Aquafine Corporation

Ultraviolet Water Treatment Unit Installation, Operation, and Maintenance Requirements

SL SERIES:
SL-10A, SL-1, & MP-2-SL

HIGH PERFORMANCE
ULTRAVIOLET TECHNOLOGY

Aquafine® Operating Manual

READ THIS MANUAL

PLEASE KEEP FOR PERMANENT REFERENCE

Revised 2/95

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THIS MANUAL COVERS THE INSTALLATION, OPERATION AND MAINTENANCE REQUIREMENTS FOR AQUAFINE ULTRAVIOLET TREATMENT EQUIPMENT IN THE FOLLOWING APPLICATIONS:

- UV DISINFECTION MODELS
- UV TOC REDUCTION MODELS
- UV OZONE DESTRUCTION MODELS

IT IS IMPERATIVE THAT THOSE RESPONSIBLE FOR INSTALLATION OF THIS EQUIPMENT, AS WELL AS THE OWNER/OPERATOR, READ THIS MANUAL AND CAREFULLY FOLLOW ALL INSTRUCTIONS AND GUIDELINES. **EQUIPMENT OPERATORS MUST COMPLY WITH OPERATIONAL SAFETY REQUIREMENTS.**

AQUAFINE CORPORATION BUILDS THE FINEST ULTRAVIOLET EQUIPMENT IN THE WORLD. WHEN PROPERLY INSTALLED AND OPERATED, AQUAFINE ULTRAVIOLET TREATMENT UNITS WILL PROVIDE MANY YEARS OF SATISFACTORY SERVICE

PHONE: 661- 257-4770 FAX: 661- 257-2489

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SAFETY REQUIREMENTS

Follow All Safety Guidelines

The most important reason for proper installation and operation 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.

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

Never Look at the Lighted Ultraviolet Lamps

1. Never look at lighted blue ultraviolet lamps. Never operate the ultraviolet lamps outside the UV treatment chamber. UV lamp exposure can severely burn and damage eyes and skin.
2. Properly ground the UV treatment unit. Failure to properly ground the unit can result in severe electric shock hazard.
3. Provide water-tight piping and compression nut seals. Failure to do so can promote leakage and can cause damage to electrical components, as well as create an electrical hazard to operating personnel.
4. Disconnect power before servicing the 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. Only properly qualified service personnel should attempt service.

SL SERIES: DESCRIPTION OF EQUIPMENT

The SL Series is the appropriate choice for many low volume indoor applications because it offers a compact footprint and easy installation. All three models combine the electrical components and the treatment chamber(s) in one integral unit.

SL-10A

This unit mounts vertically. It is the smallest of the series. Inside the cabinet housing are the ballast and the UV treatment chamber. The housing has a front cover which allows access to all interior components. On the side of the treatment unit is a knockout for electrical input power.

Three Efficient, Low-Volume Models

SL-1

This unit mounts vertically. It is the middle of the series. Inside the cabinet housing are the ballast and the UV treatment chamber. The housing has a front cover which allows access to all interior components. On the side of the unit is a knockout for electrical input power.

MP-2-SL

This unit mounts horizontally. It is the largest of the series. Inside the electrical housing are the ballast and two UV treatment chambers. They operate serially, as this is the most efficient design. The housing has a front cover which allows access to all interior components. On the back is a knockout for electrical input power.

THE TREATMENT CHAMBER(S)

This applies to all three models. On either end of each treatment chamber is a threaded stainless steel nipple with a compression nut and an O-ring. A quartz sleeve fits inside the treatment chamber through the threaded stainless nipples. The UV lamps fit inside the quartz sleeves, and they connect to the lamp sockets on either end. These sockets provide a water-tight seal and a vibration-proof grip on the ends of the lamps to prevent loosening of the contacts.

A Simple Design Guarantees Maximum Efficiency

Each treatment chamber is fitted with two raised-face stainless steel flanges (in the case of the MP-2-SL, each chamber has one flange each). The bottom flange is always designated as the Inlet, while the top flange is the Outlet. There is a special disc within the bottom flange that causes turbulence to eliminate laminar flow and to increase the unit's efficiency.

SL SERIES MODEL APPLICATIONS

The model SL-10A is intended only for UV disinfection. Models SL-1 and MP-2-SL are available for three distinct applications:

UV DISINFECTION

Aquafine Ultraviolet Disinfection Units disinfect water without chemicals. They provide in excess of 99.9% reduction of all common water-borne microorganisms through UV exposure within the disinfection chamber. No by-products are produced.

The Three Primary Applications for Ultraviolet Treatment

UV TOC REDUCTION

Aquafine TOC Reduction Units reduce TOC (Total Organic Carbon) through molecular bond dissociation using 185 nanometer wavelength energy. Measured reduction rates will vary depending upon specific organic substances present and associated energy levels required to dissociate them. The primary by-product is carbon dioxide. Dual wavelength UV lamps are used which achieve 99.9% disinfection.

UV OZONE DESTRUCTION

Aquafine UV Ozone Destruction Units destroy ozone (O_3) in water using UV light. The applied dosage level of 90,000 $\mu W/sec/cm^2$ @ 254 nanometers reduces ozone concentrations in water from 1.0 ppm to below detectable levels. This results in increased dissolved oxygen levels and 99.9% disinfection.

HOW THE MODELS ARE NUMBERED

Model Names and Numbers

For the SL Series models the number following the prefix "SL" indicates the number of UV lamps. The SL-10A, SL-1, and the MP-2-SL are intended for disinfection. Models intended for TOC Reduction have the suffix "TOC" and those intended for Ozone Destruction have the suffix "DEO_3".

For operational purposes, the only difference in operating the various models and applications is the maximum flow rate capacity (GPM) per model (see Capacity Chart, page. 7).

The safety, installation, operation, and maintenance procedures in this owner's manual are applicable to all models regardless of their application.

