$30.^{00}$

Operation and Installation Manual

TrueTemp II Series Water Temperature Control Units

Important! Read Carefully Before Attempting to Install or Operate Equipment

Part No. 682.93094.00 **Revision *NEW*** **Bulletin No. AE1-660**

Write down your unit serial number(s) _____ _____

here for future reference _____ _____

_____ _____

_____ _____

AEC is committed
to a continuing program of product improvement.
Specifications, appearance, and dimensions described in this manual
are subject to change without notice.

Effective 4/2/2008
Part No. 682.93094.00 Revision ***NEW*** Bulletin No. AE1-660

Safety Considerations

TrueTemp II Series temperature control units are designed to provide safe and reliable operation when installed and operated within design specifications, following national and local safety codes.

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

- ☑ Only **PROPERLY TRAINED** personnel familiar with the information within this manual should work on this equipment.
- ☑ Follow all local **SAFETY CODES**.
- ☑ AEC TrueTemp II Series cabinets and piping are hot and are a **BURN HAZARD**.
- ☑ Do not operate an AEC system without all outer panels installed. Pressurized hot water leaks can cause serious injury.
- ☑ Wear **SAFETY GLASSES** and **WORK GLOVES**.
- ☑ Use care when **LOADING**, **UNLOADING**, **RIGGING**, or **MOVING** this equipment.
- ☑ Operate this equipment within design specifications.
- ☑ **OPEN**, **TAG**, and **LOCK ALL DISCONNECTS** before working on equipment. We recommend following OSHA Lock-Out/Tag-Out Standard 29 CFR 1910.147.
- ☑ Make sure the unit is properly **GROUNDED** before switching power on.
- ☑ When welding or brazing in or around this equipment, be sure **VENTILATION** is **ADEQUATE**. **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.
- ☑ Do not jump or bypass any electrical safety control.
- ☑ Do not restore power until all tools, test equipment, etc. have been removed and the panels replaced.

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1 General Information

1-1 Introduction

AEC water temperature control units are reliable, accurate, and easy-to-use process temperature control units. They are self-contained, portable, and shipped ready to use.

The TrueTemp II Series water temperature control unit is designed to circulate water through your process and to precisely, automatically, and reliably maintain it at a specified temperature. Standard unit operating range is from 0ºF (-17ºC) to 250°F (121°C), or up to 300°F (149°C) as an option. The unit is suited for use with city water, water from portable or central chillers or towers, or well water.

These units are designed for rapid recirculation of a relatively small amount of water to provide close and uniform temperature relation between To Process and From Process lines. This performance, of course, depends on the configuration of your process and any restrictions within the mold. The recirculation, combined with the large immersion heater and cooling capability, gives fast and accurate response to bring the water up to temperature or to changes in the settings when needed.

The TrueTemp II Series water temperature control unit is a self-contained system consisting of a centrifugal pump, electric immersion heater, cool/vent solenoid valve, and electrical control, including a PID microprocessor controller and thermocouple. It is designed for use in process temperature control applications using water or a water/glycol mix. Any other use or fluid **is prohibited**.

Some standard safety devices include a mechanical overtemperature safety thermostat, a pressure relief valve, motor overload/overcurrent protection, a low pressure cutout switch, transformer primary over current protection, and non-fused lockable rotary disconnect.

A properly installed, operated, and maintained AEC system provides years of reliable operation. Please read and follow the instructions in this manual to get the most satisfaction from your AEC system.

1-2 Necessary Documents

The following documents are necessary for the operation, installation, and maintenance of AEC water temperature control units. Additional copies are available from AEC.

Familiarize the appropriate personnel with these documents:

- ☑ This manual.
- ☑ The controller operation manual.
- ☑ The electrical schematic and connection diagram placed inside the control enclosure.
- ☑ The operation and installation manuals for accessories and options selected by the customer.
- ☑ The Customer Parts List included in the information packet.

1-3 Models Covered

This manual provides operation, installation, and maintenance instructions for AEC water temperature control unit.

Make sure that you know the model number, serial number, and operating voltage of your temperature control unit if you contact AEC.

