

Aquarius[®] Owner's Manual

Deionized Water Heating System



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Materials Warranty

Heateflex® warranties the equipment offered to be free from defects in material and workmanship, under normal handling and proper usage, for a period of one year from the date of shipment. All products purchased from manufacturers by Heateflex® will carry that manufacturer's warranty period. This expressed warranty is in lieu of, and excludes all other representations made by advertisements or by agents. There are no implied warranties for the equipment.

Heateflex® agrees to correct any defect in workmanship or material which may develop under normal handling and proper usage during a period of one year from the date of shipment or, by its option, to repair or replace the defective equipment F.O.B. Arcadia, California, USA. Purchaser's remedies shall be limited exclusively to the right of repair or replacement.

Heateflex® shall not be liable for any expenses incurred by the purchaser or any other person by reason of the use, misuse, sale, or fabrication of the equipment regardless of whether the equipment conforms to the specifications.

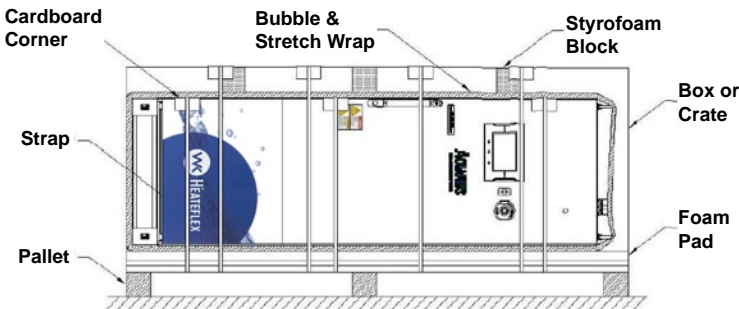
Items returned for warranty repair must be prepaid and insured for shipment. Warranty claims are processed on the condition that prompt notification of a defect is given within the warranty period. Heateflex® shall have the sole right to determine whether, in fact, a warranty situation exists.

Declaration of Conformity to CE

Declaration of Conformity is optional for Aquarius® systems and will be provided as requested and/or as necessary.

Shipping Information

Aquarius® deionized water (DIW) heating systems are thoroughly tested and then packaged and shipped horizontally as shown below. They are wrapped in bubble pack, plastic wrapped, and then placed onto a pallet with a 2-1/2" thick impact absorbing foam pad. The unit is strapped down to a pallet, covered with corrugated box or crating material, and then taped and re-strapped.





1. Receiving Procedures

1.1 Inspection Guidelines

We carefully inspect and properly package each unit before giving them to the carrier. We fully expect your Aquarius® DIW system to arrive at your facility in perfect condition. If damage occurred during shipping, please refer to Sec 2.3.

ALL PRODUCTS ARE SHIPPED F.O.B. FACTORY; THEREFORE, WHEN IT IS DELIVERED TO THE CARRIER, IT BECOMES YOUR PROPERTY. THUS, IT IS IMPORTANT THAT YOU TAKE NOTE OF ANY DAMAGE, WHETHER OBVIOUS OR HIDDEN, AND REPORT SAME TO THE TRANSPORTATION COMPANY WITHIN FIVE (5) DAYS OF RECEIPT OF THE SHIPMENT AT YOUR PREMISE TO AVOID FORFEITING CLAIMS FOR DAMAGE.

1.2 Unpackaging & Handling Guidelines

After a thorough inspection, carefully lift the top of the packaged and tilt it from its horizontal shipping position to its normal functional vertical position. (Note: top of unit is opposite of the plinth base). Remove all packaging materials, including box or crate, Styrofoam blocks, straps, etc. Once unpackaged, the unit can be transported using either the supplied eyebolts or by fork-lift truck using the plinth base.

If using eyebolts, evenly distribute load and respect max parameters:

Eyebolt Parameters	
Cable Angle	Max. Load
45°	1080 lb.
60°	1440 lb.
90°	3060 lb.

If using a fork-lift truck, ensure the unit is less than 3150 pounds.

Then remove stretch and bubble wrap.

All Aquarius® DIW heating systems are equipped with a plinth base to maneuver the them vertically, in its functional orientation.



1.3 What To Do If Your Shipment Is Damaged:

Leave the items, packing material, and carton “as is”. Notify your carrier’s local office and ask for immediate inspection of the carton and its content.

After inspection has been made by the carrier, and you have received acknowledgment in writing as to the damage, please contact our Customer Service Department for return authorization at (626) 599-8566.

If writing for return authorization, please indicate your purchase order number.

We will either repair or replace the unit, depending upon the extent of the damage.

It is your responsibility to follow the above instructions, or the carrier will not honor any claims for damage. If there are any shortages or questions regarding this shipment, please notify us within ten (10) days.





2. Introduction

While the official language of the “Original Instructions” is in English, any interpretation of this Instruction Manual in other Community languages will be discussed by the manufacturer (Heateflex) and the customer on an as required basis.

Your new Aquarius® DIW heating system is engineered to offer a safe, reliable, and effective solution to de-ionized heating needs by providing at temperature ultrapure DIW. These systems are designed to reduce water usage as well as maintain high purity requirements. This has been achieved using our patented Heateflex heaters and Power-to-Flow® Control system.

Heateflex's patented Power-to-Flow® Control system eliminates undesirable overshoots or drops in temperature, which are commonly the result of inadequate PID temperature controllers. Aquarius® systems are designed to maintain accurate user-specified temperature even with process flow rate variations and during recirculation (Systems equipped the recirculation option only). The Power-to-Flow® Control system compensates for changes in the process flow rate by measuring the flow rate of the fluid as it enters the heaters, measuring the temperature at various stages in the heating process, and adjusting the proportion of power applied to each heating zone based on those measurements. This integrated control method is advancement to previous methods of temperature control that reacts quickly and robustly to any variations in flow, providing a steady supply of ultra-pure DIW at a stable temperature.

High purity is maintained throughout the heating process due to the use of PVDF, FEP, and PFA wetted surfaces. Aquarius® systems are equipped with many safeties and to protect the heater modules from unnecessary damage due to overheating, including:

- Thermocouples
- Pressure transducer
- Liquid level sensor
- High-limit sensors
- Flow sensor
- Thermal cut-off sensors

All Aquarius® systems come standard with a pressure by-pass protect against over pressurization of the unit. Shorted SCR sensing has been incorporated in the Aquarius® for added heater protection. A Safety Relay, Safety PLC and GFCI are standard on the Aquarius® which provides added protection to the unit and for operators. To monitor the purity level of the exiting heated DIW, a resistivity sensor is available as an option on Aquarius® systems. The Power-to-Flow® Control system also incorporates the use of a visual touch screen user interface which is straightforward and easy to operate with only a few adjustments needed after initial settings are entered.