GENERAL INSTALLATION & OPERATING REQUIREMENTS

Operating Performance Is Affected By Compliance With These Requirements

1. Always disconnect electrical power to the ultraviolet UV treatment unit when servicing the equipment.
2. Under no condition should any personnel ever look at the lighted blue ultraviolet lamps.
3. The ultraviolet treatment unit must always be properly grounded.
4. Do not allow the UV treatment unit to overheat by being electrified without water flow for excessive periods of time. **Performance is affected by compliance.**
5. The UV treatment unit must not be electrically cycled. (Do not exceed four (4) lamp on/off cycles in any 24 hour period.) **Performance is affected by compliance.**
6. Do not allow flow rate to exceed maximum rated capacity. (See chart, page 7) **Performance is affected by compliance.**
7. When installing the unit, it is necessary that the unit be isolated from undue vibration, which could be caused by proximity to heavy equipment, poorly connected attachment piping, erratic or improper pumps, etc. Vibration of the UV treatment unit will damage the electrical components and cause premature failure of the UV lamps. **Performance is affected by compliance.**
8. The temperature of water or fluid coming into the UV treatment unit should not exceed 100°F (38°C). Should the temperature of your normal water or other fluid exceed 100°F (38°C), contact the factory for assistance. **Performance is affected by compliance.**
9. Before using the UV treatment unit, flush it and the discharge piping to rinse out any debris which may be present due to installation activities. You must sanitize all discharge piping and fittings from the unit to the point-of-use to remove any existing contaminants and to give the unit a "clean start". Be sure to rinse your sanitizing solution with UV treated water. **Performance is affected by compliance.**
10. Follow UV lamp replacement and quartz sleeve cleaning procedures on pp. 17-18. **Performance is affected by compliance.**

SUMMARY OF MONITORING AND MAINTENANCE REQUIREMENTS

Establish And Implement A Routine Maintenance Schedule

1. The exterior surfaces of the Aquafine UV unit should be kept clean as part of routine maintenance. Use a soft cloth with soap and water or any commercial stainless steel cleaner.
2. Monitor the port visually daily to verify the UV lamp(s) are operating. Immediately replace any failed UV lamp (see page 14).
3. Inspect for overhead piping leaks and correct as necessary to protect UV equipment (see page 13).
4. Follow quartz sleeve cleaning requirements (see page 18).
5. Replace the UV lamps after 8,000 hours continuous use or after every two years intermittent use.
6. Follow the operating guidelines for any optional features supplied with the UV treatment unit.
7. Measure the performance of the UV treatment unit at sufficient intervals to ensure the effluent meets your requirements (see page 23).

CAPACITY CHART

Different Models for Different Size Applications

SL Series Ultraviolet Disinfection Units	Maximum Flow Clear Fresh Water		Maximum Flow Ultrapure Water DI/RO	
Model	**GPM**	**m^3/hr**	**GPM**	**m^3/hr**
SL-10A	3	.7	4	.9
SL-1	10	2.3	12	2.7
MP-2-SL	20	4.5	24	5.4
SL Series UV Ozone Destruction Units				
SL-1 DEO_3	N/A		4	.9
MP-2-SL DEO_3	N/A		8	1.8
SL Series UV TOC Reduction Units*				
SL-1 TOC	N/A		3	.7
MP-2-SL TOC	N/A		6	1.4

*These capacities are recommended as general guidelines in choosing specific models for the reduction of TOC in high purity water. Flow rates may be decreased to meet specific performance criteria.

Actual performance will depend upon specific organic substances present and the wavelengths and energy levels required to achieve interatomic bond dissociation. Further reducing flow rates will improve TOC reduction performance. Contact factory for specifications of other models not shown on this chart.

WARRANTY CONSIDERATIONS

The limited warranty covering your Aquafine UV treatment unit can be found on page 26 of this manual.

The following installation or operating conditions are considered hazardous or damaging to the equipment and can compromise the ability of the Aquafine unit to perform as intended. In addition, any such condition may void equipment warranty.

Improper Operation Can Damage The UV Treatment Unit

1. Failure to connect proper electrical service to the unit.
2. Failure to properly ground the unit.
3. Failure to eliminate excessive vibration, piping movement, or water hammer.
4. Failure to avoid excessive stops and starts. Not more than four (4) stop/start cycles per 24 hours of operation.
5. Operation of visibly damaged equipment.
6. Failure to avoid undue overhead piping stress which results in the cavitation of the UV chamber. **Limit the load to 10 lbs. (4.54 kg) per flange.**
7. Use of components other than those provided or authorized by Aquafine Corporation.
8. Failure to correct overhead piping connection leaks or compression nut seal leaks which result in damage to electrical components.

INSTALLING THE UNIT

Where to Install the Unit

Install the UV treatment unit in a sheltered area with ample ventilation. Ambient temperatures surrounding the unit should be between 35°F (2°C) and 110°F (43°C). Should your requirements differ, contact the factory for assistance.

As an ultraviolet UV treatment unit does not provide any chemical residual within the water, it is desirable to install the unit as close as possible to the point-of-use to avoid potential recontamination by discharge pipes, fittings, etc. The base of the UV treatment unit should be mounted on a solid support to avoid strain on the unit or your related pipes and fittings.

Verify the location is free from vibration which could be caused by proximity to heavy equipment, erratic or improper pumps. Excessive vibration will damage internal electrical components and cause premature failure of the UV lamps.

How To Protect Your Unit

Limit overhead piping load to 10 lbs. (4.54 kg) per flange.

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.

Allow sufficient service access clearance as shown in the plumbing schematic on page 10. In making your plumbing connections, provide unions, valves, bypass and drain as shown on the attached recommended plumbing schematic.