1-4 Standard Features

- Compact, rugged cabinet with easy-access side panels
- Cast-and-flange design to reduce connection points
- Incoloy™ immersion heater with IEC contactors
- NEMA 1 electrical enclosure
- Off-the-shelf microprocessor controller; display includes diagnostics features with indicator and warning status lights; CE and $_{C}UL_{US}$

- Independent high temperature safety thermostat
- Motor and transformer over current protection
- ¼” cooling solenoid valve on all sizes
- EPDM/NI-Resist pump seal
- Adjustable low supply water pressure switch; factory-set at 16 psig (110 kPa/1.1 bar)
- 150 psig (1,034 kPa/10.3 bar) pressure relief valve
- ¾” water supply and drain connections; 1½” process connections
- Automatic vent sequence
- 2” (76 mm) casters
- Operating range of 0ºF to 250ºF (-17ºC to 121ºC)
- One (1) -year parts and labor warranty at the factory; three (3) -year controller warranty, and limited lifetime warranty on wetted pump components.

1-5 Available Options

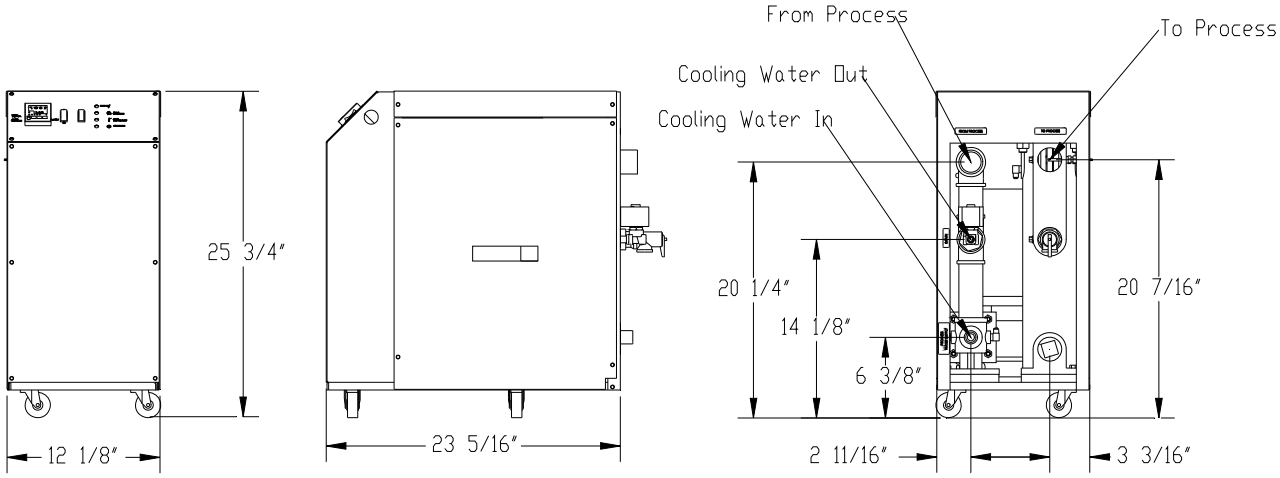
TrueTemp II Series systems are available with options to tailor the unit to your requirements. Some are factory installed; some can be retro-fitted in the field. Consult your sales representative for more information. Available TrueTemp II Series options include:

- RS-232 or RS-485 communications
- Heaters available in 9 or 12 kW
- Quick Cool function
- Manual bypass
- Auto system water purge (mold purge)
- Y-strainer
- Hammer arrestor (water hammer shock stop)
- Remote start/stop control
- Rubber feet; available in lieu of casters
- ½” slow-close cooling solenoid valves available on all sizes
- Two-zone stack rack with casters, common wiring and piping available

- 300ºF (149ºC) operation; includes graphite-impregnated silicon carbide seal
- Audible and visual general fault alarm
- Electrical operation available in 208, 230, 460, and 575 volts, 60 Hz; 200, and 400 volts, 50 Hz
- 10 foot power cord; no plug, shipped loose

Figure 1
Typical TrueTemp II Series Water Temperature Control Unit and Specifications

Direct Injection



Model number	Pump						Dimensions						Shipping weight	
							H		W		D			
460 / 230	hp	*kW*	gpm	*lpm*	psig	*kPa*	in.	*cm*	in.	*cm*	in.	*cm*	lbs.	*Kg*
TTII, 9 kW heater	¾	*0.56*	30	*113.6*	26	*179.3*	25¾"	*65.4*	12 1/8"	*30.5*	23 5/16"	*58.4*	210	*96*
	1	*0.75*	35	*132.5*	30	*206.9*								
	2	*1.50*	50	*189.3*	38	*262.0*								
	3	*2.24*	60	*227.1*	40	*275.8*								
	5	*3.73*	75	*283.9*	54	*372.3*							240	*109*
	7½	*5.60*	90	*454.2*	63	*434.4*								

