Water Temperature Control Unit

Service and instruction manual

S, A, K, and H Series Water Units

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DO NOT DISCARD: IMPORTANT INFORMATION INCLUDING REPLACEMENT PARTS
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SAFETY GUIDELINES

SAFETY SYMBOLS AND DESCRIPTIONS

High Voltage Hazard

The equipment is supplied with 3-phase electrical power. Components inside this equipment may have live power. Use caution when servicing this equipment.

Hot Surface Hazard

This equipment has the ability to operate above 212°F (100°C). The surface of the equipment’s cabinet and connected piping may reach excessive temperatures. Use caution when servicing this equipment.

Caution

This equipment can cause a potentially hazardous situation. If caution is not taken, there is a potential for injury or property damage.

WARNINGS AND PRECAUTIONS

The Delta T Systems Water Temperature Control Unit is designed to provide safe and reliable operation when installed and operated within design specifications, following national and local safety codes.

To avoid possible personal injury or equipment damage when installing, operating or maintaining this equipment, use good judgment and follow these safe practices:

1. Compliance and recognition of the following precautions are the sole responsibility of the user of this equipment.
2. Do not operate or service this equipment until you have read and understand the manual supplied with this equipment.
3. Only qualified personnel familiar with the information within this manual should install, use, or service this equipment.
4. Follow all Safety Codes.
5. Wear safety glasses and work gloves.
6. Install and ground equipment per NEC code and local requirements before switching on main power.
7. Operate equipment within design specifications.
8. Unrestricted flow of fluids to drain service must be provided.
9. This equipment may contain dangerously hot fluids which may cause components, cabinets and piping to be a burn hazard. Do not come in contact with hot fluid or piping.
10. Cool equipment down to at least 125°F prior to shutting down and relieve internal pressure from air and fluid supply before disconnecting or servicing this equipment.
11. When welding or brazing in or around this equipment be sure there is adequate ventilation. Protect adjacent materials from flame or sparks by shielding with sheet metal. An approved fire extinguisher should be close at hand and ready for use if needed.
12. Do not operate equipment without covers installed and do not jump or bypass electrical safety controls.

13. Control power switches do not remove power to all terminals. **Turn off or disconnect main power to unit when not in use, or for service.**

14. Do not restore power until all tools, test equipment, etc. have been removed and the panels replaced.

15. Open, tag and lock all disconnects before working on equipment. It is best practice to remove all the fuses and carry them with you.

16. Make sure the temperature control unit is properly **grounded** before switching power on.

17. Disconnect and lock out input power before servicing this equipment.

18. Shut off equipment using main electrical disconnect.

19. **Do not operate or allow equipment to run unattended!!**

20. **NEVER pressurize reservoir tanks if tank is included on unit**
GENERAL INFORMATION

PURPOSE OF INSTRUCTIONS

These instructions are furnished to simplify and minimize your work of operating and maintaining Delta T Systems Temperature Control Units.

Your acquaintance with the construction and characteristics of these units will help you obtain optimum performance, reduce shutdowns and increase service life.

Some units may be modified for specific applications from those described in this bulletin and other changes may be made without notice.

EQUIPMENT DESCRIPTION

Delta T Systems Water Temperature Control Units are reliable and provide accurate temperature control. They are self-contained, fully assembled and ready to use.

As standard, most water units only require the proper 3-phase electrical supply and a water supply that supplies a minimum of 10 psi to function. Most units can operate up to 250°F (optional 300°F) and are designed for use with city water, well water, tower water, and water/glycol mixes supplied from chiller systems. Any other fluid is prohibited.

A properly installed, operated, and maintained unit will provide many years of reliable operation. To get the most satisfaction from your new portable temperature control unit, please read and follow the instructions in this manual.

MODELS COVERED

This manual provides operation, installation and maintenance instructions for S, A, K, and H series Delta T Systems Water Temperature Control Units.

