. The dark ring near the lamp base indicates a lamp filament failure. Lamp cycling can also cause a darkening lap around the filament. Replace the lamp.



UV G400 TROUBLESHOOTING

LAMP SOCKET BURNING		
SYMPTOM	PROBABLE CAUSE	REMEDY
Lamp socket burning	Lamp Socket	A defective lamp socket can cause a lamp socket to fail and burn. Within the lamp socket assembly are metallic receptacles. If the receptacles do not make proper contact with the lamp pins, a high resistance short will occur, eventually resulting in heat build up in the interior of the socket. Replace lamp socket. Corrosion of the lamp pins and socket pins can cause a high resistance short. Replace lamp and lamp socket.
	Lamp connection	The UV lamps operate under high voltage. If the lamp pins and socket are not properly engaged, the connection can create an electrical arc, eventually generating enough heat to melt the components. Replace lamp and lamp socket and assure connection is properly secure.
	Ballasts	The ballast controls the electrical power to the lamps. If there is a problem with the ballast, which results in lamp flickering or over-powering, damage can be done to the lamp connector assembly. Replace ballast.
	System restart time delay has been set to 30 minutes.	Check the SW-7-1 switch -- CLOSED = 3 minutes, OPEN = 5 seconds.

UV SYSTEM PERFORMANCE		
SYMPTOM	PROBABLE CAUSE	REMEDY
UV system non-performance - Bacteria, TOC, Ozone	Sampling procedures	Sampling procedures can contribute to measuring errors.
	Concentration spikes	Contamination or concentration spikes can result in temporary negative performance.
	Piping contamination	System sanitation is critical. If the pipe system is contaminated, then performance may be flawed.
	Leaking	Leaking can result in system contamination.
	TOC & Chlorine performance	For TOC and Chlorine applications, lamps with 185nm output must be used.
	Water flow too high	If the capacity of the equipment exceeds the design capacity, then performance will be compromised.
	Water quality	If the water has debris, chemicals or materials which absorb the UV energy, the performance will be compromised.
	UV lamp maintenance	The lamps may require maintenance.
	Quartz sleeve maintenance	The quartz sleeves may need maintenance





TROUBLESHOOTING

SYSTEM ALARM MESSAGE		
ALARM	PROBABLE CAUSE	REMEDY
SYSTEM OK	Activates when there are no system alarms.	
LAMP OFF ALARM	UV lamp	Activates when one or more UV lamps is not ON. The UV lamps should be inspected for damage. Replace UV lamp.
	Ballast	The ballast maybe defective.
	Enclosure temp High	Cabinet temperature has reached its set point. System will automatically shut OFF . Check cooling fans for operation
	Water temperature	Water temperature has reached its set point. System will automatically shut OFF and restart when temperature has cooled 20 °F. Let system cool or allow cooler water to enter the treatment chamber.
LAMP FAULT	Activates when the UV lamp and lamp socket are not engaged properly.	Inspect lamp socket and lamp connection. Repair and replace lamp if required.
	Water Temperature	Water temperature has reached its set point. System will automatically shut OFF and restart when temperature has cooled 20 °F. Let system cool or allow cooler water to enter the treatment chamber.

SYSTEM ALARM MESSAGE		
ALARM	PROBABLE CAUSE	REMEDY
TIME TO CHANGE LAMPS	Lamp Operating Hour	The lamp operating hours has reached the alarm set point. Replace lamps and reset the lamp operating hours.
1000 HOURS TO LAMP	Lamp Operating Hours	Activates when lamp run hours are within 1000 hours of lamp replacement set point. Prepare to change UV lamps.
LOW UV ALARM	UV Lamps	As the UV lamps age, the lamps solarize. After a normal operation of 8000 hours, the lamps should be replaced. Please note that the lamps will remain lit for many hours after 8000 hours but the UV output will decline.
	Quartz Sleeve/ Detector Fouling	In raw water applications (non RO/DI), minerals or debris will attach to the quartz sleeves. The material will block the transmission of the UV energy into the water. The quartz sleeves must be replaced or cleaned. CIP does not always properly clean the quartz sleeves.
	Water Quality	Any changes in the water transmission or quality will cause the sensor reading to change. In some applications where the water is blended, the transmission properties can change.