Figure 2
TrueTemp II Series Unit Full-Load Amps

Model		Full-load amps at 460 volts	
hp	kW	9 kW heater	12 kW heater
0.75 hp	*0.56 kW*	12.7 amps	16.5 amps
1.00 hp	*0.75 kW*	13.1 amps	16.9 amps
2.00 hp	*1.50 kW*	14.7 amps	18.5 amps
3.00 hp	*2.24 kW*	16.1 amps	19.9 amps
5.00 hp	*3.73 kW*	18.9 amps	22.7 amps
7.50 hp	*5.60 kW*	22.3 amps	26.1 amps

-Notes-

2 Shipping Information

2-1 Unpacking and Inspection

You should inspect your TrueTemp II Series temperature control unit for possible shipping damage. If the container and packing materials are in re-usable condition, save them for reshipment if necessary.

Thoroughly check the equipment for any damage that might have occurred in transit, such as broken or loose wiring and components, loose hardware and mounting screws, etc. In case of breakage, damage, shortage, or incorrect shipment, refer to the following sections.

2-2 In the Event of Shipping Damages

Important!

According to the contract terms and conditions of the Carrier, the responsibility of the Shipper ends at the time and place of shipment.

- ☑ Notify the transportation company's local agent if you discover damage.
- ☑ Hold the damaged goods and packing material for the examining agent's inspection. **Do not return any goods to AEC before the transportation company inspection and authorization**.
- ☑ File a claim against the transportation company. Substantiate the claim by referring to the agent's report. A certified copy of our invoice is available upon request. The original Bill of Lading is attached to our original invoice. If the shipment was prepaid, contact AEC at (847) 273-7700 for a receipted transportation bill.
- ☑ **Advise AEC regarding your request for assistance and to obtain an RGA (return goods authorization) number.**

2-3 If the Shipment is Not Complete

Check the packing list. The apparent shortage may be intentional. Back-ordered items are noted on the packing list. You should have:

- ☑ AEC TrueTemp II Series water temperature control unit
- ☑ Bill of lading
- ☑ Packing list
- ☑ Operating and Installation packet
- ☑ Electrical schematic and panel layout drawings
- ☑ Component instruction manuals

Re-inspect the container and packing material to see if you missed any smaller items during unpacking. Determine that the item was not inadvertently taken from the area before you checked in the shipment. Notify AEC immediately of the shortage.

2-4 If the Shipment is Not Correct

If the shipment is not what you ordered, **contact the shipping department immediately at (847) 273-7700**. Include the order number and item. *Hold the items until you receive shipping instructions*.

2-5 Returns

Important!

Do not return any damaged or incorrect items until you receive shipping instructions from AEC.

2-6 Uncrating Your New TrueTemp II Series System

- ☑ AEC TrueTemp II Series water temperature control units are shipped in a cardboard box surrounded by individual foam pieces.
- ☑ Carefully open the top of the box and remove the front and back pieces of foam.

Caution!

Be careful when cutting straps.

Straps may spring back and cause injury!

- ☑ From the top, slip two lifting straps between the bottom piece of foam and temperature control unit. Spread the straps from the center line so it is balanced.
- ☑ Loop the straps over a fork truck fork. Lift slowly and only high enough to clear the box..
- ☑ Carefully slide the box from beneath the unit and lower the unit. Lower slowly. The unit should land on its casters and can be rolled into position.
- ☑ Retain the crating in case reshipment is necessary due to hidden shipping damage.

- Notes -

3 Installation

3-1 Installation Location Considerations

TrueTemp II Series systems are portable and can be installed almost anywhere. As with all equipment installations, follow all applicable codes and regulations.

- ☑ The recommended ambient temperature range for TrueTemp II Series installations is from +14ºF (-10ºC) to a maximum operating ambient temperature of 104°F (40ºC). Recommended ambient storage temperature range is from -13ºF to 149ºF (-25ºC to 65ºC). If storing the unit below freezing temperatures, make sure the unit has an antifreeze mixture circulated inside.
- ☑ Provide a minimum of twelve inches (12” or about 30 cm) clearance on all sides of the cabinet to allow circulation of cooling air.
- ☑ Locate the unit as close to the process as is practical.

3-2 Process Approach Temperature Considerations

If the differential (△) between **COOLING WATER IN** and **TO PROCESS** temperatures is less than 10°F (7ºC), consult our Sales Department for advice on how to control low approach applications.

3-3 External Piping Sizing Considerations

- ☑ All external hose and piping should be adequately sized to assure minimum external pressure drop.
- ☑ Low external piping pressure drop is needed for best operation.