Model numbers can be found on the unit’s nameplate. **If contacting Delta T Systems, please have your model number and serial number available.**

Model numbers ending with “S” indicate a specially constructed unit, not all information in this manual may apply.

INCLUDED DOCUMENTS

The following documents are included for the operation and maintenance, of your Delta T Systems Water Temperature Control unit and internal components.

- This manual
- Electrical schematic
- Flow schematic

STANDARD EQUIPMENT FEATURES

- 250°F/121°C Fluid Operating Temperature
- Microprocessor-Based PID Controller
- Horizontally-Mounted Pump to Promote Extended Seal Life
- Motor Overload Protection
- Over Temperature Protection
- Low Water Pressure Protection
- High Pressure Safety Relief Valve
- Liquid-Filled Delivery and Return Pressure Gauges
- Fully-Insulated Heater Tank
- Grounded Circuit Control with Fused Transformer
- Pilot Lights indicating Separate Functions of Use
- Rugged, Heavy Gauge Sheet Metal Cabinet
- 3” Industrial-Grade Casters
- Ease of Service Design
- NEMA 1 Electrical Specifications & Wiring in Conformance with NEC Electrical Codes
SHIPPING INFORMATION

RECEIVING AND INSPECTION

Every Delta T Systems Water Temperature Control Unit is shipped in a custom-made wood crate to ensure the integrity of the unit when it is received at your facility.

If the crate seems to show signs of damage, thoroughly inspect the equipment for any signs of damage that may have occurred in transit. If components are broken or damaged, refer to www.deltatparts.com or contact Delta T Systems for potential return to the factory for recertification and repair.

UNCRATING YOUR UNIT

CAUTION: Steel banding may spring back and cause injury!

The crate and unit are heavy and should not be moved without the aid of a hand truck/fork lift.

First, remove sides and top from the base, but leave the unit banded to the base.

Then, cut steel banding to release the unit from the base.
INSTALLATION

WORK RULES

The installation, operation, and maintenance of this equipment must be conducted in accordance with all applicable work and safety codes for the installation location. This may include, but is not limited to OSHA, NEC, CSA, and any other local, national, and international regulations.

- Read and follow these instructions when installing, operating, and maintaining this equipment. If the instructions become damaged or unreadable, obtain additional copies from Delta T Systems.
- Only qualified personnel familiar with this equipment should work on or with this water temperature control unit.
- Work with approved tools and devices.
- Disconnect the electricity before maintenance or service.

UNIT LOCATION

The unit is designed for indoor installation where the temperature of the room is between 40°F and 120°F. The equipment must be installed on a rigid surface suitable to support the full operating weight of the unit. Level all equipment to ensure proper operation.

The unit must be in an accessible area. To allow for proper maintenance and servicing of the unit, consider accessibility to all components when locating the unit. In general, whenever possible allow a minimum of 36 inches of clearance around all sides and above the unit for maximum ease of service and maintenance. Avoid locating piping or conduit over the unit. This ensures easy access with an overhead crane or lift to lift out heavier components when they are replaced or serviced.

When locating the unit, it is important to consider proper ventilation, especially in high ambient temperature conditions. For proper ventilation and heat dissipation, allow adequate room on both sides of the unit. Failure to do so may lead to overheating of the motor windings and other components which can cause premature component failure.

RIGGING

The unit has a structural steel base with casters to facilitate easy movement and positioning. Follow proper rigging methods to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the unit. Use pads where abrasive surface contact may occur. Use the frame supporting the unit for positioning it with a crane or forklift.

ELECTRICAL CONNECTIONS

WARNING: Electrical shock hazard

Check identification plate to make certain your electrical service conforms to unit specifications and amperage draw. Have a qualified electrician bring properly sized power leads and ground from a fused disconnect to the unit. Make certain the disconnect switch is sized according to the National Electrical Code recommendations.