Operating Pressure At 120 psig

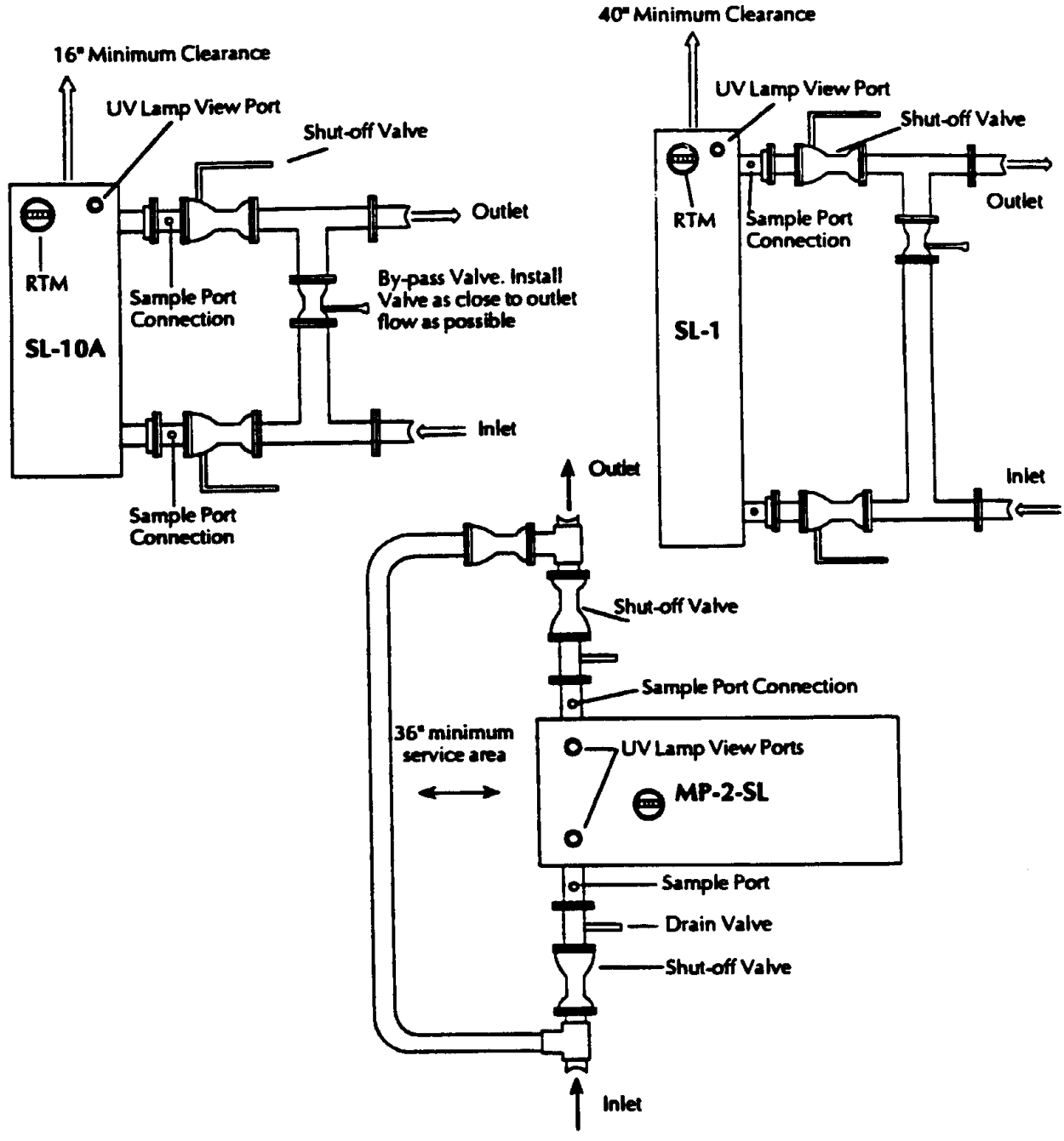
The operating pressure should be 120 psig (8.24 bar). If your unit has the high pressure modification option (model number suffix "HP") operating pressure may increase to 150 psig (10.34 bar).

WIRING THE UNIT

Bring your wiring to the electrical knockout on the side or back of the cabinet, making sure your electrical service matches up to the electrical data as shown on the electrical name plate (118, 236 volts AC, 60 hertz, 50 hertz, etc.). Locate an "On/Off" switch near the UV treatment unit so the current may be conveniently turned off for servicing. IT IS AN ABSOLUTE NECESSITY THAT THE UNIT BE PROPERLY GROUNDED FOR SAFE AND PROPER OPERATION. Failure to properly ground the UV treatment unit automatically voids all equipment warranty.

UV performance is line voltage sensitive. Line voltage should be ±10% of rating shown on electrical name plate. Insufficient line voltage (brownout) can reduce rated performance.

PLUMBING SCHEMATIC FOR ALL SL SERIES ULTRAVIOLET TREATMENT UNITS



ADDITIONAL PLUMBING REQUIREMENTS FOR USERS OF ULTRAPURE WATER

UV Light Traps Protect Non-Metallic Piping

Ultrapure water users have reported that over time, exposure to ultraviolet light may photochemically degrade non-metallic piping materials, including most or all fluoro-polymers, resulting in material breakdown and/or structural failure.

Should your water application and piping material be so classified, we recommend you install "UV light traps" to isolate any such susceptible material from direct exposure to the ultraviolet light. One common practice is to install stainless steel 90° elbows at the inlet/outlet of the UV treatment chamber prior to the connection of any non-metallic materials.

Should you require any additional assistance, please contact your local Aquafine representative or the factory directly.

INSTALLING THE QUARTZ SLEEVES

The Quartz Sleeves Are Very Fragile

After your plumbing connections have been completed, you can begin installing the quartz sleeves. These sleeves will then enclose and protect the UV lamps inside the treatment chamber.

First, remove the compression nuts from both ends of the treatment chamber.

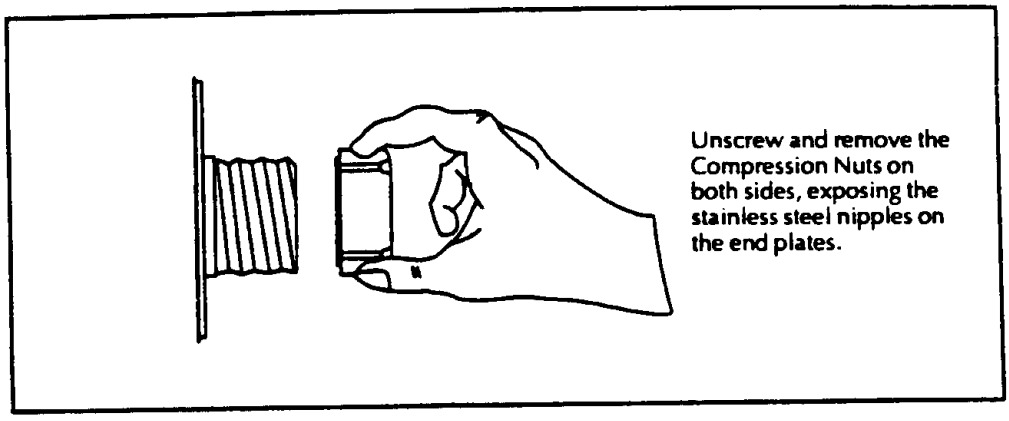


Diagram 1

Next, insert the quartz sleeves through the stainless steel nipples. You should work from the open end of the cabinet.