Note: Use a backup wrench to support TrueTemp II Series system piping when making process piping connections.

! CAUTION

All external valves, fittings, and hoses must be rated at a minimum of 150 psig and 250°F (1,034.25 kPa/10.34 bar and 121ºC).

The exception is when the temperature control unit is optionally rated for 300ºF (149ºC) operation; external valves fittings and hoses must then be rated at a minimum of 150 psig and 300ºF (1,034.25 kPa/10.34 bar and 121ºC).

3-4 Piping Considerations for Permanent Installations

We recommend an optional (or customer-installed) strainer on the **COOLING WATER IN** inlet.

The unit must have at least 16 psig (110.32 kPa/1.1 bar) water supply pressure to prevent pump cavitation that can be caused by the water "flashing" to steam. To avoid damage to the pump or other components, make sure that maximum supply pressure does not exceed 75 psig (517.1 kPa/5.17 bar).

Keep restrictions to a minimum by using proper inlet pipe sizing. If the water supply piping is larger than ¾", reduce the size at the unit. The table below contains the pipe sizes that are used in the unit.

Pipe sizes for ¾ hp to 7.5 hp (0.56 kW to 5.59 kW) units	
Location	**Size in inches NPT**
To Process	1½"
From Process	1½"
Cooling Water In	¾"
Cooling Water Out	*- depends on solenoid used -*

Common black pipe is recommended for permanent installations. TrueTemp II Series water circuit piping is primarily ferrous (iron) and reacts electro-chemically with non-ferrous metallic materials such as copper. Some water contains dissolved minerals that greatly accelerate the reaction between dissimilar metals. Ferrous piping is recommended to minimize galvanic action. If piping must be copper, use dielectric unions at the unit.

3-5 Piping Considerations for High Mobility Installations

Mobile TrueTemp II Series systems must use high quality hose rated for **at least** 150 psig and 250°F (1,034.25 kPa/10.34 bar and 121ºC). Special 300°F (149ºC) high temperature TrueTemp II Series systems must use hosing rated at 150 psig and 300°F (1,034.25 kPa/10.34 bar and 149ºC) or greater.

Quick disconnects may be used for mobility, although **they cause a drop in pressure**. If used, they must be sized carefully to minimize pressure drop. Don't use quick disconnects with check valves *unless absolutely necessary*.

! CAUTION

Non-relieving quick connect fittings or check valves on the water supply must have a pressure relief piped to the drain.

Failure to do so could result in a dangerous over-pressure condition!

3-6 Process Water Considerations

Raw Water

Water treatment is vital in any piping system. In some cases, raw water may be used in the system without problems; in other cases, it can result in large deposits of scale and corrosion.

We offer a complete line of water treatment equipment. Contact your sales representative for water testing and treatment options.

Distilled Water

Non-ferrous (brass, copper, or high-temperature plastic) piping is recommended for distilled water processes.

Deionized Water

Stainless steel (316 SS minimum) or PVC plastic components must be used with deionized water. We recommends stainless steel because of the temperature constraints with plastic.

3-7 Making Process Water Connections

Direct Injection

On the back of each unit, the connections are labeled appropriately. For Direct Injection units connect the **TO PROCESS** hookup to the entrance of the process and the **FROM PROCESS** hookup to the exit of the process. Connect the **COOLING WATER IN** to your plant water supply. Connect the **COOLING WATER OUT** line to an open drain, or to the return line of your central water system.

Make sure you carefully select the connecting lines and connectors between the temperature control unit and the process to suit the needs and requirements of your application.

If your unit has a maximum operating temperature of 250ºF (121ºC), the connecting lines and connectors should have a service rating of at least 250ºF (121ºC) and 150 psig (1,034.25 kPa/10.34 bar). If it has a maximum temperature of 300ºF (149ºC), the lines and connectors should have a service rating of at least 300ºF (149ºC) and 150 psig (1,034.25 kPa/10.34 bar).

TO PROCESS — 1½" NPT

This is the outlet for the tempered water leading to the process being controlled.

FROM PROCESS — 1½" NPT

Water from the process re-enters TrueTemp II Series system to be tempered and re-circulated back into the process.