- Electrical connections must comply with all applicable electrical codes.
- The temperature control unit must be grounded in accordance with NEC Article 250.

Before applying power: Tighten all electrical terminations or connections and inspect for damage to wires and components. Electrical connections can become loose during shipping.
Piping Considerations

When installing the unit, all connection piping and hoses should follow these considerations:

- All external hose, valves, fittings, and piping should be rated for a minimum of 150psi and 250°F (Optional 300°F).
- All external hose, valves, fittings, and piping should not be smaller than the size of the connection. This will help reduce restrictions.
- If quick disconnects are used, be careful to minimize pressure drop. Do not use quick disconnects with check valves unless absolutely necessary.

**CAUTION:** Do not install back flow preventing devices on the water supply line without a pressure relief piped to drain. Failure to do so will result in a dangerous overpressure of the system.

Process Connections

Every Delta T Systems Water Temperature Control Unit connection is clearly labeled on the back of the unit. Make sure you carefully select components with the minimum rating recommended in this manual.

**DELIVERY** – Connect this port to the Water In port on your process

**RETURN** – Connect this port to the Water Out port on your process

<table>
<thead>
<tr>
<th>Process Connection Chart:</th>
<th>Water Series</th>
<th>Delivery Size</th>
<th>Return Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini (M)</td>
<td>¾”</td>
<td>¾”</td>
<td></td>
</tr>
<tr>
<td>Compact (S)</td>
<td>¾”</td>
<td>¾”</td>
<td></td>
</tr>
<tr>
<td>Accent (A)</td>
<td>1-½”</td>
<td>1-½”</td>
<td></td>
</tr>
<tr>
<td>Upright (K)</td>
<td>1-½”</td>
<td>1-½”</td>
<td></td>
</tr>
<tr>
<td>High-Cap (H)</td>
<td>1-½”</td>
<td>1-½”</td>
<td></td>
</tr>
</tbody>
</table>

To ensure maximum efficiency, the process water piping circuit should be designed to avoid excessive use of elbows and/or lengths of pipe or hose. If hose is used, avoid tight bends, twists, and curls.

Valves, filters, and strainers may be installed in the process piping circuit to aid in maintenance, provided that such devices maintain full inside diameter of the process connection. If installed, conduct regular maintenance to guarantee the devices are clean and not restricting the flow to the process.

Water Supply Connection

Delta T Systems Water Temperature Control Units are designed to run with water or a water glycol mix. The use of any other fluids is prohibited. The minimum water supply pressure is determined by the maximum operating temperature rating of your specific unit. Your static water supply pressure can be read from any pressure gauge when the unit is OFF.

**WATER SUPPLY** – Connect this port to your plant’s city water, well water, tower water, or chilled water supply.

<table>
<thead>
<tr>
<th>Water Supply Connection Chart:</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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</tr>
</tbody>
</table>
The use of raw and untreated water may result in large deposits of scale which will reduce the optimum performance of the unit and will lead to component failure and unscheduled downtime.

If your water supply exceeds 70 PSI, a regulator and relief valve may be required to prevent a high-pressure condition.

**CAUTION:** Do not install back flow preventing devices on the water supply line without a pressure relief piped to drain. Failure to do so will result in a dangerous overpressure of the system.

**Water Connections (Separate Source Cooling Option)**

**WARNING:** Use proper temperature and pressure rated piping and hose for external connections to the unit.

**WARNING:** Using small diameter lines restricts flow and heat transfer.

Your Delta T Systems Water Temperature Control Unit is designed to operate using most water sources available, however, service life is greatly diminished by hard or corrosive water. These water sources cause control problems that will eventually damage your equipment.

A specially designed shell and tube type heat exchanger is provided as standard equipment in units with this feature. It requires a water inlet and drain connection. The drain outlet should be unrestricted without back pressure and should be directed away from all personnel.

It is highly recommended that you have a treated water source available for this equipment.