TROUBLESHOOTING

SYSTEM ALARM MESSAGE			SYSTEM NOT OPERATING		
ALARM	PROBABLE CAUSE	REMEDY		PROBABLE CAUSE	REMEDY
LOW UV ALARM	Temperature	UV output of the lamps is sensitive to temperature. If the UV detector is set with a water temperature of 70° F and the operational temperature is 50°F, the sensor reading will be less. The detector should be set to the “normal” operating temperature.	SYSTEM NOT OPERATING SYSTEM NOT OPERATING	Defective Detector	If the Detector is installed, the detector provides a temperature signal to the controller. If the system has a Water Temperature Too High Alarm and the water temperature is below the set point, the detector may be defective.
	Low UV Alarm Set Point Wrong	Reset the alarm set point.		Blown fuse/Circuit breaker	Check main fuse or circuit breaker. A complete inspection to determine the cause of failure should be completed.
HIGH TEMP WARNING	Water temperature	Water temperature is approaching the alarm set point. Provide cooler water.		GFI (option)	Some UV units are equipped with a GFI. Resetting the GFI will restore power to the unit.
WATER TEMP TO HIGH	Water temperature	Water temperature has reached its set point. System will automatically shut OFF and restart when temperature has cooled 20°F. Let system cool or allow cooler water to enter the treatment chamber.		Power to the Unit	Main power to the unit should be checked.
	Defective Detector	Check the detector temperature display and the water temperature.		Auto Mode Operation	If the unit has been set to operate in Auto mode, the START/STOP button will not start the unit.
				Lamp Fault	Inspect and check lamp socket connection.
				High Water Temperature(Optional)	If water temperature too high message is displayed, the unit will not start. The water temperature must be 20°F below the set point to restart.



TROUBLESHOOTING



TROUBLESHOOTING

UV SYSTEM PERFORMANCE		
	PROBABLE CAUSE	REMEDY
UV SYSTEM NON-PERFORMANCE, BACTERIA	UV Lamp Maintenance	The lamps may require maintenance.
	Quartz Sleeve Maintenance-Dirty	The quartz sleeves may need maintenance
	Sampling Procedures	Sampling procedures can contribute to measuring errors.
	Concentration Spikes	Contamination or concentration spikes can result in temporary negative performance.
	Piping Contamination	System sanitation is critical. If the pipe system is contaminated, then performance may be flawed.
	Leaking	Leaking can result in system contamination.
	TOC and Chlorine Performance	For TOC and Chlorine applications, lamps with 185nm output must be used.
	Water Flow to High	If the capacity of the equipment exceeds the design capacity, then performance will be compromised.
	Water Quality	If the water has debris, chemicals or materials which absorb the UV energy, the performance will be compromised.



WARRANTY

The following installation and operating conditions are considered hazardous and damaging to the equipment, compromising the ability of the Aquafine unit to perform as intended.

Any of the following conditions will void the equipment warranty:

1. Failure to supply the correct voltage and frequency as indicated on the nameplate decal.
2. Failure to comply Aquafine electrical drawings and with local electrical codes.
3. Failure to properly ground the unit.
4. Failure to eliminate excessive vibration, piping, movement, or "water hammer".
5. Failure to exercise caution in the handling of the sensitive and delicate components (such as lamps, quartz sleeves, electronic boards, etc.) during installation and/or maintenance procedures.
6. Failure to avoid excessive stops and starts. Not more than three (3) "ON/OFF" cycles per 24 hours of operation.
7. Operation of visibly damaged equipment.
8. Failure to avoid undue overhead piping stress, which can result in structural damage to the UV unit. Limit the load to 25 lbs (11.3 kg), for 2" & 3", 50 lbs (23 kg), for 4" and 75 lbs (34 kg), for 6" or above. Torsion loads or side loading of the risers should be eliminated.
9. Use the components other than those provided or authorized by Aquafine.
10. Failure to correct overhead piping connection leaks or compression nut seal leaks which result in damage to the electrical components.
11. Allowing operating water temperature to exceed 120°F.
12. Operating the units without water flow.