3-8 Making Cooling Water Connections

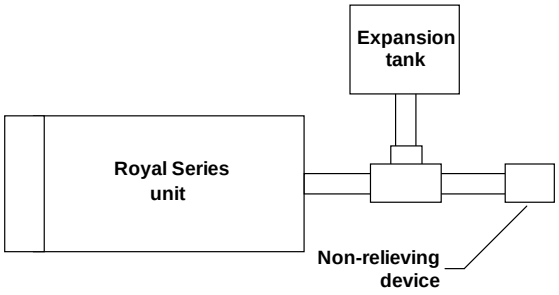
WATER IN — ¾”

The cooling water supply inlet from a cooling tower, a chiller, or a city water supply.

! CAUTION

If a non-relieving device such as a regulator, ball valve, or check valve is installed on the WATER IN line, you *MUST* install an expansion tank of at least ½ gallon (about 2 liters) capacity.

Failure to do so can result in system overpressure from thermal expansion. Install the tank configured as shown below:



Check the expansion tank frequently to make sure it is not flooded.

Water Out

Size Depends on Solenoid Used

The cooling water outlet leading back to the cooling tower, chiller, or drain.

Net supply pressure must be between 25 psig and 65 psig (448.16 kPa/4.48 bar and 379.2 kPa/3.79 bar). Net supply below 15 psig (103.43 kPa/1.03 bar) may allow water to flash to steam, cavitate the impeller, and **damage the pump**, which prevents the unit from cooling properly. Operation above 65 psig (448.16 kPa/4.48 bar) may cause premature opening of the relief valve from pump pressure and pressure surges.

PRESSURE RELIEF — ¾”

The pressure relief valve, located at the back of the unit, is pre-piped to approximately four inches (4” or 10 cm) above the floor. This piping reduces the chance of scalding nearby personnel if the relief valve should trip.

3-9 Making System Purge Connections

TrueTemp II Series systems equipped with the System Purge option have a compressed air inlet marked **MOLD PURGE**. Connect to a clean, dry 100 psig (689.50 kPa/6.90 bar) air line. Install your own shutoff valve to prevent process liquid from backing up into the plant air piping if the compressed air is turned off and the check valve fails. **Don’t depend on the solenoid valve to hold water pressure in the temperature control unit.**

Figure 3
Typical Piping Schematic

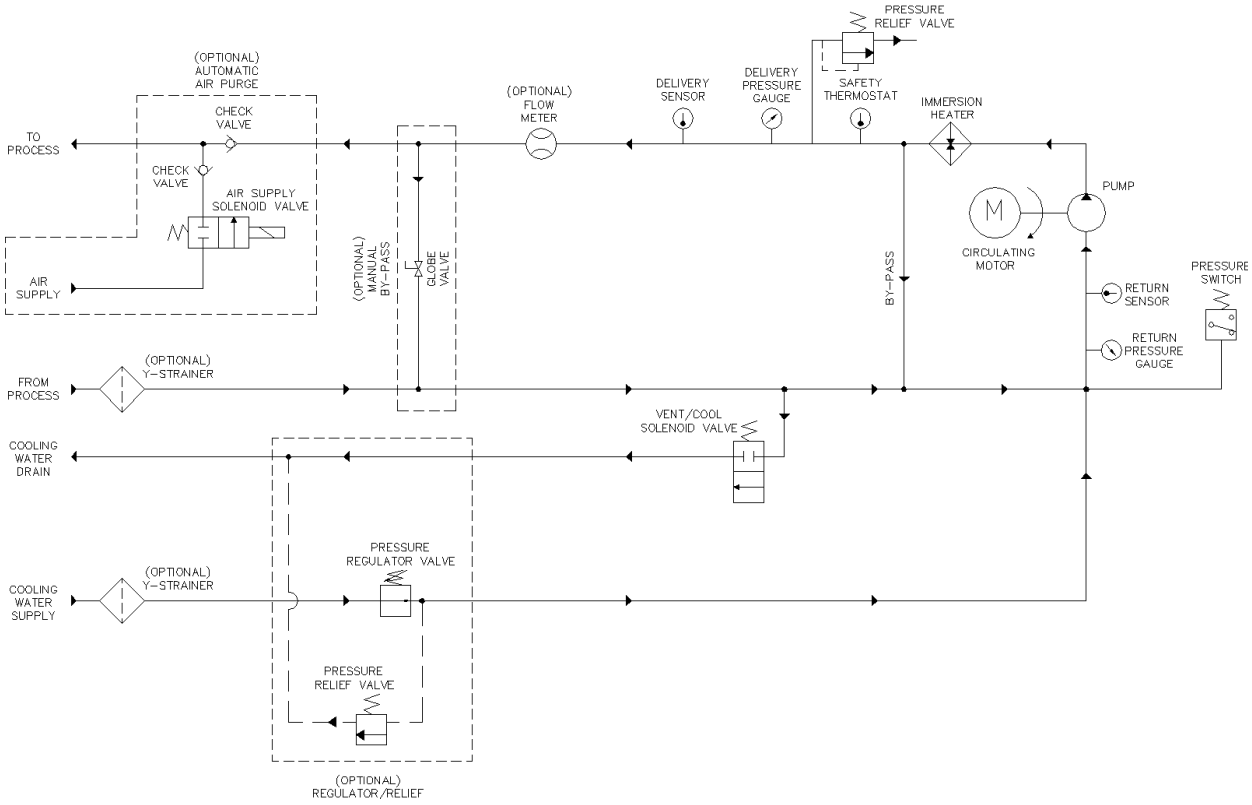
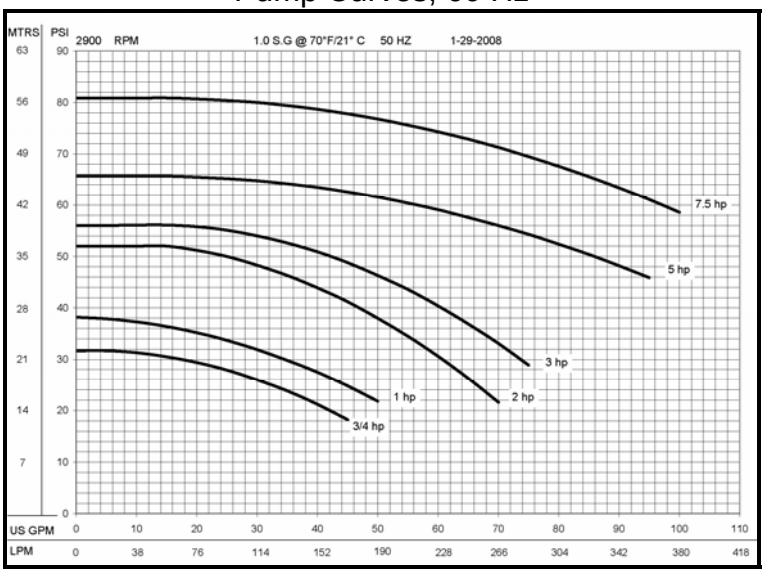