Our Aquarius® systems satisfy all CE and SEMI'S Safety Standards and they are equipped with safety devices to protect the users as well as the products that they are processing. These safety devices include:

1. **Emergency Off (EMO) button** - An EMO button located on the front of the unit (and remotely if option is selected) is utilized by the user in the event of an emergency condition to shut power to the unit (and other devices if option is selected). It is a SEMI S2 compliant device with a direct opening action mechanism, and safe break action.
2. **Door Interlock Switch** - A door interlock switch mounted to the front cabinet door is used to indicate if the door is open or closed. If the front door is open, the power will be cut to the unit. This safety device features force guided contacts and a tamper resistant mechanism.
3. **Safety Relay** – The Safety Relay monitors both the EMO button and the Door Interlock Switch. The Safety Relay incorporates redundant relays in conjunction with the emergency off button switch and the safety open-door interlock to achieve safety category 3. The Safety Relay determines whether or not to provide power to the unit.
4. **Ground Fault Circuit Interrupter (GFCI)** – GFCI monitors heater amperage and any circuits containing 120 volts or more if a suspicious current leak is detected in circuitry.
5. **Thermal Cut-Off Sensor** – The thermal cut-off sensor is a thermal sensor which opens once it's breaking temperature is exceeded. It is used to shut down the heater when a runaway heating condition occurs.
6. **Safety PLC (Programmable Logic Controller)** - Safety PLC monitors high-limit thermocouples, GFCI, and Thermal Cut-off Sensor status using redundant force guided relays, and controls the Heater Master Relay (which controls the heater contactor) and the Heater Safety Relay (which controls the SCR output signals to the heater).
7. **Pressure Relief Valves** – Pressure relief valves are installed at the input and output of the unit to relieve pressure if it exceeds the pressure relief set value which protects the plumbing components of the unit and personnel.
8. **Water Leak Deluxe (Optional)** – The water leak deluxe option consists of monitoring for system leaks via water leak sensor and isolation valves which shut off the incoming process fluid and the heaters as well. This option allows the user to isolate and reduce a pressurized system to a zero-energy state prior to maintenance or service work. The system uses two pneumatically or manually operated 2/2-way diaphragm valves to isolate the system. The valves are located at the input and output. (Optional).
8. **Lockout/Tagout (Optional)** - Lockout/Tagout is optional for Aquarius® systems. It provides a fusible disconnect switch on the unit and conforms to SEMI S2-0715 to isolate the unit electrically for maintenance and service. The handle is lockable. If the lockout/tagout is not included, the main disconnect is customer supplied. (Optional)

We are confident in our product quality and reliability, and we offer technical support.





3. Factory Performance Test

The following tests are performed on all Aquarius® systems after assembly and before shipping. The units are tested with DIW supplied to the unit and discharged to drain.

1. A high potentiometer test procedure is performed on the heaters used in Aquarius® systems. The test procedure includes a leak, thermocouple, and resistance test. For detail, reference SOP 1201 High Pot Test Procedure.
2. Voltage, Flow, and Pressure readings on the controller are calibrated as follows:
 - a. Incoming voltage is measured on the input side of the contactor by a voltmeter. If the measured voltage reading does not match the voltmeter reading on the screen, the voltage value is adjusted accordingly by adjusting the voltage calibration parameter which is located on the **System Calibration** screen of the **System Set Up Menu**.
 - b. An external flow meter is plumbed in-line with the DIW heater. The flow reading on the touch screen should match the reading indicated on the external flow sensor. If an adjustment is required the flow meter value is adjusted accordingly by adjusting the flow calibration parameter which is located on the **System Calibration** screen of the **System Set Up Menu**.
 - c. An external pressure meter is plumbed in-line with the DIW heater. The pressure reading on the touch screen should match the reading indicated on the external sensor. If an adjustment is required the pressure value is adjusted accordingly by adjusting the pressure calibration parameter which is located on the **System Calibration** screen of the **System Set Up Menu**.

For more detailed information on the Aquarius® control system and operation screens please refer to the PF3000 controller manual.

3. The Aquarius® control system is monitored and controlled by a Programmable Logic Controller (PLC) and related hardware of the Aquarius® and checked for functionality.
 - a. The inputs and outputs of the Safety PLC are checked and verified.
 - b. All components and sensors are checked and tested.
 - c. Control system functionality are checked and tested.
4. Aquarius® DIW heating systems are tested to operate with the “**Process Temperature Set Point**” parameter set to the maximum temperature possible according to the equation below. This test will insure that all heater modules are operating and full heater power is available.

a. Proper flow rate is calculated with the formula:
$$\text{GPM} = \frac{\text{KW} \times 3.79}{95^{\circ}\text{C} - \text{TEMP INPUT D.I. } (^{\circ}\text{C})}$$

- b. The calculated flow rate is introduced to the DIW heater and the unit is turned on. The DIW heater is allowed to reach the process temperature set point.
- c. At 95°C, the unit may trigger the **High Temperature Alarm**. High Temperature Alarm indicates that adjustments are possibly required. Make adjustments as indicated in the TROUBLESHOOTING GUIDE.





5. Aquarius® systems are tested at “**Process Temperature Set Point**” parameter set below the maximum temperature possible and 1 gpm DIW flow. This will test the performance of the controller.
 - a. The unit is allowed to operate with the controller “**Process Temperature Set Point**” set to a value below the maximum temperature possible and flow set to 1 GPM.
 - b. If the temperature is not stable, confirm that the controller’s parameters are set to factory settings shown in the user’s manual. If further controller tuning is required, see the TROUBLESHOOTING GUIDE.
6. Aquarius® systems pass operational tests of the following safety interlocks or alarms:
 - a. **Components:** Aquarius® components are thoroughly checked for functionality, which includes the Safety Relay(CON2), Door Interlock, EMO (Emergency Off), SCR (Silicon Controlled Rectifier), Safety PLC, High Limit T/C Monitoring, Liquid Level, Thermal Cut-Off Sensor, Leak Sensors (Optional), GFCI, and Current Transformer.
 - b. **Flow Sensor:** The system flow rate is indicated by the FLOW RATE value readout on the **System Status** screen.
 - i) Modify the current “**Low Flow Alarm Set Point**” located on the **System Set Up ► Alarm Set Points** screen.
 - ii) Set the “**Low Flow Alarm Set Point**” value to just above the **FLOW RATE** reading on the **System Status** screen. The Low Flow Alarm will trigger and the controller will disable the heaters and send the unit into **STANDBY** mode.
 - iii) Return the Low Flow Alarm Set Point” to the original setting.
 - c. **Pressure Sensor:** The system pressure is indicated by the PRESSURE value readout on the System Status screen.
 - i) Modify the current “**High Pressure Alarm Set Point**” located on the **System Set Up ► Alarm Set Points** screen.
 - ii) Set the “**High Pressure Alarm Set Point**” value to just below the **PRESSURE** reading on the System Status screen. The **High Pressure Alarm** will trigger and the controller should disable the heaters and send the unit into **STANDBY** mode.
 - iii) Return the “**High Pressure Alarm Set Point**” to the original setting.
 - d. **Output Thermocouple:** The process (output) temperature is indicated by the **PROCESS TEMPERATURE** value readout on the System Status screen.
 - i) Modify the current “**High Temperature Alarm Set Point**” located on the **System Set Up ► Alarm Set Points** screen.
 - ii) Set the “**High Temperature Alarm Set Point**” value to just below the **PROCESS TEMPERATURE** reading on the **System Status** screen. The **High Temperature Alarm** will trigger and the controller will disable the heaters and send the unit into **STANDBY** mode.
 - iii) Return the “**High Temperature Alarm Set Point**” to the original setting.