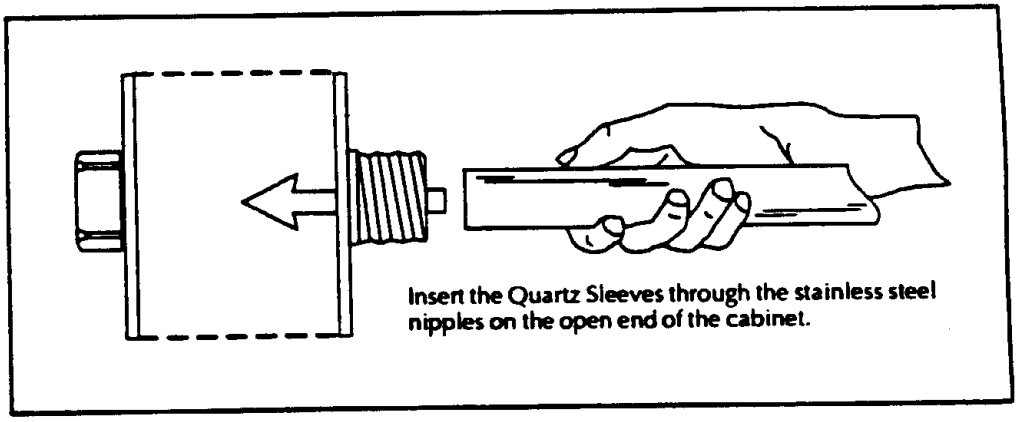


Diagram 2

The quartz sleeves are very fragile. Handle them carefully to prevent breaking or chipping. It is also very important to keep the quartz sleeves clean and free from debris, fingerprints, etc.

After inserting the quartz sleeves into the treatment chamber, make sure each sleeve sticks out an equal distance from either end of the treatment chamber.

Now, reattach the compression nuts on each stainless steel nipple. The lubricated O-ring inside each compression nut will create a compression seal around the end of each quartz sleeve.

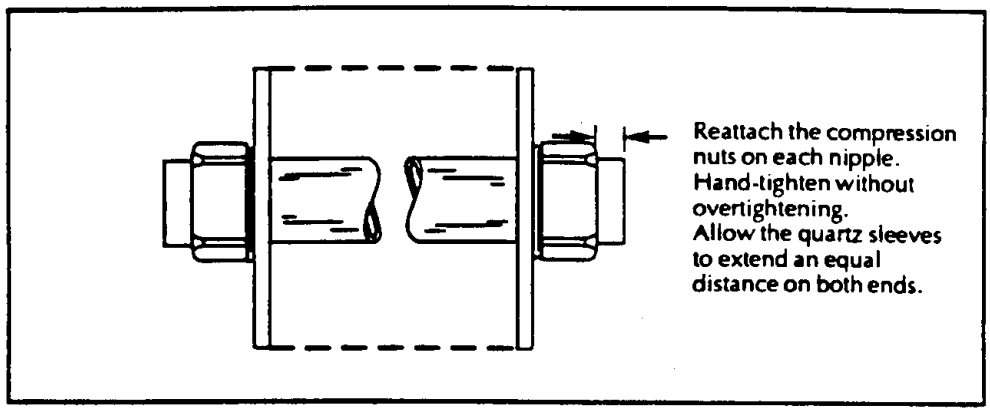
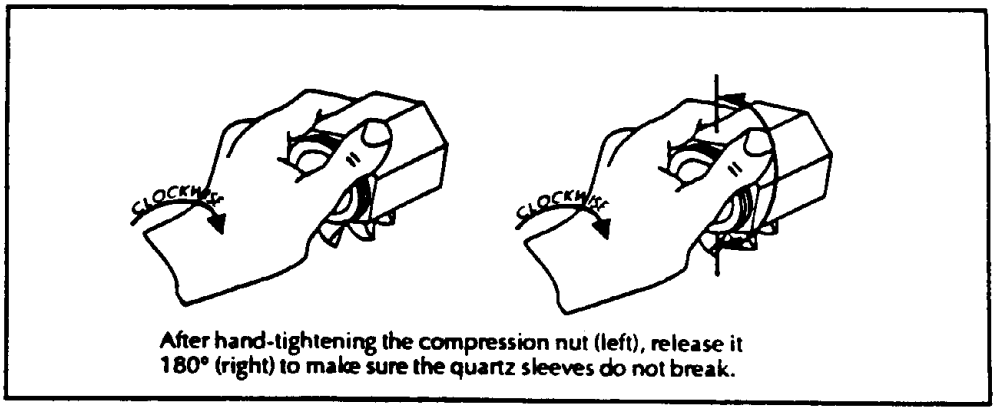


Diagram 3

Firmly hand-tighten the compression nuts on both ends of all quartz sleeves. **DO NOT EXCEED 40 INCH-POUNDS TORQUE.** It is extremely important that you do not over-tighten the compression nuts. This can fracture the ends of the quartz sleeves. Under normal conditions, hand-tightening the compression nuts is all that is required to form a 120 psi seal.



After hand-tightening the compression nut (left), release it 180° (right) to make sure the quartz sleeves do not break.

Diagram 4

Checking For Leaks

After you have tightened the compression nuts, and all other plumbing connections have been made, slowly introduce water into the system and verify that there are no leaks around the compression nut seals. Should there be any leaks, release the water pressure, hand-tighten the compression nuts a little more, and then re-pressurize the unit.

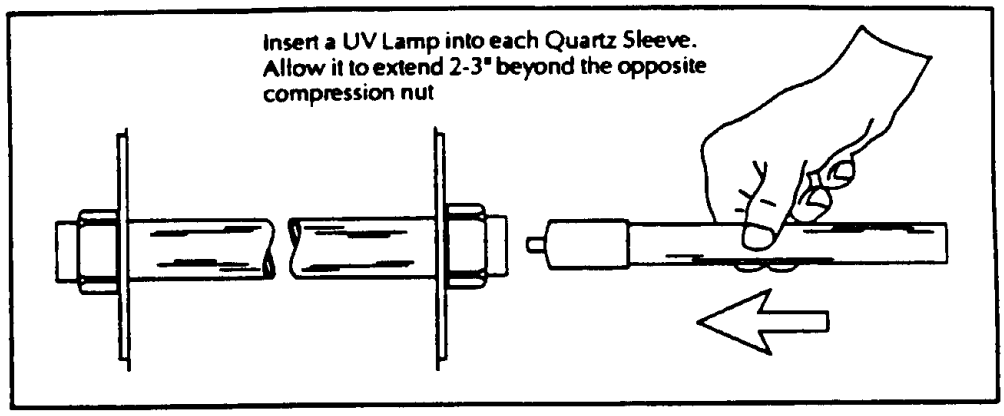
INSTALLING THE ULTRAVIOLET LAMPS

Handle The Lamps With Care. Don't Leave Fingerprints

The next task is to insert the ultraviolet lamps into each open quartz sleeve on the open side of the UV treatment unit.