NOTE: To register your UV system for warranty, go online to www.aquafineuv.com

REMEMBER, ALWAYS USING GENUINE AQUAFINE PARTS KEEPS YOUR WARRANTY, UL, CE & NSF CERTIFICATIONS VALID.

Please see Aquafine's official warranty on the following page.





AQUAFINE EQUIPMENT WARRANTY

The following terms and conditions will govern the equipment warranty provided by Aquafine Corporation Inc. to the Owner/Operator:

Aquafine Corporation (“Aquafine”) warrants to the Owner/Operator noted above (the “Customer”) that if within 12 months from equipment start-up or 18 months from the date of delivery, whichever comes first, equipment manufactured by Aquafine (the “Equipment”) will be free from defects in material and workmanship and will function in accordance with the specifications agreed to by Aquafine for the Equipment.

This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in the Operation and Maintenance manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or other third parties or defects in designs or specifications furnished by or on behalf of the Customer by a person other than Aquafine. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by anyone except: (a) authorized representatives of Aquafine, or (b) Customer acting under specific instructions from Aquafine.

Customer must notify Aquafine in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator’s log, a copy of the Customer’s maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator’s log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Aquafine of the problem as specified above, this warranty may, in Aquafine’s discretion, be invalid.

Customer will fully cooperate with Aquafine, in the manner requested by Aquafine, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required Aquafine will either, at Aquafine’s expense, ship a repaired, reworked or new part to the Customer who will install such part as directed by Aquafine or will direct Customer to acquire, at Aquafine’s expense, such part from a third party and then install such part as directed by Aquafine.

In the event that Aquafine determines that the problem cannot be resolved by way of telephone support and/or shipment by Aquafine, or acquisition by the Customer, of a replacement part for installation by the Customer, Aquafine will send one or more persons to make an on site inspection of the problem. If an on site visit is made, Aquafine personnel will evaluate the problem and repair or replace any Equipment determined to be in breach of this warranty. If the problem is not attributable to a breach of this warranty, Aquafine reserves the right to invoice the Customer for this service.

Equipment components manufactured by third parties but furnished to Customer by Aquafine are warranted by the original manufacturer, only to the extent of the original manufacturer’s warranty, and are not covered by the above warranty.

This warranty is the exclusive remedy for all claims based on a failure of or defects in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

Aquafine does not assume any liability for personal injury or property damage caused by use or misuse of the Equipment. Aquafine shall not in any event be liable for special, incidental, indirect or consequential damages including, without limitation, lost profits, lost business opportunities, lost revenue or loss or depreciation of goodwill, even if it has been advised of the possibility thereof. Aquafine’s liability shall, in all instances, be limited to repair or replacement of Equipment in breach of this warranty and shall not exceed the cost of such repair or replacement. This liability with respect to repair or replacement will terminate upon the expiration date of this warranty.

In addition to the foregoing, in no event shall Aquafine’s liability relating to the Equipment, or the agreement between Aquafine and the Customer relating to the Equipment, exceed that portion of the purchase price for the Equipment which is actually paid to Aquafine.