Figure 4
Pump Curves; 60 Hz



Pump Curves; 50 Hz

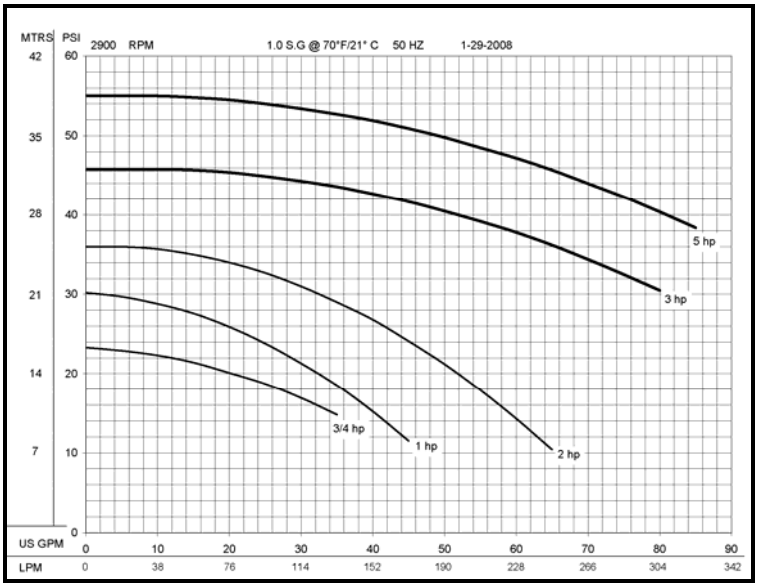


Figure 5
Pressure Drops

Model		Pressure drop flow and loss				
hp	**kW**	**9 kW htr**	**flow gpm**	***flow lpm***	**loss psi**	***loss kPa***
0.75 hp	*0.56 kW*	12.7 amps	30.0 gpm	*113.6 lpm*	0.0 psi	*0.0 kPa*
1.00 hp	*0.75 kW*	13.1 amps	35.0 gpm	*132.5 lpm*	1.0 psi	*6.9 kPa*
2.00 hp	*1.50 kW*	14.7 amps	50.0 gpm	*189.3 lpm*	1.5 psi	*10.3 kPa*
3.00 hp	*2.24 kW*	16.1 amps	60.0 gpm	*227.1 lpm*	2.0 psi	*13.8 kPa*
5.00 hp	*3.73 kW*	18.9 amps	75.0 gpm	*283.9 lpm*	2.5 psi	*17.2 kPa*
7.50 hp	*5.60 kW*	22.3 amps	90.0 gpm	*340.7 lpm*	5.0 psi	*34.4 kPa*

3-10 Making Electrical Connections

TrueTemp II Series systems are designed for three-phase voltage operation. Refer to the unit nameplate for proper voltage and amperage requirements.