The ultraviolet lamps are expensive and fragile. They must be handled with care. Take them out of the factory packing carton and remove the paper warning tag attached to each ultraviolet lamp.

Insert one UV lamp into each open quartz sleeve and push it about 2"-3" (51-76 mm) out beyond the opposite compression nut, so as to be able to hold the lamp with one hand.



Drawing 5

Be careful to avoid leaving fingerprints on the lamp.

Insert the lamp base into the rubber socket. Push until you feel a firm "bottomed out" connection. Carefully slide the rubber boot portion of the lamp socket over the end of the lamp. **CAUTION: Verify no portion of the rubber boot has folded under during this process.**

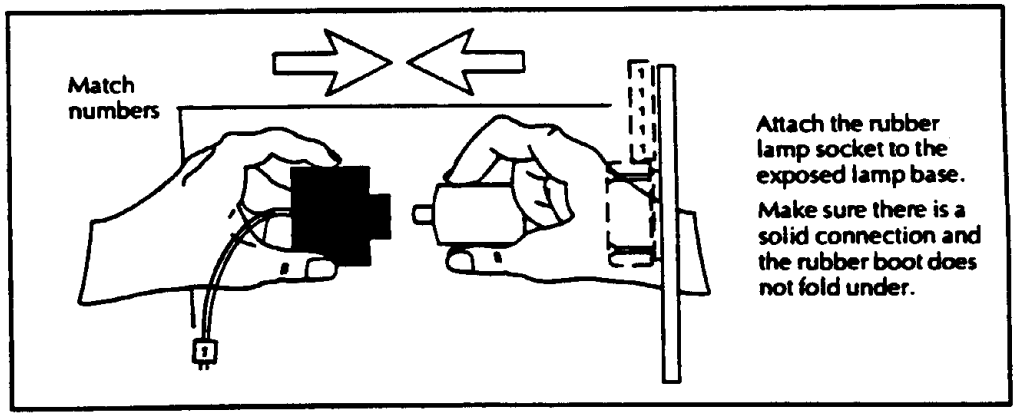
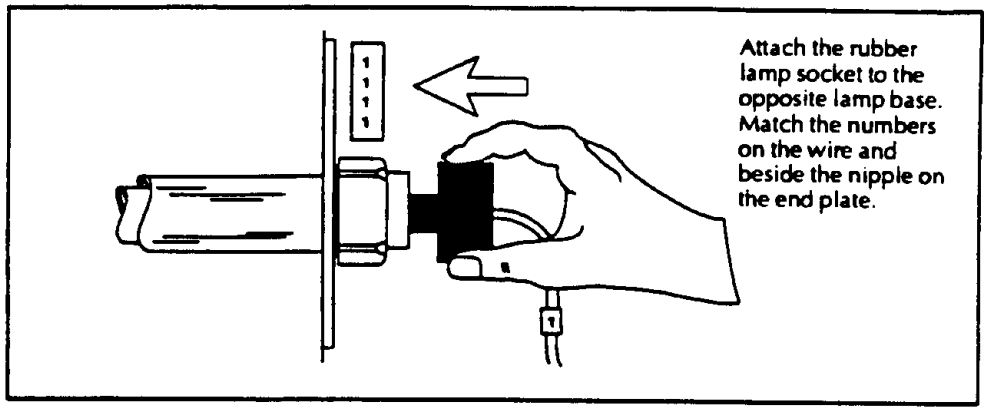


Diagram 6

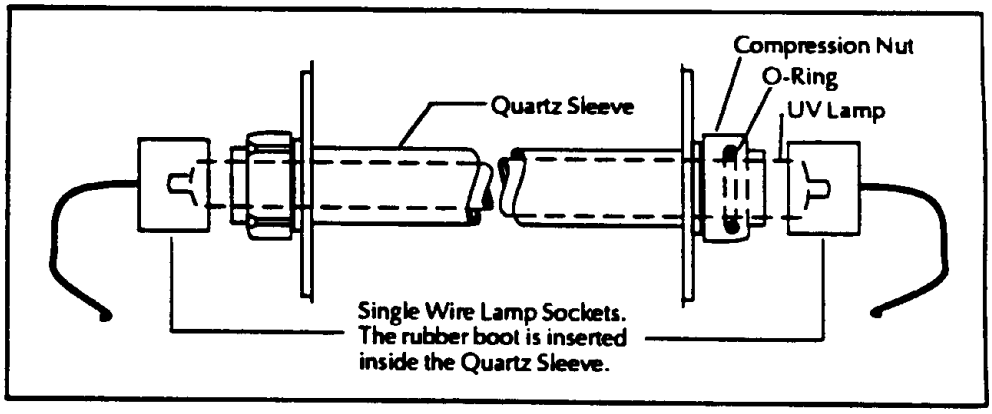
The final lamp procedure is to connect the right side rubber lamp sockets onto each lamp. Pay special attention to match the numbers on the socket lead wires with the numbers beside each steel nipple on the end plate.



Drawing 7

Push the rubber socket boot onto the end of each ultraviolet lamp. When properly attached, a slight "snap" can be felt, which indicates a proper connection.

You have now completed the procedures for properly attaching the UV lamp sockets on the UV treatment unit.



Drawing 8

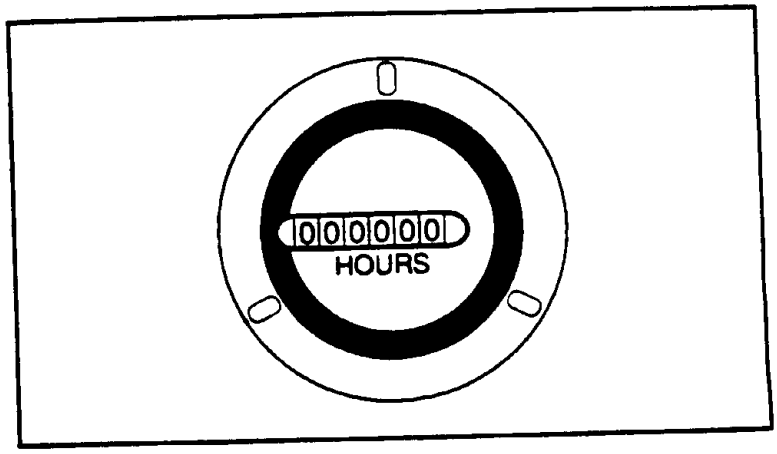
MONITORING DEVICES

RUNNING TIME METER

The Running Time Meter Lets You Track Operating Hours

Your ultraviolet treatment unit has been furnished with a Running Time Meter, located on the front instrument panel. This non-resettable running time meter will log up to 99,999 hours. It reminds you of the number of operating hours on the equipment, as certain maintenance functions need to be performed at certain time intervals.