7. Aquarius® systems with Recirculation Option is tested to ensure optimum functionality and performance during recirculation.
- a. The inputs and outputs of the pump and pump controller are checked and verified.
 - b. Communication between the pump, pump controller, and Aquarius® control system are verified and checked for functionality.
 - c. The pump safeties and/or alarms are tested. This includes the Water Leaks Alarm, which is standard on the Aquarius® system, to ensure that the supply of DIW to the unit is shut off in the case that a critical leak condition is present.
 - d. The unit is allowed to operate with the controller "**Process Temperature Set Point**" set to a value below the maximum temperature possible with the unit in Recirculation to ensure optimal temperature performance during Recirculation.
 - e. All external signals to the Aquarius® system are tested.
 - f. Aquarius® pump air cooling systems are tested to ensure optimal pump performance.





4. Basic Safety Precautions

Every effort has been made to ensure that this unit will run with a minimum of user input or maintenance. However, there are still precautions to be taken whenever operating, performing maintenance, or servicing this unit. This unit makes use of heating elements and electrical components, both of which pose inherent burn, fire, and electrical shock hazards. These hazards can result in injury to personnel, the plant, and/or the process. Please note the following to aid in the operation of your unit and to decrease the risk of the above-mentioned hazards.

Precautions:

- Carefully and completely read through this and all accompanying literature completely to verify that you understand the functionality and features of this system. Please become familiar with the integral safeties and controls within this system, and know their functions.
- Always disconnect all electrical power prior to installing, servicing, or replacing electric heating elements and/or assemblies. The means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rule.
- Electrical termination enclosures should be selected to match the application's environment and be able to withstand worst-case failures, especially in hazardous locations.
- Avoid fire hazards. Electric heaters and their components can develop temperatures that produce an auto-ignition source. Avoid mounting heaters in atmospheres containing combustible gases, vapor, or dust. Article 501 of the National Electrical Code (NEC) requires that the maximum sheath temperature when the heater is continually energized not exceed 80 percent of the surrounding atmosphere's auto-ignition temperature.
- Avoid having heaters come in contact with combustible materials. Keep heaters far enough away from combustible materials to prevent ignition.
- Be aware of the labeling on the unit, such as a lightning-bolt warning symbol, which alerts you to a safety hazard that could harm you or the unit.
- While servicing or operating this unit it is advisable to remove all metal from the individual working on the unit. This includes metal bracelets, rings and jewelry, as well as metal rim glasses and wristwatches.
- Keep your clothing, hands, and feet dry at all times whenever working with electrical equipment.
- Pull the fuses, open the circuit breakers, or disconnect the circuits from their source of power to protect yourself, the test equipment and the equipment under test.
- Do not troubleshoot or service a circuit with the primary power applied.
- If it becomes necessary to work on the unit with the power applied, keep one hand free at all times (behind you).





- Ensure no power applied to a circuit when making continuity or resistance checks.
- Use the correct tools (i.e. screwdriver, alignment tool, etc.) for the job.
- Do not use metal tools around the connectors when there is power to the unit, as they may cause arcing.
- Turn off power before connecting alligator clips to any circuit.
- Do not take anything for granted when working with inexperienced help. Check every operation before they perform it.
- The operation of this unit creates large amounts of heated process fluid. This fluid is likely to be heated to temperatures above the threshold of safety for human contact. Please be advised of this and take the necessary precautions whenever connecting or disconnecting any plumbing from the system. If you are ever in doubt, turn the unit off, and wait an appropriate amount of time before performing any operations or service involving the plumbing.
- The process fluid within this system may also become pressurized from outside flow sources. It is the user's responsibility to verify that pressure within the system has been relieved externally; in order to prevent exposure to hazardous fluid such heated de-ionized water, or heated chemicals and/or acids.
- This unit has several safety interlocks integrated within the system. However, it is the user's responsibility to verify that incoming power has been disconnected from a remote source prior to opening or servicing the unit. This is advised to prevent user exposure to high voltage and current, and reduce the risk of electric shock.
- The function of this unit is to heat process fluid for use in ultra-pure operations. Therefore during normal operation the unit will accumulate heat within the plumbing and the heater compartment. It is our recommendation that the unit is allowed a sufficient amount of time to cool before any maintenance or inspections are made to the unit in order to prevent user exposure to heated surfaces or air.
- The processes in which this unit is intended involve heated fluids. Whenever heated fluids are involved, certain precautions must be taken in order to avoid user injury. This is especially important since it is most likely that this unit will be used with aggressive fluids that can further harm or injure an individual, such as deionized water and process acids. User exposure to these types of materials can result in burning, scalding, and in some cases deep tissue damage. To avoid injury it is the user's responsibility to take the appropriate precautions as outlined above, and in all cases dealing with heated or aggressive materials, to use the appropriate safety equipment, such as but not limited to safety goggles and glasses, and chemically resistant gloves and garments.
- This heater is not intended for use with any liquid other than DIW.
- The heater is not intended for use with flammable liquids. Use of this equipment with flammable liquids will greatly increase the fire risks of the system.

Whenever servicing this unit, at least 300 lumens of light is required; otherwise use portable lighting that does not have to be held.





Warning Labels:

Label Name	Label	Safety Warning
1. Danger Label		High-Voltage Electrical Equipment
2. Warning Burn Hazard		Warning label for high temperature fluid. Release pressure, drain, and cool fluid before opening.
3 Danger Electrical Arc Flash		Danger label for electric arc flash hazard. Wear protective equipment when diagnosing an energized system.
4. Air Supply (with option 01)		Label for maximum air supply pressure.
5. Serial Number Plate		Plate with system model, serial, electrical, and pressure information.
6. Incoming Power Label		Label for incoming power information for voltage, amps, phase, and frequency.
7. Fuse Rating		Label for fuse type and amperage.
8. Door Interlocked		Label for door interlock instructions.
9. Caution Hot Surface		Caution label for hot surface.
10. High Power		Label for high power.





5. Pre-Installation Preparation

Before actually installing the Aquarius® systems, careful attention must be paid to the requirements of the system. As shown in the drawing section of this manual, the system has electrical, plumbing and physical properties that govern how it is to be installed. Input and output connections are clearly marked on the back of each system as well as the incoming voltage. The SCCR is indicated in the QC and name plate. These connections may vary for different models due to the optional features that may have been added or for particular customer needs. These connections must not be connected to any tap or fitting other than that specified for the respective model (please refer to the drawing section of this manual to better understand the configuration of your system).

Other energy sources such as pneumatic (CDA) power may be required for optional features such as the Water Leaks Alarm, Auto Purge (Aquarius® systems only), as well as for the recirculation feature and pump air cooling system of the Aquarius® systems. These requirements will be detailed on respective drawings and be clearly visible and marked on the back of each Aquarius® systems.

It is the responsibility of the user to provide these types of energy sources, i.e. pneumatic (CDA) and DIW and appropriate isolation of all energy sources, including electrical power, if not provided as an option.

To further ease the installation process, lifting lugs have been mounted on each system, which greatly aid in maneuvering the unit to its final destination.

WARNING!