Make sure you provide a correctly sized and protected supply of electrical power to the unit.

Important!

Refer to your local electrical codes for making proper electrical connections

For example, in the United States refer to National Electric Code (NEC) Article 430-24 through 430-26, Table 310.15(B)(2)(a) for proper feeder conductor and supply disconnect sizing.

Maintain a safe ground and disconnect the power supply before servicing the unit. A qualified electrician should make electrical connections, and disconnect and lock out electricity using OSHA 29CFR 1910.147 standards when you need a service call.

Check serial tag voltage and amperage requirements and make sure your electrical service conforms *before* making any electrical connections. Total running amps for TrueTemp II Series systems are listed on the nameplate. Customer connections can be run to the supply terminals from either side of the unit. Make sure that all three phases are wired correctly. If not wired properly, the unit will run *backwards*. **Again, check the unit nameplate for correct voltage and amperage.**

! DANGER

Improper electrical connections can damage the unit and cause serious operator injury or death!

Bring properly sized power leads and ground from a fused disconnect (installed by your electrician) to the unit. Provide external overcurrent protection to the unit, using circuit breakers or fuses. If you use fuses, make sure that they are dual-element time-delay

fuses, sized according to your electrical code. Make sure that **all** electrical connections are ***tight***.

Important!

1. **Electrical connections must comply with all applicable electrical codes.**
2. **The temperature control unit must be grounded in accordance with NEC Article 250.8**
3. **Voltage must be within plus or minus ten percent (±10%) of the nameplate rating.**
4. **Make sure your installer provides external protection.**

Refer to the electrical wiring schematic in your Customer Information packet for additional information.

4 Identifying Controls and Features

4-1 Identifying Mechanical Controls and Features

To Process Thermocouple

A type K ungrounded thermocouple with a 304SS probe is downstream from the heater to sense process temperature.

Safety Thermostat

The safety thermostat mounted on the side of the heater tank protects against thermal runaway. The thermostat guards against the unlikely event of “runaway” heating. If overheating occurs, the safety thermostat shuts down heater outputs. The unit continues to pump water through the system to prevent heater damage. We recommend that you install an audible or visual alarm to the terminals provided. Factory installed alarms are available; see the electrical schematics for more information.

Pressure Relief Valve

If the combined pressure of the cooling supply water and pump discharge exceeds 150 psig (1,034.25 kPa/10.34 bar), the pressure relief valve opens and relieves the pressure. This is a non-adjustable ASME construction valve with a stainless steel spring.

Important!

Route a pipe from the pressure relief valve to a suitable drain to reduce potential scalding hazard.

The drain line must not have any restrictions or back pressure.

Low Pressure Cutout Switch

This switch, set at 16 psig with a 2 psig differential (110.3 kPa/ 1.10 bar with a 13.79 kPa/0.14 bar differential) shuts down the unit if the **COOLING WATER IN** water pressure drops below 16 psig (110.3 kPa/1.10 bar). For the 300 °F (148.9 °C) option, this switch is set at 55 psig with a 2 psig differential (379.2 kPa/ 3.79 bar).

Pumps

Pumps range in power from ¾ hp to 7.5 hp (0.56 kW to 5.59 kW) and are equipped with 3-phase ODP motors and seal flush lines as standard.

The pump is a bronze-fitted close-coupled centrifugal type. It features a split case design to facilitate replacement of the seal. It has a high output capacity with excellent discharge pressure helping it facilitate turbulence to maximize heat transfer, and is well suited for the conditions under which it was designed to operate.

Heaters

The specially designed 9 kW three-phase low watt density electrical immersion heater heats the water, and the controller regulates the temperature. The standard heater has an incolloy sheath for best heat transfer and low fouling properties.

Low watt density immersion heaters at 12 kW are available options for these models, depending upon the heating needs of the process. All models are built to provide full heat as required by the process and determined by the controller, providing more precise temperature control.

