

# *SX Heaters Owner’s Manual*

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## 1. Introduction

This in-line point-of-use fluid heating system will accurately heat and maintain the temperature of your process fluid. For best results, we recommend users read this manual and accompanying literature to familiarize themselves with all features and functions.

## 2. Description

This electric heating system is a high-tech piece of equipment incorporating many design innovations and precautionary measures to insure safe and reliable operation under normal conditions. It incorporates features that enable it to maintain purity levels. The construction of the fluid handling components of this unit use high purity stainless steel components all manufactured from 316L grade material. The safety systems used within the unit incorporate over-temperature protection, over-current protection, and a user-controlled emergency disconnect switch. Our proven technologies enable the unit to effectively reach and maintain desired temperatures.

## 3. Shipping Instructions

- The proper shipping procedure for the heater includes shipping the unit in a horizontal position.
- The heater is factory tested to ensure you receive an operational unit.
- The unit is packaged and shipped in a horizontal position, face up.
- The unit is wrapped in bubble pack, then placed onto a pallet.
- The unit is strapped down then covered with a corrugated box or crating material.

## 4. Receiving Inspection Procedure

This shipment was carefully inspected, checked and properly packaged at our company and delivered to the carrier in good condition. We fully expect your merchandise to arrive in your hands in good condition.

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. REPORT THIS INFORMATION TO THE TRANSPORTATION COMPANY WITHIN 5 DAYS OF RECEIPT OF THE SHIPMENT AT YOUR PREMISES TO AVOID FORFEITING CLAIMS FOR DAMAGE.

### What to do if 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 contents.
- 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 **(435) 783-6040**. If writing for return authorization, please indicate your purchase order number.
- We will either repair or replace the merchandise 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 10 days.

## 5. Specifications

**THIS EQUIPMENT MUST ONLY BE USED WITHIN THE RANGE OF ENVIRONMENTAL CONDITIONS LISTED BELOW**

|                             |   |
|-----------------------------|---|
| Operational usage:          | INDOOR USE ONLY   |
| Maximum operating pressure: | 65PSI at 95°C   |
| Maximum fluid temperature:  | 95°C  |
| Temperature resolution:     | +/-1°C  |
| Maximum operating altitude: | 6,600 ft (2,000 meters)   |
| Ambient temperature range:  | 5°C ~ 40°C (operating)<br>-40°C ~ 60°C (storage)  |
| Maximum relative humidity:  | 80% up to 31°C<br>76.7% at 32°C<br>73.3% at 33°C<br>70.0% at 34°C<br>66.7% at 35°C<br>63.3% at 36°C<br>60.0% at 37°C<br>56.7% at 38°C<br>53.3% at 39°C<br>50.0% at 40°C and above |

**THIS EQUIPMENT MUST ONLY BE USED WITH SAFETY COMPONENTS (TEMPERATURE CONTROLLER, LEVEL CONTROLLER, HI-LIMIT CONTROLLER, ETC.) THAT IS APPROVED TO EIC/EN STANDARDS CONDITIONS LISTED BELOW**

## 6. 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, plant, and/or process. Please note the following to aid in the operation of your unit and to decrease risk of the hazards mentioned above.

- Carefully read completely through this and all accompanying literature 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 function.
- Always disconnect electrical power prior to installing, servicing or replacing electric heating elements and/or assemblies.
- 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 labeling on the unit, such as a lightning-bolt warning symbol, which alerts you to a safety hazard which could harm you or the unit.
- While servicing or operating this unit is advisable to remove all metal from your person. 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 trouble shoot 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).
- Be certain that there is no power applied to a circuit when making continuity or resistance checks.
- Use the correct tool (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 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
- This function of this unit is to heat process fluid for use in ultra-pure operations. Therefore, during normal operation unit will become heated 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 used 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 highly likely that this unit will be used with aggressive fluids which can further harm or injure an individual, such as de-ionized 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.

## 7. Installation Procedures

Installation of this unit consists of first verifying that the minimum facility requirements for normal operation can be met. Once the mounting requirements are completely understood and it has been verified that they can be met, the next step would be locating where the unit will be used.

The unit should then be fastened in a manner consistent with the accompanying documentation with the appropriate mounting hardware and then a final check should be made to ensure that all venting and clearance requirements are met before connecting incoming power. It is also recommended that the minimum safety requirements be met, prior to initial unit power-on. The unit must be mounted in such a position that it does not exceed a tilt of 10° in either the vertical or horizontal directions.

Once the unit is secured in its operational position, the water lines can be introduced. The input can be brought directly to the appropriately labeled connector. For the types of fittings included, refer to "Specifications" section (pg. 2). Once the appropriate plumbing has been connected, water should be run through the system without the power connected to check for leaks. If no leaks are present, incoming power and the appropriate signals may be brought in.