The heater module must be mounted and installed in the vertical position with the plumbing connected as described in the drawing section of this manual. This FEP immersion type heater should always be under liquid when operating.

Operating the heater in air or in a crystalline or precipitate, that may coat the heater, will result in heater burn out and may cause severe damage to your equipment and pose severe risks for a fire.

Units in contact with corrosive or caustic fumes should have the electrical enclosure purged with positive pressure nitrogen to prevent deterioration of controller and electrical components. To prevent heater from generating bubbles, there should be a minimum of 20 PSI pressure from the output.

Failure to conform to this warning will cause severe damage!

Heateflex assumes no risk for noncompliance. Heateflex does not warranty any equipment that does not use Heateflex interlock safety devices.



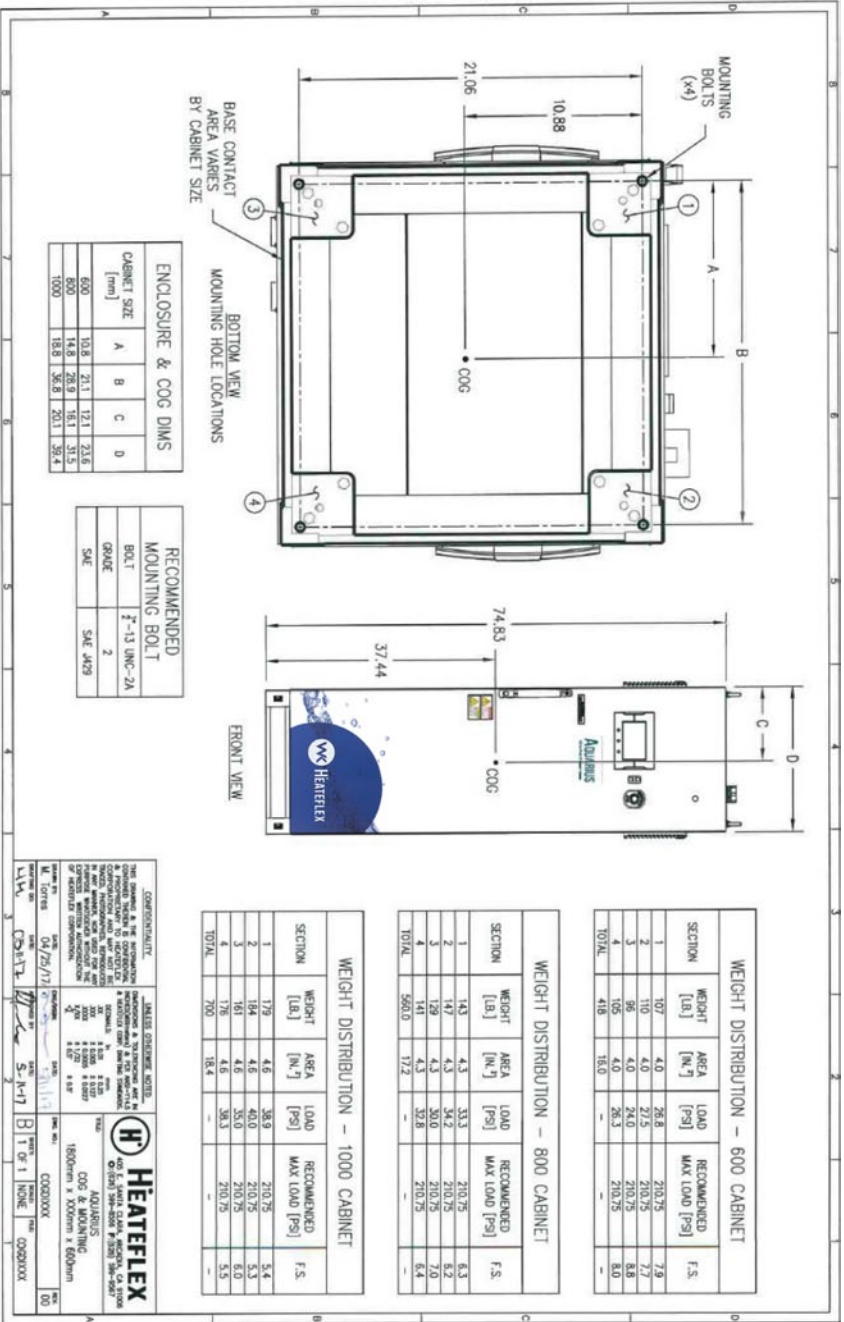


6. Installation Instructions

Your new Aquarius® system has been pre-wired and tested prior to shipment. After proper installation, the unit will supply your heated de-ionized water needs for years to come.

1. Verify that the minimum operating requirements are available. (See the Facility Diagram and the Electrical Schematic drawings in **SECTION II** for more information.)
2. Install the unit in its permanent location. Please ensure that the recommended space requirements required for servicing of the system has been met, as detailed in the Aquarius® Space Requirement drawings. Please provide adequate space to allow the door to open fully or open to 90°.
3. The unit must be secured using the included plinth base mounting brackets to be compliant with SEMI S2-0715. It must be secured to the floor to minimize possible tip over during a seismic event. See the figure below for more information regarding unit attachment.
4. Connect the incoming and outgoing water lines. Use only connection types provided with the unit. (Refer to the drawing section of this manual to for system connections.)
5. Connect the air supply lines and the purge or relief/vent water lines if necessary.
6. Install incoming electrical power from main fusible disconnect (customer supplied) to electrical compartment prior to being powered on. For point-to-point connections see the electrical schematic drawings in SECTION II of this manual. All switches must remain in the OFF position. See the equipment specifications section on the Quality Control Documentation for current rating, operating voltage, and type rating.
 - a. Customer Supplied main fusible disconnect switch must utilize Type J low peak fuses. Consult Equipment Specifications in the Quality Control Documentation for recommended amperage rating.
 - b. If Lockout/Tagout option is selected, Fusible Disconnect is provided. Refer to drawing section of this manual for more information.
 - c. If a stationary appliance is not fitted with a supply cord and a plug, or with other means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under overvoltage category II conditions, means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules. Compliance is checked by inspection.
7. Supply the unit with process fluid (and air if necessary). (Refer to the Facility Diagram in **SECTION II** for more information.)
8. Start-up-procedure
 - a. Be sure all electrical switches and/or circuit protectors are in the OFF position.
 - b. The Customer is responsible for connecting the **Remote EMO** button (optional) according to the schematic diagram provided, or using a jumper if no **Remote EMO** is to be used. (Maximum input resistance is 600 Ohms)