**Drain Connection**

During operation, the drain port on your unit should always be open. A closed or plugged drain line will prevent cooling and cause an over temperature situation.

**DRAIN** – Connect this port to either an open drain for city or well water, tower water system return, or chiller system return.

**Drain Connection Chart:**

<table>
<thead>
<tr>
<th>Water Series</th>
<th>Port Size</th>
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<tr>
<td>Mini (M)</td>
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</tr>
</tbody>
</table>

To ensure maximum performance, *keep the back pressure of the drain line to a minimum.*
FIRST TIME STARTUP PROCEDURE

Please note before starting unit:
The controller provided with your Delta T Systems Temperature Control Unit has already been fully programmed. Any attempts to re-set values may cause a malfunction to the unit’s operation.

PRELIMINARY OPERATIONS

Prior to following the startup procedures, please make sure that all of the following items have been completed.

1. Check to make sure the applied 3-phase voltage matches the unit nameplate within 10%.
2. Install all the process, supply, and drain connections.
3. Ensure all the service panels are installed.
4. Check the static water pressure of the water supply line, which must be above 10 PSI.
5. Connect the main power to the unit and follow the startup procedure.

CAUTION:
Your Delta T Systems Water Temperature Control Unit operates with hot water under pressure. To reduce the risk of scalding:

- Always wear work gloves and safety glasses when operating the unit
- Never operate the unit with cabinet panels removed
- NEVER install or use a hose or fitting that is rated less than 150 PSI and 250°F

To reduce the risk of electrical shock:

- All electrical installation and repairs should be done by a qualified electrician
- Ground the unit in accordance with electrical codes
- Never attempt repairs without disconnecting and locking out main power
- Never jump or deactivate any safety device

STARTUP PROCEDURES

1. After you complete all necessary connections, turn on the water supply.
2. Check for correct pump rotation:
   I. On units not equipped with auto-vent, press the vent switch.
   II. Toggle the on/off button and observe rotation and/or discharge pressure. Rotation should match the motor marking and the unit should build discharge pressure. Tips to observe motor rotation:
      a. If visible, observe the cooling fan rotation on the back of the motor.
      b. If accessible, mark a rotating component (shaft, flinger, etc) with marker or paint pen:
   III. If necessary, change pump rotation following the steps below
      a. Disconnect and lock out incoming power to the unit.
      b. Reverse leads L1 and L3 on incoming supply power.
      c. Do not switch leads at the motor, contactors, or starters.
      d. Recheck for proper rotation and pressure when unit is running.
3. Once pump rotation is correct, turn the ON/OFF switch to “ON”. As standard, every Delta T Systems Unit comes with an automatic vent procedure upon power up for 3 minutes. During this time the unit will not heat. If your process is large, it may require additional venting.
4. Once the unit is fully vented, the initial installation is complete and the unit will control to the set point on the digital PID controller (found on the front).
CIRCULATION OF WATER IN THE SYSTEM

Water is circulated through the system by a centrifugal pump. Delivery and return manifolds may be used to direct flow through various areas of the process. Most units are of the "direct injection" type but some units will have a heat exchanger installed for cooling purposes.

Other units might have a reservoir tank. Please check your flow schematic for complete details.

Upon Start-up of a new or reconnected unit, the pump and motor should always be checked for proper rotation.

OPERATION

When the ON/OFF switch is in the “ON” position, the unit is energized and supplies power to all controller functions. When the switch is in the “OFF” position, power to the unit controls is de-energized. The “VENT” switch and primary circuit remain energized.

Process temperature is maintained by the controller in the unit and is determined by set point temperature. Refer to the specific controller operation bulletin for setting the required process temperature and other features.

SHUTTING DOWN YOUR UNIT

Prior to shutting down the temperature control unit after operation, cool the unit down below 100°F (Push and hold the Cool button). This will help prevent scale build-up on key components. Failure to do so may result in reduced life of the unit. Then the water supply to the control unit should be shut off. Push and hold the “VENT” switch for several seconds to relieve internal pressures.