PARTS LIST

Part	Part No.
BALLASTS	
Ballast Assembly 120/240V 50/60Hz	43474-1
Ballast Assembly 120/277V 50/60Hz - HX MINI SERIES	45040
ELECTRICAL COMPONENTS	
Monitoring Station & UV Detector	
Monitoring Station	41114-1
Detector Kit w/20' cable (NIST Cert. included)	43240
Detector Kit w/20' cable (NIST Cert. NOT included)	43240-1
Standard Detector only	42601
Detector Cable	41116
Detector Comp. Nut CPVC	4252
Detector O-Ring VITON®	40432
RTM & Fans	
RTM Square 240V/50HZ	15844
RTM Square 120V/60HZ	15843
RTM Square 240V/60HZ	17745
Fan 2" 120V	4205
Fan 2" 240V	4206
Fan 4" 240V	3903
Fuses	
Fuse 3 Amp	14205
Fuse 6 Amp	913838
LAMPS, QUARTZ SLEEVES	
HX Lamps	
STANDARD HX "S" Lamp 254nm SE	GOLD-S
STANDARD HX "L" Lamp 254nm SE	GOLD-L
STANDARD HX "M" Lamp 254nm SE	GOLD-M
Validated HX Lamps	
VALIDATED HX "S" Lamp 254nm SE	CREAM-S
VALIDATED HX "L" Lamp 254nm SE	CREAM-L
VALIDATED HX "M" Lamp 254nm SE	CREAM-M
Quartz Sleeves	
"S" Quartz 25mm DE	3184
"L" Quartz 25mm DE	3198
"M" Quartz 25mm DE	45034
LAMP & QUARTZ SLEEVE COMPONENTS	
Lamp Sockets & Comp. Nuts	
3' Lamp Socket Lead Wires	40569-3
8' Lamp Socket Lead Wires	40569-8
16' Lamp Socket Lead Wires	40569-16
20' Lamp Socket Lead Wires	40569-20



PARTS LIST

Part	Part No.
Lamp Sockets & Comp. Nuts continued...	
Comp. Nut CPVC 25mm	19685
Comp. Nut 316L S.S. 25mm (Before 6/11)	40357
Comp. Nut 316L S.S. 25mm (After 6/11)	47034
Comp. Nut Cap	17489
Comp. Nut Cap - BLANK	17489-1
Comp. Nut Tool	45820
Comp. Nut Tool	18517
Quartz Sleeve Components	
Quartz Sleeve Bushing 25mm	17489
Quartz Support Bushing: HX 08ED-12GDL	42921
Quartz Sleeve O-Ring EPDM	4253
Quartz Sleeve O-Ring VITON®	40413
CYLINDER COMPONENTS	
Cylinder Gaskets/O-Rings	
4" Gasket EPDM: HX & HX-U "B" Series	43791-1
4" Gasket VITON®: HX & HX-U "B" Series	43791-2
6" Gasket EPDM: HX & HX-U "C" Series	3118
6" Gasket VITON®: HX & HX-U "C" Series	16673
8" Gasket EPDM: HX & HX-U "D" Series	3244
8" Gasket VITON®: HX & HX-U "D" Series	16674
10" O-Ring EPDM: HX & HX-U "E" Series	16790
10" O-Ring VITON®: HX & HX-U "E" Series	40427
12" O-Ring EPDM: HX & HX-U "F" Series	15601
12" O-Ring VITON®: HX & HX-U "F" Series	40428
14" O-Ring EPDM: HX & HX-U "G" Series	16063
14" O-Ring VITON®: HX & HX-U "G" Series	40429

Pure Quality

The principles of customer dedication, product quality and reliability are essential in ensuring the purity of water.

With innovation and advanced expertise, Aquafine continues to be the world leader in UV water treatment systems for Industrial & Commercial applications.



Aquafine[®]
A TROJAN TECHNOLOGIES COMPANY

Aquafine is an ISO 9001:2008 certified company.

North America & International

29010 Ave Paine, Valencia, CA 91355
P 661 257 4770 F 661 257 2489
sales@aquafineuv.com www.aquafineuv.com

Europe

Ramskamp 77-85 D-25337 Elmshorn, Germany
P +49 4121 57806 13 F+49 4121 57806 30
saleseu@aquafineuv.com www.aquafineuv.com