We have also affixed a maintenance log to the unit for your use. It should be kept current. This provides an immediate maintenance reference: when it was performed and when the next service is due. Additional service logs are available from Aquafine, and are intended to be placed on top of the existing service logs.



Running Time Meter

MAINTENANCE REQUIREMENTS

UV LAMP REPLACEMENT

The UV Lamps Are Rated For 8,000 hours Continuous Use or Two Years Intermittent Use

The Colorguard™ ultraviolet lamps are rated for 8,000 hours of continuous use or 24 months of intermittent use, whichever comes first. After this time, the lamp glass will photochemically change and no longer allow sufficient 254-nm shortwave UV, the germicidal ray of the lamp, through the glass to effectively kill bacteria.

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 ultraviolet lamp be used for more than 24 months without replacement, regardless of the number of hours of operation, due to normal operational degradation of the UV lamp.

THE QUARTZ SLEEVES

Regular Cleaning Will Keep the Quartz Sleeves At Maximum Efficiency

As water passes through the ultraviolet treatment unit, minerals, debris and other matter in the water will settle and deposit onto the quartz sleeve. This will impair the ability of the ultraviolet rays to penetrate into the water. Therefore, it is necessary to determine a cleaning schedule for the quartz sleeves, and the frequency will depend on the specific type of water used at your facility.

If the water has been processed through deionization, reverse osmosis, or distillation, the cleaning frequency can be set at once per year. If clear, fresh water is used, the probable cleaning frequency will be anywhere from once every thirty days to once every six months. You can determine this cleaning frequency. This is done by visually inspecting any one quartz sleeve to see if any debris or film has settled on the outside of the quartz sleeve.

We suggest initially you schedule your first inspection after thirty days of use, and if after the first month the quartz sleeves are noticeably dirty, your cleaning frequency should be shortened; if the sleeves are clean, the frequency can be lengthened.

CLEANING THE QUARTZ SLEEVES

Clean The Quartz Sleeves With Soap and Water

To clean the quartz sleeves, first turn off the water to the unit, disconnect the electrical service and drain the UV treatment chamber. Next, remove the ultraviolet lamps. Then loosen the compression nuts and carefully remove the quartz sleeves. The quartz sleeves may then be washed with mild soap and hot water and rinsed clean with hot water.

Should this be insufficient to clean the quartz sleeves, use a mild abrasive cleaning agent. Use care when cleaning the quartz sleeves. They are fragile. Should a quartz sleeve be damaged, it must be replaced. **When replacing the UV lamps, follow the directions on pp. 14.**

INTERMITTENT OPERATION

A minimum of three gallons per hour must pass through the unit. This small amount of fluid flow is required to carry away the heat generated by the ultraviolet lamps. **Never operate the unit for more than one hour without flow of water**. Should the unit operate for an extended period of time without water flow, several damaging conditions may take place:

Follow These Guidelines If You Are Using The Unit For Batch Operations

First, the fluid within the ultraviolet chamber will become hot, and this will cause the UV lamps to lose effectiveness. Second, the heat can permanently damage the ultraviolet lamps. Third, the heat can damage the lamp ballast components and related instrumentation. Operating the ultraviolet unit for more than three hours without water flow through the chamber will automatically void the warranty on this equipment.

Overheating Can Damage the UV Unit

Should the unit be used for specific batch flow operations, it can be turned "On" and "Off" manually. Make sure the unit is allowed to warm up for at least one minute before use, and make sure the unit is turned "Off" after each session. Do not exceed 4 start/stop cycles per 24 hour operation.

If you need help to determine the best method of operating your UV treatment unit under intermittent conditions, contact your local representative or the factory.

An optional Temperature Safety Control Device is available to prevent the overheat problems described above.

MODEL S-254 UV OPTICAL SENSOR

OPTIONAL FEATURE

The S-254 UV optical sensor measures the relative output of ultraviolet light within the UV treatment chamber. This provides you with information about the following conditions: the degradation of the UV lamps, the fouling of the quartz sleeve, and the increased turbidity of the water.

REMOTE CONFIGURATION

The S-254 Sensor Must Be Calibrated After Each Lamp Replacement

In the SL Series, the S-254 Optical Sensor is available only in a remote conifiguration. The meter assembly and instrumentation are located in a separate NEMA 4 control box. The calibration points are accessible at the meter face from behind the enclosure window.

Power is supplied through the cord and plug furnished for 120V/60Hz service. The plug is deleted for all other power requirements. A shielded signal cable connects the sensor meter assembly to the sensor probe. The sensor probe is located in the sensor port fitting on the UV treatment chamber.

All S-254 UV optical sensors are tested and preset at the factory in free air. **Calibration is required at installation and after each subsequent lamp changeout cycle.**

CALIBRATION PROCEDURE

How To Set The Sensor

1. Gradually start the normal flow rate.
2. Bring the unit up to normal operating pressure.
3. Turn the UV lamps on for a minimum of 15 minutes.
4. Adjust the sensitivity pot to 100%.
5. Adjust the sensitivity pot to 50%.
6. Adjust the alarm pot until the red LED barely comes on.
7. Set the sensitivity pot back to 100%.
8. Check calibration by turning the sensitivity pot to 50%; the red LED should come on.
9. Turn the sensitivity pot back to 100%.

Re-calibration must be performed after the first 100 hours of operation on new UV lamps, both at the time of installation and each time the UV lamps are replaced.

ALARM CONTACTS

Normally Closed and Normally Open alarm contacts are also provided for use with user-supplied peripheral equipment, such as remote alarms or solenoid valves. Dry relay contacts are rated as follows: 0.52 AMP 120 VAC., O.25 AMP 236 VAC

Should your application require higher contact ratings, you must use a slave relay. The connection of peripheral equipment is the responsibility of the user.

The Sensor Alarm Activates When UV Intensity Falls Below Preset Levels

SENSOR ALARM

The S-254 UV optical sensor provides information about the relative amount of UV passing through the water. The reading is affected by quartz sleeve fouling and/or the germicidal lamp efficiency. The UV sensor is sensitive to, and reflects changes in, UV transmission when a substantial change occurs in the normal operating flow rate, temperature, operating pressure, or quality of the fluid flowing in the system.