CAUTION:

- Removal from service should only be made by qualified maintenance personal.
- Turn off or disconnect main power to unit when not in use!
- NEVER attempt to remove a temperature control unit from operation before the pressure and electrical connections have been properly shut off. Severe personal injury or death could result if system pressure is not relieved of water or air pressure and electrical connections are not disconnected and locked out prior to removal or servicing.

If your temperature control unit is to be removed from service for an extended period of time, it should be thoroughly drained. Drain plugs are provided within the control unit at key locations for this purpose.

Note: Storage or shipping of units in areas with freezing temperatures may result in damage to the unit, if the unit is not thoroughly drained.

CONTROLLER OPERATION

See the Controller bulletin for instructions on the controller in your unit.
ROUTINE MAINTENANCE

Periodic inspection of the following equipment must be made to maintain optimum performance of your Delta T Systems Water Temperature Control Unit.

**WARNING:**
- Improper electrical connections can damage the unit and cause serious operator injury or death.
- Disconnect all power to the unit, let the unit cool down, relieve all pressure, and turn off the water prior to any servicing.

**CAUTION:**
- All electrical connections must be done by a qualified electrician. Never attempt to service a unit until a qualified electrician has opened and locked out the main disconnect using proper safety procedures.
- Internal pressure should be relieved before working on the unit. To do so shut off the water supply, then press and hold the vent button
- Maintenance should be done by an individual familiar with all of the information in this manual

**Motor**

Clean out the motor air intake grill of any dust and oil accumulation

**Draining**

When taking the unit out of service or exposing it to freezing temperatures, drain the unit thoroughly. Drain plugs are located at the bottom of the suction tube and pump casing. Blow out the unit using compressed air to ensure the least amount of water remains in the unit.

**Heaters**

Heaters may need to be cleaned chemically or mechanically to remove scale and build up on the sheath of the elements. Scale can cause poor heat transfer and heat build-up inside the element causing it to fail prematurely. Never reuse an old gasket when reinstalling heaters.

**Solenoid Valves**

Solenoid valves are very susceptible to hard water and mineral deposits. Cleaning on a regular schedule can help prevent poor temperature profiles. Inability to reach set point or excessive noise are signs the solenoid should be cleaned.

**Drain Lines**

Check outlet of drain line for any obstructions or back pressure.
**TROUBLESHOOTING GUIDE**

**PREPARE FOR TROUBLESHOOTING:**

- Verify all connections to the process and water supply are correct (deliver-to-delivery, return-to-return).
- The troubleshooting guide applies to *typical* Water TCUs with no special custom functionality.
- Refer to the image below of a *typical* Water TCU electrical panel to aid in identification of components during troubleshooting.
TROUBLESHOOTING GUIDE

UNIT WILL NOT START / RUN

1. IS THE SUPPLY VOLTAGE CORRECT?
   - NO: CORRECT THE SUPPLY VOLTAGE
   - YES: PROCEED TO STEP 4

2. DOES THE CONTROLLER LIGHT UP?
   - NO: PROCEED TO STEP 4
   - YES: REPLACE FUSE(S)

3. ARE THE CONTROL OR PRIMARY FUSE(S) BLOWN?
   - NO: SUPPLY SUFFICIENT WATER PRESSURE TO WATER CONNECTION
   - YES: REPLACE FUSE(S)

4. IS THE MOTOR OVERLOAD TRIPPED?
   - NO: IF PROBLEM STILL PERSISTS, CALL DELTA T SERVICE (800) 733-4204
   - YES: RESET OVERLOAD & VERIFY TRIP SETTING

PRIOR TO SERVICING ANY ELECTRICAL COMPONENT, VERIFY THE UNIT IS OFF AND ALL SUPPLY POWER IS DISCONNECTED.