- c. Establish the minimum flow for your system; for information, see the specifications sheet.
- d. Turn-on Customer supplied Fusible Electrical Disconnect. Heater power is available but the unit will not turn on.
- e. Verify that the compact fused disconnect switch(s) are set to the ON position. If light is detected on the compact fused disconnect switch, the fuse(s) may be open and need replacing.
- f. Turn on the unit (by pressing the **"ON"** button on the front of the unit). The controller will load into the **"STANDBY"** mode. Please note that the door must be completely closed in order for the unit to turn ON.
- g. The **ALARM MENU** key will be flashing to indicate unfulfilled alarm conditions, which include but are not limited to the "High Limit," "Low Flow" and "Low Level" alarms. To clear these alarms conditions, fill the unit with the process liquid until full. This will satisfy **"Low Flow"** and **"Low Level"** alarms conditions. Press the **ALARM RESET** key located on the Alarm Menu screen to clear the alarms. The **High Limit** alarm will always be present upon power up.
- h. The customer needs to enter the **"Process Temperature Set Point"** located in the **Control Settings** screen before the unit can process. All the necessary controller parameters have been Factory preset and can be modified if desired. The customer needs to enter and/or review the desired **"Process Temperature Set point"**, "Low" & "High" set points for Temperature, Flow Rate, Pressure, and Resistivity (if the option is available). These values can be found on the **Alarm Set Points** screen. To modify these parameters simply press the data display key to the right of the parameter description to be changed. If key is grayed out, the user will need to log in with appropriate log in credentials to modify these parameters. Select the Login Window Key located on the upper right hand corner. Enter the password into the keyboard and press the **Return** key. Next, select the Process Temperature Set Point window, enter the desired set point value, and press the **Enter** key. The set point value entered will now be displayed.
- i. Once all parameters have been changed to your specifications, go to the System Status screen by pressing the **SYSTEM STATUS** key located at the top right of the touch screen. The System Status screen will allow the user to activate or "Run and/or Stop" the heater. At this point the unit is ready to process. Press the **RUN** key to start heating. The **"STANDBY"** label will switch to **"ACTIVE"** and a green indicating light will illuminate green if all safety devices are in a safe condition and no critical alarms are present. The **"HEATING"** mode green indicating light will turn on and flicker ON and OFF when heating is present. Please note that for Aquarius® systems with the recirculation option, the unit will be defaulted in **"DEMAND"** mode. Please refer to Aquarius® system with Recirculation section of this manual for more information.
- j. This unit will now supply DIW at the process temperature set point that you selected.

For more detailed information on the Aquarius® control system and operation screens please refer to the PF3000 controller manual.





7. System Shut Down Procedure

Before shutting down the Aquarius® system verify that doing so will not adversely affect other equipment, machinery, and/or processes and that it is safe to do so. Prior to powering down the system, place the Aquarius® control system into Standby mode. (Refer to the PF3000 controller manual for more detailed information.) Once the unit is in Standby mode, power down the system by pressing the OFF button which is located on the front of the Aquarius® system. The indicating lamp on the ON button will de-energize and the touchscreen will turn off. Please note that electrical power will remain present within the system until the Aquarius® system has been disconnected from the electrical energy source. To turn on the unit, simply press the ON button located next to the OFF button. The Aquarius® system will always power up in the Standby mode.

It is ultimately the responsibility of the user to verify and provide adequate isolation of all energy sources, i.e. electrical power, pneumatic air (CDA) and DIW. The process fluid within this system may become pressurized from outside flow sources. It is the user's responsibility to verify that pressure within the system has been relieved externally prior to servicing, in order to prevent exposure to hazardous fluid, in this case, heated de-ionized water.

Certain energy isolation devices may be provided with the Aquarius® system as an option, such as an electrical disconnect switch and/or pneumatic AOV valves for process fluids. If provided, the electrical disconnect switch will be mounted in an enclosure located on the back of the Aquarius® system. If provided, the pneumatic AOV valves will be located inside the enclosure in the heater/plumbing section. While energy isolation devices may be provided with the Aquarius® system, it is the responsibility of the user to determine if these options are sufficient and safe based on their requirements.

If the unit is to remain powered off for an extended length of time, it is recommended to disconnect and isolate all energy sources to the Aquarius® system, such as electrical power, pneumatic air (CDA) and DIW.





8. Suggested Operational Inspection

To reduce the possibility of unanticipated problems, the Aquarius® system should be thoroughly checked every 6 months. A thorough inspection should consist of a check for leaks, confirm correct operation interlocks, and verify calibration.

1. Leak Check

- Open door or remove side panels (left or right)
- Pressurize the unit (65 psi. MAX)
- Check all plumbing connectors. If there is a leak, fix or replace the components.

Aquarius® systems are controlled by the PF3000, a PLC-based controller. The controller's basic function is to control the discharge temperature of the water. Additionally, it monitors temperature, flow, voltage, pressure, and resistivity (optional) and provides safety interlocks for the unit.

2. Safety Check

To check Safety PLC's safety circuits, open the controller panel; disconnect one sensor lead wire from the Safety PLC (flow sensor, liquid level sensor, pressure sensor or thermocouple). Note: Opening the cabinet will cause the Door Interlock to trigger shutting down all power to the unit and preventing the unit from starting up. Contact the factory for additional information. The controller should sound an alarm signal indicating an open analog sensor or open thermocouple. Reconnect the sensor to the correct terminal after testing. Test the sensors one at a time. If no alarm sounds, the controller may be defective, contact the factory or replace the controller.

3. Check Safety PLC's Calibration

- Input Thermocouple
- Process Thermocouple
- Flow Sensor
- Pressure Sensor
- Voltage Transducer
- Resistivity (Optional)

Calibration can be adjusted in the **System Set Up ► System Calibration**. A user password is required to modify these values.

9. Decontamination and Decommissioning

Few bacteria live or grow in temperatures in excess of 70°C. However, incoming bacteria may flourish where water is allowed to cool or stagnate in the plumbing unless adequate sanitizing procedures are employed.

Aquarius® systems are compatible with most common sanitizing agent. The system should be disinfected on the same schedule and with the same procedures as the main DIW distribution network.





Verify that the specific sanitation method is compatible with the O-ring material selected. The table (right) indicates examples of acceptable means of sanitation with a given O-ring material for Aquarius® systems. Consult factory to verify other means.

We recommend that users follow proper decontamination and decommissioning procedures when removing Aquarius® systems from service. Please contact us for recommendations on proper disposal or qualified dismantlers in your area.

O-Ring Material	Approved Sanitization Methods
Chemraz 505	Carbon Steel Powder Coated
Viton	H2O2 and HCl

Item	Material of construction
Cabinet	Carbon Steel Powder Coated
Drip Pan	Polypropylene (PP)
Wire Insulation	Polyvinyl Chloride (PVC) Tetrafluoroethylene (TFE)
Plumbing	Fluorinated Ethylene Propylene (FEP) Perfluoro-alkoxy Alkanes (PFA) Polyvinylidene Fluoride (PVDF) Polytetrafluoroethylene (PTFE)

10. Aquarius® with Auto Purge (Optional)

Aquarius® systems features an Auto Purge option that reduces the potential of bacteria growth in the DIW or process fluid and Aquarius® plumbing system. The purge feature of the Aquarius® can be activated or used three different ways:

1. Automated using the PF3000 control logic.
2. Manually through the use of the HMI/Touch screen interface.
3. Remotely through a communications interface.

Heating DIW or process fluid is not permitted while the system is actively purging. Please refer to the PF3000 controller manual for more information on the operation of the Auto Purge feature and HMI/Touch screen operation of the Aquarius® system. The Auto Purge feature is not available on Aquarius® systems with the recirculation feature.