Incoming power should be brought in through the conduit fitting located on the bottom of the cabinet. Also, an appropriately sized external disconnect switch should be used with the unit to protect the operator during servicing. Incoming power can be brought into the unit, after the appropriate external fused disconnect switch, or circuit breaker. For the incoming power requirements, refer to "Specifications" section (pg. 2). Please ensure that the external disconnect is in the off position while you are attaching the incoming power, and refer and review the "Safety Precautions" section (pg. 2) before attempting any electrical work. Once the incoming power connections are secure, ensure that the cabinet door is closed and locked before activating the external disconnect. Once these conditions are met, refer to the "Operating Instructions," section (pg. 4).

## 8. Operating Instructions

**INSTRUCTIONS MAY DIFFER FOR YOUR UNIT. CONTACT WHITE KNIGHT FOR DETAILS.**

Prior to any operation of this unit, we recommended users read and understand the "Safety Precautions" section of this manual (pg. 4). After understanding these items, the procedure below details basic operation.

Basic operation of the unit consists of verifying that all safety conditions are met, and then setting the operational parameters. Once these two steps are complete, the unit should provide process fluid at the required temperature, and run with no normal user intervention.

Ensuring that safety conditions are met prior to initial unit power-on consists of checking that fluid is actually flowing to the unit, and verifying that all minimum safety requirements are met. Once this has been established, the unit can be powered on for the first time. Once all the conditions are met, and the unit is powered on, it will return a low flow condition and a high limit failure by default. Press the "Low Flow Reset" button for three seconds. The unit will check for an adequate flow condition, and if one exists it will begin to bring the temperature to the set point. Then the "Hi-Limit Reset" button should be depressed, in a fashion similar to the "Low Flow Reset". If the condition is safe the unit will begin to bring the fluid temperature to setpoint. Every time the unit is powered on, the "Low Flow Reset" and "Hi-Limit Reset" buttons will need to be depressed. The next step then is to set the process set point to the required temperature. This is accomplished by the following:

- Refer to the temperature controls panel, and verify that it is displaying the process temperature in the proper units. If it is not, refer to the accompanying temperature controller manual.
- Once the controller is displaying the proper units, the set point can be adjusted by first momentarily pressing either the up or down key on the controller to view the current set point.

- Momentarily pressing either the up or down key on the controller will then change which numerical position is to be adjusted. The flashing digit is the highlighted digit.
- Pressing and then holding either the up arrow key, or the down arrow key will either increment or decrement the highlighted value.
- By momentarily pressing the up or down key on the controller, you can select the next value of the temperature you wish to adjust. Repeat the procedure in step five to adjust the next value of the temperature you have selected.
- After approximately 10 seconds of user inactivity, the controller will return to operation, and will try to control the temperature to the current set point.
- The first time the unit is powered up, it is also recommended that the Auto Tune procedure be run. Once the set point has been adjusted to normal operating conditions, the Auto Tune procedure can be run. To start the Auto Tune procedure, press and hold the up arrow and down arrow keys simultaneously for 3.2 seconds, then release. The display will begin flashing, and will continue to flash throughout the Auto Tune process. For more details of the Auto Tune process, refer to the accompanying controller manual.
- You will not need to run the Auto Tune procedure again unless you significantly change the value of the set point, or if system stability is unacceptable.
- Once you have completed the above procedures, the unit is ready to heat fluid. No further calibration or set up is necessary for the controls in order to process the fluid at the correct temperature.
- The automatic temperature controller included with this unit uses a combination of PID and fuzzy logic. Due to the manner in which this unit operates, it does not require regular re-calibration or maintenance. The only sort of calibration that is required is the Auto-Tuning process. This process is used to provide the controller with the reference values for the P, I, and D parameters of the controller. The Auto-Tuning process only needs to be completed upon the initial operation of the unit, if the set-point of the unit has been changed by a large amount, or if system stability is unacceptable. To Auto-Tune your unit please refer to page 19 of the accompanying controller manual for the details of this procedure.

## 9. Warranty

White Knight follows strict manufacturing, assembly and testing procedures to ensure consistency and reliability.

White Knight warrants SX heaters and components are free from defects in materials and workmanship for one year from our shipment date. Failures due to normal wear, misuse, abuse or unauthorized disassembly nullify this warranty.

White Knight does not guarantee the suitability of products for specific applications. White Knight is not liable for any damage or expense resulting from use or misuse of its products in any application. Responsibility is limited solely to repair or replacement of defective products or components.

Prior written, faxed or emailed approval must be obtained from White Knight before returning any product or component for warranty consideration. All determinations regarding cause of failure are made by White Knight, and all decisions regarding warranty fulfillment or nullification are made by White Knight.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY GUARANTEE OF SUITABILITY FOR ANY PURPOSE. NO VARIATIONS OF THIS WARRANTY SHALL BE HONORED NOR CONSIDERED LEGALLY BINDING, EXCEPT WRITTEN AGREEMENTS SIGNED BY THE CEO OF WHITE KNIGHT FLUID HANDLING.

Tim White, CEO  
White Knight Fluid Handling



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