UNIT RUNNING, NOT COOLING

1. IS THE SETPOINT LOWER THAN THE PROCESS TEMP?
   - NO: DECREASE SETPOINT
   - YES: CALLEDelta T SERVICE (800) 733-4204

2. IS THE COOL LIGHT ON?
   - NO: INSPECT COOLING SOLENOID
   - YES: CALL DELTA T SERVICE (800) 733-4204

3. IS THERE A STREAM OF WATER FROM THE DRAIN?
   - NO: IF PROBLEM STILL PERSISTS, CALL DELTA T SERVICE (800) 733-4204
   - YES: IF PROBLEM STILL PERSISTS, CALL DELTA T SERVICE (800) 733-4204

CONTINUED NEXT PAGE...
TROUBLESHOOTING GUIDE

UNIT RUNNING, NOT HEATING

CHECK

1. IS THE SETPOINT GREATER THAN THE PROCESS TEMP?

   YES
   
   2. IS THE HEAT LIGHT ON?

      NO
      
      INCREASE SETPOINT

      YES
      
      2. IS THE 3-MINUTE AUTO-VENT CYCLE COMPLETE?

         NO
         
         ALLOW AUTO-VENT TO COMPLETE

         YES
         
         4. IS THE HEATER PULLING A BALANCED AMP LOAD ACROSS ALL THREE LEGS?

             NO
             
             REPLACE HEATER

             YES
             
             
             5. IS THERE A STREAM OF WATER FROM THE DRAIN?

                NO
                
                IF PROBLEM STILL PERSISTS, CALL DELTA T SERVICE
                (800) 733-4204

                YES
                
                INSPECT COOLING SOLENOID

ELECTRICAL TROUBLESHOOTING REQUIRES ACCESS INSIDE THE ELECTRICAL ENCLOSURE AND SHOULD BE PERFORMED BY, OR UNDER THE DIRECT SUPERVISION OF, A QUALIFIED ELECTRITIAN.

PRIOR TO SERVICING ANY ELECTRICAL COMPONENT, VERIFY THE UNIT IS OFF AND ALL SUPPLY POWER IS DISCONNECTED.
TEMPERATURE CONTROL UNITS

PARTS

Even if we didn’t make your original unit we can most likely make it better. We offer a complete line of original OEM replacement parts for many different brands, including: Cunair; Thermal Care; Sterling; AEC; Advantage Engineering; Mokon; Budzar; and more. We stock items such as Pump Seals, Immersion Heaters, Motors, and Cooling Valves. And in most cases, you’ll realize a 20 to 30 percent Savings. IN DESPAIR? WE REPAIR! If your electronic proprietary controller needs repair, check with us first for fast turnaround. Better yet, we may be able to convert your existing equipment using standard “Off-the-Shelf” Instruments.

PARTS FOR MANY BRANDS AVAILABLE!

LIQUID CIRCULATING TEMPERATURE CONTROL UNITS AND PARTS IN STOCK.

- Heaters
- Motors
- Pumps
- Pump Seals
- Impellers
- Process Controllers
- Solenoid Valves
- Solenoid Repair Kits
- Heat Transfer Oil
- Much More!!

SERVICE ON PARTS THROUGH OUR WEBSITE

WWW.DELTATPARTS.COM

Delta T Systems, Inc.
2171 Highway 175 • Richfield, Wisconsin 53076
Phone: 262.928.0391 • 800.733.1204 • Fax: 262.628.0332
WWW.DELTATSYS.COM
Visit our website to view System Flow/Filling Diagrams and Flow Charts

The Delta T Systems Product Line-Up includes
Water Circulating Units • Oil Circulating Units • Portable Chillers
Pump Reservoirs • Heat Exchangers • Other Specially-Designed
Equipment and Systems
NOTE: FACTORY RECOMMENDS THAT THE PLC CONTROL LOGIC INCLUDES AUTOMATICALLY VENTING THE UNIT UPON FIRST POWER-UP.