11. Aquarius® with Recirculation (Optional)

Aquarius® systems with the optional recirculation feature have a built-in recirculation system and are equipped with an ultra-pure PFA-PTFE bearing-less pump, pump air cooling system, and safety interlocks. The pump is controlled by a PLC. The Aquarius® recirculation feature is optimized for precise DIW temperature control during recirculation, and provides hot DIW at temperature on-demand. The recirculation feature reduces heat up time by implementing controlled heating at instances when demand is not required. When demand is needed, the Aquarius® system returns to single pass mode and is ready to provide DIW at the specified temperature.

In addition to saving process time, Aquarius® recirculation feature also reduces DIW usage which is an added cost savings for waste water and energy. The ability of the Aquarius® to provide an instant supply of heated DIW negates the requirement for a trickle flow, which is commonly used by DIW heaters to maintain pre-demand water temperature. Aquarius® recirculation feature will also discourage bacteria growth from forming in the process fluid and Aquarius® plumbing, which is essential in maintaining high purity requirements.





11.1 Recirculation Operation

The status of the Aquarius® system with Recirculation is indicated on the System Status screen of the user interface. To access the Recirculation sub-menu, press the Recirculation key (∞). The Recirculation key is located at the bottom left of the System Status screen. The three different modes of the Recirculation System are illustrated by a series of labels and/or illuminated green indicating lights. These three modes are:

1. **Demand:** This is the default mode of the system. The Recirculation System is not active and the fluid is being sent to process.
2. **Venting:** The Recirculation System is preparing to initiate and is filling the pump and plumbing with fluid and/or evacuating any air/bubbles from the plumbing. This mode will activate anytime excessive air/bubbles are detected within the recirculation plumbing.
3. **Recirculation:** The Recirculation System is active and no fluid is being diverted to process. An external signal is required in order to initiate this mode.

The Aquarius® system has been configured to default to the **“Demand”** mode. To place the Aquarius® into Recirculation mode several conditions must occur:

1. The Recirculation System must be enabled.
2. A customer provided “Recirculation Signal” is required to send the system into the Recirculation mode.
3. The Venting mode cannot be active.

If the above conditions are not met, the system will fail to enter **“Recirculation”** mode and remain in **“Demand”** mode. Please note that the presence of any “critical” alarms will abort recirculation by shutting off the pump and deactivating the heaters. Once “critical” alarms are resolved, recirculation will automatically resume but the system will be in **“Standby”** mode and the heaters will remain OFF until the system is placed back into the **“Active”** mode.

Please follow all Pre-Installation Preparation, Installation, Suggested Operational Inspection procedures and the Pump Air Cooling System Set Up and Calibration prior to activating recirculation. This includes the connection of an external maintain switch/signal to the Aquarius® “Recirculation Signal”. The Recirculation Signal is available for Discrete and Ethernet communication connections. Please refer to the specific Electrical Component Layout drawing and the Electrical Schematic drawing for more information.

To initiate the Recirculation mode from Demand mode:

1. Recirculation System **DISABLED / ENABLED** key located on the System Status screen enables/disables the Recirculation System. To enable the system press the **DISABLED** key. The “Disabled” label will change to “Enabled” and will be illuminated yellow.
2. Provide a closed “Recirculation Signal” to the system to initiate the “Recirculation” mode.

To return back to the Demand mode from the Recirculation mode:

1. Provide an open “Recirculation Signal” to the system to initiate the “Demand” mode.

Note: If Recirculation System is disabled, “Recirculation Signal” has no effect on recirculation.





11.2 Recirculation Pump Air Cooling System

Aquarius® systems feature a pump air cooling system that optimizes the pump life and protects the pump motor from over-temperature conditions. The temperature of the pump motor is continuously monitored and during recirculation should the temperature of the pump rise above the Factory defined "Pump Motor Temperature Set Point" the pump air cooling system will initiate. The pump air cooling system will lower or maintain the pump motor temperature and keep it at a safe operational temperature. The pump air cooling system will disengage or shut off once the temperature of the motor is below the Factory defined "Pump Motor Temperature Set Point". It is recommended that the pump air cooling system be utilized for optimum performance. Please follow the Pump Air Cooling System Set Up and Calibration procedures prior to operation of the Recirculation feature.

The Pump Air Cooling System Specifications are listed below.

Pump Air Cooling System Specifications	
The pump air cooling system equipment MUST only be used within the range of the environmental conditions or requirements listed below:	
Air Supply Port	1/2" FNPT
Required Air Supply Tube (Min. - Max.)	3/8" - 1/2"
Incoming Air Supply Pressure (Max.)	60 psi
Regulated Air Pressure (Min.)	20 psi (See plumbing schematic for factory setting)
Pump Motor Temperature Set Point	55°C

11.3 Pump Air Cooling System Set Up

It is recommended that the pump air cooling system be utilized for optimum performance. Please follow the Pump Air Cooling System Set Up and Calibration procedures prior to operation of the Recirculation feature. Provide a steady air supply source for the pump air cooling system as detailed below. It is highly recommended that this air supply source be independent from other system requirements for air.

- 1) Locate the 1/2" FNPT air supply port for the pump air cooling system at the back of the Aquarius®. Please refer to Facility Diagram in **SECTION II** for its specific location.
- 2) Install a tube connector to the 1/2" FNPT air supply port. We recommend using a 1/2" MNPT tube connector with a 3/8" to 1/2" tube size.
- 3) Connect the appropriate air supply tube to the respective 1/2" MNPT tube connector.
- 4) Provide 60 psi maximum of steady air supply pressure. Minimum needed should be equal to or greater than the air regulator setting. See plumbing schematic for setting.
- 5) Proceed with the Pump Air Cooling System Calibration procedure.





11.4 Pump Air Cooling System Calibration

Calibration of the pump air cooling system is necessary once the air supply connection for the pump air cooling system has been completed. This is achieved by regulating the air pressure of the pump air cooling system when it is active. To perform this calibration procedure access to the interior enclosure of the Aquarius® system with the system powered ON is required. Please refer to the PF3000 controller manual for more information on the HMI/Touch screen operation of the Aquarius® system.

Please take extreme cautionary measures as live voltage will be present in Aquarius® system during the Pump Air Cooling System Calibration procedure.

1. Take the appropriate steps necessary to have the Aquarius® system powered ON with the enclosure door open. Please note that the Door Interlock switch will prevent the unit from powering ON when the enclosure door is open.
2. Verify that an adequate steady supply of air is being supplied to the pump air cooling system (60 psi maximum).
3. Locate the pump air cooling system pressure regulator/gauge in the heater compartment of the Aquarius® system and take note of the air pressure reading on the pressure gauge. Please refer to the Mechanical Layout Drawing in SECTION II for its specific location.
4. Turn the Aquarius® system ON, once again with the enclosure door open.
5. Verify that the Recirculation System is enabled which is indicated by an illuminated yellow "Enabled" key on the System Status screen. If the Recirculation System is not enabled press the DISABLED key.
6. Send the unit into Recirculation mode by providing a closed "Recirculation Signal".
7. Once the unit is in Recirculation mode, activate the pump air cooling system temporarily by pressing the "Pump Air Cooling System Calibration ON/OFF" key located on the System Calibration screen.
8. The pump air cooling system will activate for approximately 60 seconds and then shut off. Please note that the air pressure reading on the pressure gauge may drop when the pump air cooling system is actively cooling.
9. With the pump air cooling system active, check the air pressure reading on the pressure gauge and regulate the air pressure of the pump air cooling system to a minimum of 20 psi by adjusting the air pressure regulator accordingly.