When the UV intensity falls below the minimum standard due to any of the above conditions, the sensor alarm light (red LED) will come "on" and corrective action must be taken to optimize the performance of the UV treatment unit.

1. Examine your system for any significant changes in normal operating conditions.
2. Check if all UV lamps are electrically operating and/or need replacement. Verify that the quartz sleeves are clean.

If quartz sleeve fouling has caused the optical sensor alarm to activate, the quartz sleeves must be cleaned. At the same time, you must clean the sensor probe quartz window, as below:

CLEANING THE SENSOR PROBE WINDOW

Clean The Sensor Windows When The Quartz Sleeves Are Cleaned

1. Shut off the flow and release the pressure.
2. Shut off all power to the UV unit.
3. Remove the coaxial cable by pushing and turning the BNC terminal counterclockwise. The connector will slide off.
4. Unscrew the compression nut which holds the sensor probe in the nipple. Twist and pull the probe from the nipple.
5. Use a lint-free cloth with alcohol and very carefully wipe the lens face on the front of the probe. Failure to do so may result in false readings.
6. Replace the probe and the coaxial cable.
7. Turn the power "on" and resume operation. Whenever new lamps have been installed, follow all re-calibration instructions.

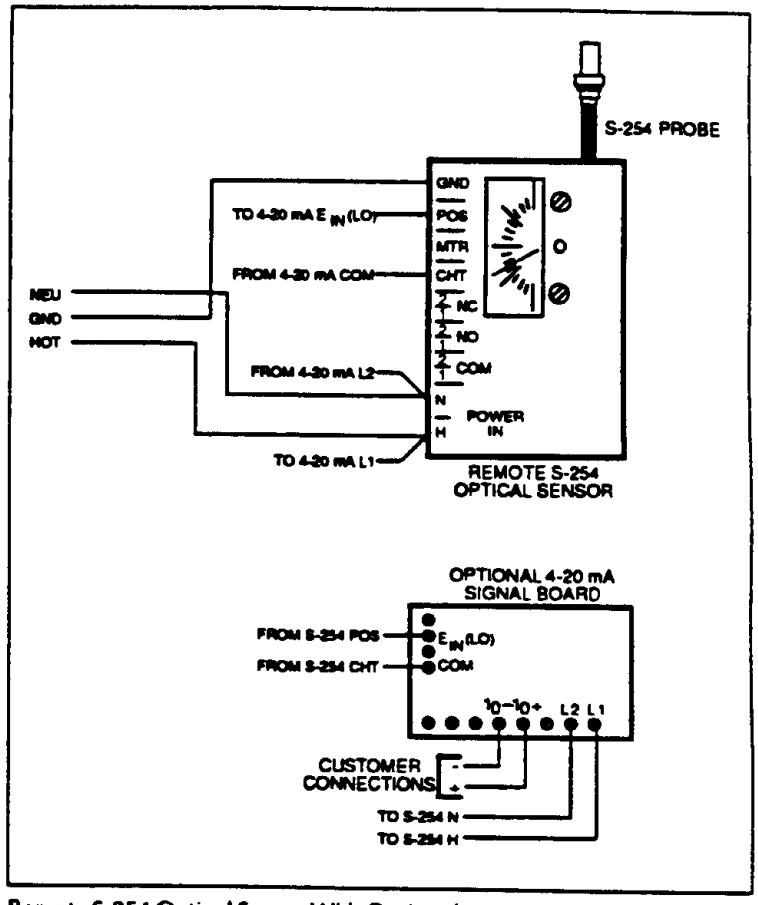
4-20 MA SENSOR SIGNAL

OPTIONAL FEATURE

This optional accessory works with the optional Remote S-254 Optical Sensor. It generates a 4-20 mA output signal based upon the relative UV intensity which may be monitored at a remote control panel or control PC. The customer is responsible for providing and connecting an appropriate 4-20 mA display instrument.

This Provides The Ability To Remotely Monitor UV Intensity

A second NEMA rated enclosure is provided and connected to the remote sensor enclosure. The customer is responsible for bringing peripheral instrument wires through the 1/2" electrical knockout on the bottom of the dedicated NEMA enclosure and connecting it to the indicated terminals.



Remote S-254 Optical Sensor With Optional 4-20 mA Sensor Signal.

T-120 TEMPERATURE SAFETY CONTROL

OPTIONAL FEATURE

The T-120 Temperature Safety Control consists of a heat-sensing probe and its associated circuitry. This device protects against inadvertent overheating inside the UV chamber, which can, in time, damage the UV lamps and the ballast/LED Display Panel circuitry.

The T-120 Temperature Safety Control senses raised water temperature and assumes the UV lamps are operating "on" with no water flow. The device automatically turns the UV lamps "off" when the water temperature reaches 120°F (49°C) and automatically turns them back "on" when the temperature falls to 100°F (38°C). This temperature spread prevents excessive stop/starts during no flow conditions, and it protects the UV lamps and the electrical components from overheating damage.

The T-120 Will Protect The Unit From Overheating

The temperature probe is located in the end plate and is near the inlet water entrance to the chamber. **It is important to use the designated inlet as the inlet.** It will instantly respond to temperature changes with resumed water flow and will thus reactivate the UV lamps. No operator maintenance is required, other than periodic visual verification that the UV lamps are properly operating during normal water flow conditions.

The cut-off temperature has been preset at the factory. Should you require a different set point, please contact the factory for assistance.

MEASURING PERFORMANCE

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

Sample Analysis Is The Best Method To Determine Effectiveness

Periodic sample collection and testing should be scheduled as often as the user deems sufficient to be assured the quality of the Aquafine ultraviolet unit effluent is acceptable.

OBTAINING PROPER WATER SAMPLES

One of the primary purposes for using UV treatment equipment is that the process does not use chemicals or leave a chemical residual. UV does, however, require professional samples of the process water proper, as opposed to water subject to contamination through discharge piping, sampling valves, sample containers, and sample-taking error.

Our experience has shown that the vast majority of unsatisfactory post-UV bacteriological samples are directly related to improper sample-taking techniques.

The SL-1 and MP-2-SL Models Use 1/4" NTP Fittings On The Inlet and Outlet Ports For Collecting Samples

On the SL-1 and MP-2-SL models, we have provided 1/4" NTP threaded fittings on both the intake and discharge UV chamber flange risers. We recommend you use these fittings to collect "before and after UV" water samples to eliminate the possibility of contamination by nearby piping, fittings, etc.