Note: regulated air pressure of the pump air cooling system is dependent on the air supply source pressure. Please provide a stable supply of air to the pump air cooling system.





12. Troubleshooting for Aquarius® System

Problem	Solution
Aquarius® system will not power ON	<p>A. Verify factory power is provided to system.</p> <p>B. If option is selected, verify that the fused disconnect switch is set to the ON position.</p> <p>i) If disconnect switch is set to OFF, check continuity of the disconnect switch fuses.</p> <p>C. Verify that the EMO (Emergency Off) Switch is not engaged.</p> <p>D. Verify that the compact fused disconnect switch is set to the ON position.</p> <p>i) If disconnect switch is set to OFF and a light is present, check continuity of the disconnect switch fuses.</p> <p>E. Check system fuses.</p> <p>F. Call the factory for assistance.</p>
Nuisance Hi-Limit Alarm	A. Call the factory for assistance.
Controller returns to "STANDBY" mode from "ACTIVE" mode after ALARM RESET key is pressed and no alarm is indicated.	<p>A. The Auto Reset function is ON (enabled). If undesired, disable the Auto Reset function. (Note: The Auto Reset function affects only the Low Flow Alarm by disabling it.)</p> <p>B. Minimum flow set at 0.5 gpm and actual flow is 0.5 gpm or less. Increase the actual flow to more than 0.5 gpm to switch back to "ACTIVE" mode and to initiate the heaters.</p>
Nuisance Low Level Alarm (from ACTIVE mode).	<p>A. Hot water or fluid has the potential to trap air bubbles. Increase the pressure of the water supply, or restrict the output to increase the back pressure.</p> <p>B. Check the Liquid Level Sensor.</p>
Low Level Alarm (from STANDBY mode)	A. No process flow. Verify that the process fluid supply valve is open allow the process fluid flow through the system heaters
High Temperature Alarm	A. The process temperature has exceeded the "High Temperature Alarm Set Point". If the "High Temperature Alarm Set Point" is set correctly, then make an adjustment in the Control Settings screen to the "Power Adjust" parameter. Reset this parameter to -5 counts. See if this solves the issue. If not, continue reducing the count by five until the issue is resolved.
Low Flow Alarm	A. The flow rate has dropped below the "Low Flow Alarm Set Point" or the minimum required flow rate of 0.5 gpm. Increasing the flow rate or decreasing "Low Flow Alarm Set Point" may resolve this problem. Please note that a minimum flow rate of 0.5 gpm is required for the heaters to turn ON.
High Pressure Alarm	A. Danger – The system exceeds "High Pressure Alarm Set Point". It is recommended that the system pressure be less than 65 psi. Reduce the pressure in the system by shutting off the water supply and opening the output valve.
Discharge Temperature is not stable	<p>A. Check all parameters in Control Settings screen and compare them to Factory Settings.</p> <p>B. Calibrating the Heater Amperage may be needed if the incoming voltage is not following the ordered voltage. It is important that the full load amperage be found and entered into the Heater Amperage value.</p>
The "manual" Purge feature is not functioning (Optional on Aquarius® systems only)	<p>A. Verify that an adequate supply of air is present.</p> <p>B. Verify that the solenoid valves are operational.</p> <p>C. Verify that the air operated valves (AOV) are operational.</p>
Auto Purge feature is not functioning (Optional on Aquarius® systems only)	<p>A. Verify that the Auto Purge feature has been enabled.</p> <p>B. Check the Auto Purge settings.</p> <p>C. The unit is "ACTIVE". The Auto Purge feature can only be activated when the unit is in "STANDBY" mode, the "Auto Reset" is set to ON and there is no flow through the unit.</p> <p>D. Verify that an adequate supply of air is present to the solenoid valves.</p> <p>E. Verify that the solenoid valves are operational.</p> <p>F. Verify that the air operated valves (AOV) are operational.</p>









Problem	Solution
Pump Alarm (Aquarius® systems only)	Please note that this alarm is only active when the Recirculation is "active". A. Verify that the circuit breaker is set to the ON position. B. Check for any loose wiring connections. C. Pump Controller may not be powered ON or voltage supplied to the pump controller is out of range. Check the pump power supply and incoming power to the pump controller. D. Check the motor power cable. E. Check the motor sensor cable. F. Check the Safety PLC interface cable. G. The pump motor temperature is over 100°C. H. The pump motor temperature was higher than 90°C for more than 10 minutes. I. The pump controller temperature was higher than 70°C for more than 10 minutes. J. The pump controller temperature is over 80°C. K. The pump controller has an over current issue or the power channel has been interrupted.
System will not enter Recirculation mode. (Aquarius® systems only)	A. Verify that the Recirculation feature is enabled. B. Verify that the "Recirculation" signal is being sent to the system. C. Vent/Relief is active. Wait until this mode clears. D. Check for any loose wiring connections. E. Verify that an adequate supply of air is present. F. Verify that the solenoid valves are operational. G. Verify that the air operated valves (AOV) are operational. H. The Pump and/or Pump Controller are defective.
System is continuously Venting. (Aquarius® systems only)	A. There is air in the water lines. Wait for the air to vent from the water lines. B. Check the position of the recirculation liquid level (L/L #2) sensor. C. Check for any loose wiring connections. D. Check to see that the recirculation liquid level (L/L #2) sensor cable is connected. E. Verify that the recirculation liquid level (L/L #2) sensor is functional.

For more information, please refer to the PF3000 controller manual.





13. Environmental Specifications

 	High Voltage Electrical Equipment	
 WARNING	This equipment MUST only be used within the range of the environmental conditions listed below	
	Operational usage	INDOOR USE ONLY
	Maximum operating pressure	65 psi at 90°C
	Maximum fluid temperature	90°C
	Temperature resolution	+/-1°C
	Maximum operating altitude	6,600 feet (2,000 meters)
	Ambient temperature range	5°C, ~ 40°C (operating) -40°C, ~ 60°C (storage)
 WARNING	This equipment MUST be installed with customer supplied external switch or circuit breaker. Switch or circuit breaker must be:	<ol style="list-style-type: none"> 1. In close proximity to the equipment 2. Within reach of the operator. 3. Marked as the disconnecting device for the equipment. 4. Disconnect Switch Lockout Tagout Option is available.

Noise level Test Information				
Test Method(s): The evaluator observed the sound levels from various locations around the equipment and from a location representing the typical operator location. The equipment was operated and cycled in its worst-case laboratory condition. Measurements were taken 20 inches away from the front and right side of the equipment at a height of 45 inches from the floor. Measurements at the left and rear of the equipment were restricted due to proximity with the location of the equipment relative to the walls.				
Acceptable results: Maximum sound pressure level does not exceed 80 dB(A).				
Test Results: PASS				
Ambient – 68.8 dB(A) –				
Location:	Front: 68.6 dB(A)	Left: 68.8 dB(A)	Right: 68.7 dB(A)	Rear: 68.8 dB(A)

Note: Operation of the system adds no measurable sound pressure to the local environment.

The energy consumption for idle, average, and peak conditions varies from system to system and depends on how the customer uses the system. For daily energy consumption information, reference the Quality Control documentation.





14. Aquarius® Options

Aquarius® systems can be customized to meet specific customer requirements. Please contact us for Aquarius® options and configurations that are not specified.

Common options include:

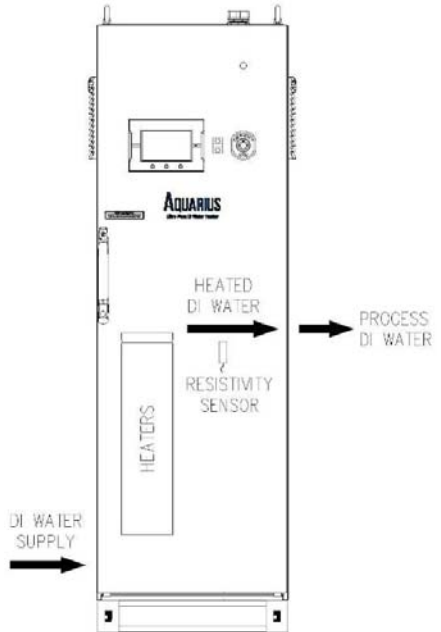
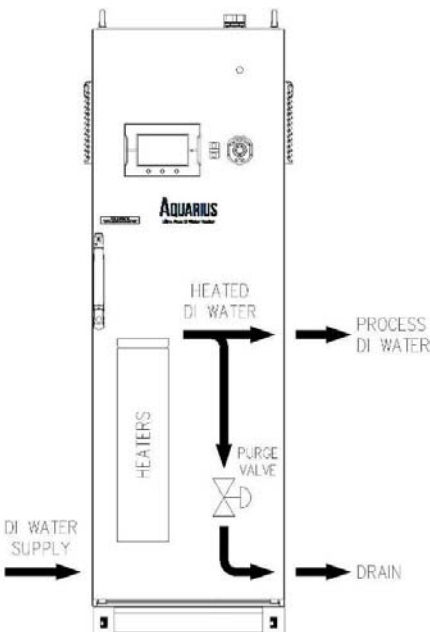
- 160 mm heater modules
- Auto Purge (pump not included)
- Resistivity sensor
- Discrete interface package
- Analog interface package
- Dry contact interface package
- Dry signal for 2nd process set point
- 32 mm internal plumbing size (Flow range = 1.0-18.0 gpm)
- 40 mm internal plumbing size (Flow range = 1.0-32.0 gpm)
- 3/4" or 1" FNPT input/output
- 3/4" or 1" Flare input/output
- 32 or 40 mm BCF input/output
- Manifold for multiple units
- Power supply from bottom of unit
- Lockout tag out box on back of unit
- Disconnect switch box on back of unit
- Incoming power conduit size increase
- Embedded ground wire (1 per heating coil)
- 3/4" Flare drain
- Recirculation

14.1 Aquarius® Auto Purge

The Auto Purge option provides a method for automatic or manual flushing or purging of the Aquarius® system, which eliminates stagnant fluid in the system.

14.2 Resistivity Sensor

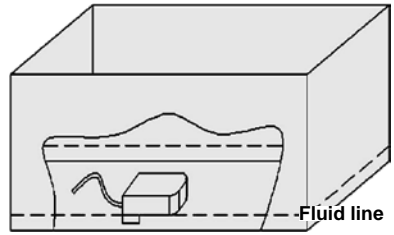
This optional feature allows the user to monitor the purity level of the heated process fluid. In addition a non-critical Low Resistivity Alarm is provided.





14.3 Leak Sensor with Auto Shut OFF

A leak sensor is used to detect fluid in a drip pan, which indicates possible plumbing failure or an excessive leak condition. If the sensor detects fluid, a non-critical or critical alarm is triggered, depending on user setup. If it is set to use a critical alarm and the shutoff option is available, it automatically shuts off any fluid entering the system, disables the heaters, and shuts off the pump if applicable.



14.4 Analog Interface Package

This option gives the user the ability to remotely enter the “**Process Temperature Set Point**” and to monitor the temperature and flow rate of the Aquarius® system.

This interface package provides the following 4-20 mA analog signals:

- **Remote Temperature Set Point** – 0.0 to 95.0°C
- **Temperature Retransmit** – 0.0 to 100.0°C
- **Flow Rate Retransmit** – 0.0 to 13.0 gpm (Standard 3/4” Tube or 25 mm plumbing), 0.0 to 18.0 gpm (32 mm plumbing), or 0.0 to 32.0 gpm (40 mm plumbing)

14.5 Discrete Interface Package

This optional interface package includes:

- **Remote Purge** – allows the user to monitor and control the purge function of the unit (provided that the Auto Purge option is selected).
- **Remote Emergency Off (EMO)** – allows the user to shut off the system from a remote location and/or from other equipment associated with the Aquarius® system.
- **Alarm Status signal for Critical Alarms** – provides a signal to a remote location should a critical alarm be triggered.
- **Alarm Status signal for Non-critical Alarms** – provides a signal to a remote location should a non-critical alarm be triggered.
- **Temperature Ready Dead Band Signal** - This feature provides a dry contact signal to notify the user that the Process Fluid Temperature is within a specified dead band range. The “Temperature Ready Dead Band Signal Set Point” can be modified according to the customer’s requirements.
- **Remote Alarm Reset** – allows the user to reset the alarm from a remote location. Note that the **GFCI Alarm** may not be reset using this option.
- **Remote Stop (Standby)** – allows the user to remotely “Stop” the system (Standby mode) disabling the heaters from a remote location. The **RUN** key must be pressed first in order to utilize the “**Remote Stop**” function.





14.6 Dry Contact Interface Package

This optional interface package provides these dry contact relays:

- Active Mode
- Temperature Ready Dead Band Signal
- Main Alarm
- Open Sensor Alarm (analog sensors, Process T/C and High Limit T/C)
- Low Level Alarm
- Door Open
- High Temperature Alarm
- Low Temperature Alarm
- High Flow Alarm
- Low Flow Alarm
- High Pressure Alarm
- Low Pressure Alarm
- EPO Signal
- Drip Leak Alarm
- Open Thermal Cut-Off Alarm
- GFCI Alarm
- Water Leak Alarm
- High Limit Alarm

14.7 Cable Assemblies

To provide easy connectivity to the Aquarius® system cable assemblies are available for:

- Discrete Interface
- Dry Contact Interface
- Analog Interface
- Ethernet

14.8 Secondary Process Temperature Set Point

This allows Aquarius® systems to quickly change between a primary process temperature set point to a different or secondary set point and vice versa using a remote digital signal.

14.9 Aquarius® Recirculation

This feature is available only on Aquarius® systems and provides a built-in recirculation system that has been optimized for precise DIW temperature control during recirculation and provides hot DIW at temperature on-demand. In addition, the recirculation system reduces DIW usage and reinforces high purity requirements by discouraging bacteria growth from forming in the process fluid and Aquarius® plumbing.





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