There are a variety of commercial sample collection apparatus available and should you choose one, be sure to follow the manufacturer's recommended procedures.

Should you choose to install sample-taking valves directly into the sample ports provided, we recommend you select a valve with a discharge orifice **no larger than** 1/4" (6mm).

SAMPLING PROCEDURE

The following procedure is recommended for collecting samples for bacteriological analysis when sample valves are installed:

Seven Steps To Collecting A Proper Sample

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 must not exceed 1/4" (6mm) to ensure proper velocity. Prior to taking the sample, it is imperative that the test sample valve be fully opened under full pressure for a complete three and one half minutes. Temporary tubing or some other material may be used to direct the water to a container or drain to avoid unnecessary spillage.

3. After the valve has been left fully open for three and one half minutes, reduce the flow to a reasonable stream of water (not less than 50% of full flow). Continue flowing to drain three 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 oral contamination of the sample. The operator must not allow his finger to touch the inside of the cap or the 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 three hours of sample collection and should comply with accepted standard methods.

The above procedure was developed by a leading national pharmaceutical firm after an 18 month study. It has been found that virtually all removable debris which may accumulate within a sample valve can be mechanically flushed during the procedures detailed above.

We recommend duplicate samples be taken at each test station, during each specific test, to avoid laboratory error and to ensure reasonable repeatability and validity through comparison.

REPLACEMENT PARTS LIST

SL-10A DISINFECTION

Description	Part No.	Voltage/Frequency
UV Lamp	3050	n/a
Quartz Sleeve	3150	n/a
Ballast	4035	120/60
Ballast	3493	236/50
Compression Nut	4252	n/a
O-ring	4253	n/a
Lamp Socket	4247	n/a

SL-1 & MP-2-SL DISINFECTION

UV Lamp	3084	n/a
O-ring	4253 (2 per lamp)	n/a
Lamp Socket	4247 (2 per lamp)	n/a

SL-1 & MP-2-SL TOC REDUCTION

UV Lamp	3087	n/a
O-ring	4253 (2 per lamp)	n/a
Lamp Socket	4247 (2 per lamp)	n/a

SL-1 & MP-2-SL OZONE DESTRUCTION

UV Lamp	3084	n/a
O-ring	12967 (2 per lamp)	n/a
Lamp Socket	4247 (2 per lamp)	n/a

COMMON TO ALL SL-1 & MP-2-SL APPLICATIONS

Quartz Sleeve	3184	n/a
Ballast (SL-1)	4035	120/60
Ballast (SL-1)	3493	236/50
Ballast (MP-2-SL)	3101	120/60
Ballast (MP-2-SL)	3494	236/50
Ballast (MP-2-SL)	4056	100/200, 50/60
Compression Nut	4252 (2 per lamp)	n/a

APPLICABLE TO ALL MODELS

Running Time Meter	3170	120/60
Running Time Meter	3191	240/50
Running Time Meter	3359	115/50
Running Time Meter	3192	200-240/60

AQUAFINE CORPORATION
WARRANTY

Aquafine Equipment is guaranteed to be free from defects in material and workmanship (excluding ultra-violet lamps) for a period of one year from date of purchase. Any part suspected of being defective should be returned to **Aquafine Corporation,** 25230 W. Avenue Stanford, Valencia, California 91355 *(prepaid)*. If upon our inspection the part(s) proves to be defective, it will be replaced or repaired (our option) and returned to sender prepaid.

Before returning any suspected part, contact **Aquafine Corporation** for return authorization and shipping instructions. This guarantee is void if equipment has not been installed and maintained in accordance with instructions. This guarantee is in lieu of all other warranties expressed or implied.

SERIAL NUMBER _____

WETTED PARTS DATA SHEET

Wetted Parts Common To All Aquafine SL Series Ultraviolet Treatment Units

Elastomer Components Common to All "Disinfection" and "TOC Reduction" Models

Elastomer Components Common to All "Ozone Destruction" Models

PARTS	MATERIALS	P/N	STANDARD	NOTES
UV treatment chamber	316L stainless steel		ASTM A240	post-fabrication process: passivation and electropolish.
Quartz sleeves (UV Transmitting)	G.E. type 214 fused quartz	3184 3150	GE Product Standard 8-3-214L	fire polished ends, acid wash/DI H_2O rinse
UV Sensor Probe	316L stainless steel	11883	ASTM A276 & A479	supplied with optional S-254 UV sensor.
UV Sensor Lens	Dow Corning 7940 Fused Silica	4036	Dow Corning Product Std. 8 - 19	supplied with optional S-254 UV sensor.
Closure Plug	316L stainless steel	4002	ASTM A276 & A479	supplied when optional S-254 UV sensor is not ordered
O-ring: UV Sensor Lens Seal	Viton 2-112	13939	ASTM MIL-R-83298	supplied with optional S-254 UV sensor.
T-120 Temperature Safety Control Probe (w/coupling and fitting)	316 stainless steel	12696 (4055)	ASTM A269 & A182	supplied with optional T-120 TSC.
O-ring: UV Sensor Probe Seal	EPDM. FDA approved. Hardness 70± 5	13723	ASTM D2000 M3BA 714 A14B13	supplied with optional S-254 UV Sensor.
O-ring: Quartz Sleeve Compression	EPDM FDA approved. Hardness 70± 5	4253	ASTM D2000 M3BA 714 A14B13	
O-ring: UV Sensor Port Closure Cap	EPDM. FDA approved. Hardness 70± 5	4003	ASTM D2000 M3BA 714 A14B13	supplied when optional S-254 UV sensor is not ordered.
Gasket: End Plate Seal	EPDM FDA approved. Hardness 70± 5	4211	ASTM D2000 M3BA 714 A14B13	
O-ring: UV Sensor Probe Seal	Silicone. FDA approved. Hardness 70± 5	13723	ASTM 3304	supplied with optional S-254 UV Sensor.
O-ring: Quartz Sleeve Compression	Silicone. FDA approved. Hardness 70± 5	12967	ASTM 3304	
O-ring: UV Sensor Port Closure Cap	Silicone. FDA approved. Hardness 70± 5	13724	ASTM 3304	supplied when optional S-254 UV sensor is not ordered.
Gasket: End Plate Seal	Silicone. FDA approved. Hardness 70± 5	12130	ASTM 3304	

Note: All SL Series units are factory supplied with stainless steel NPT threaded closure plugs to seal the 1/4" sample ports. Teflon tape is temporarily applied to facilitate this threaded seal.