Solenoid Valves

TrueTemp II Series systems use rugged, industrial design solenoids with replaceable coils and/or internal components. Depending on required cooling capacity, solenoid valves are available in sizes ranging from ¼" to ¾"; ½" x 9⁄16" and ¾" x ¾" solenoid valves are slow-closing.

Water Hammer Arrestor (Shock Stop)

Optional

Shock waves from fast-operating solenoid valves may damage some process systems. For these applications, a welded metal bellows-type shock stop with a pre-charged and sealed nitrogen blanket can be installed in the cooling piping.

Pump Starter

TrueTemp II Series high quality IEC-rated pump motor starters are industrial grade motor controls with Class 10 overload/overcurrent/single phase protection with manual reset.

Transformer

High quality industrial design transformers are specified to suit incoming voltage on the application and provide 115 VAC control voltage. The transformer has primary overcurrent protection and grounded neutral secondary.

Heater Contactor

Your unit uses high-quality IEC-rated industrial-grade electromechanical contactors for heater controls.

Cooling

The controller automatically regulates cooling by opening and closing the solenoid valve. The unit cools by removing the required amount of warm water from the system. This process permits an equal amount of cool plant water to enter the system well ahead of the pump, allowing it to blend with the system water. The water supply temperature governs the minimum operating temperature of the unit.

Note: The plant water supply temperature governs the minimum operating temperature of the unit.

Electricals

The pump motor and the immersion heater operate on three-phase 50/60 cycle nominal voltages with the control circuit operating at 115V single phase. The control circuit voltage is provided by a single phase machine tool transformer with a grounded neutral secondary.

The pump motor is controlled by a full voltage magnetic non-reversing motor starter, with branch circuit overcurrent and thermal overload protection.

Automatic Vent

This feature automatically triggers the purging of air from the system before you start the unit. The vent actuates the solenoid valve, and forces trapped air and water out through the drain, properly filling and priming the unit prior to startup. ***Complete venting is necessary to prevent damage to the pump and heater.***

The vent process is controlled through a fixed sixty (60) second timer. If you have a large process, you may need to complete the venting process by pressing the **VENT** button on the front-mounted switch panel.

Pressure Switch

A pressure switch built into each unit keeps the system from starting until the water supply is turned **On** and subjected to the minimum water supply pressure. This feature protects the pump seal and the heater from damage through attempted operation without water. The pressure switch is set at approximately 16 psig (110.32 kPa/1.10 bar) for 250°F (121ºC) units or 55 psig (379.23 kPa/3.79 bar) for 300°F (149ºC) units prior to leaving the factory.

4-2 The Microprocessor Controller

The controller is an easy-to-operate microprocessor-based PID control device. When the process reaches the set point, the PID control cycles the cooling valve and/or immersion heater to maintain the proper leaving water temperature.

The controller has been fully factory tested. Set the desired process temperature set point and the control does the rest.

Built-in range of operation on the controller is 0°F to 250°F (-18ºC to 121ºC).

Figure 6

Typical E5CZ Microprocessor Controller

4-3 Controller Display

Figure 6

PV or Process Value Numeric LED

During normal operation, the large red **PV** Process Value LED on the controller displays the actual process temperature at the To Process thermocouple. It also lists parameter symbols during setup and error messages if an error occurs.

SV or Set Value Numeric LED

During normal operation, the green **SV** Set Value LED on the controller displays the process set point you want the chiller to maintain. It also displays parameter and pre-set function values during setup.

OUT1 LED

The orange **OUT1** LED lights when the controller output energizes the immersion heater.

OUT2 LED

The orange **OUT2** LED lights when the controller output energizes the cooling valve.

STOP LED

Lights when operation is stopped. During operation, this indicator lights when operation is stopped by an event or by using the **RUN/STOP** function.

ALM1/ALM2 LED

The **ALM1** and **ALM2** LEDs are not used.

HB LED

The **HB** LED is not used.

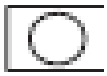
CMW LED

The **CMW** LED is not used.

4-4 Using Controller Keys

Figure 6

Note: Only those who are completely familiar with the unit controller should perform the operations described in Sections 4-4 through 4-14.

 **Level Key**

Press this key to move between setting levels. The setting level is selected in the following order: operation level; adjustement level; initial setting level, communications level..

 **Mode Key**

Press the **Mode** key for less than one (1) second to scroll through parameters within the level. Press the **Display** key for at least one (1) second or more to change the parameters in reverse (moving one per second in reverse order).

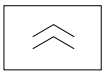
Important!

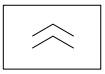
Do not change any of the control settings without consulting AEC's Service Department.

***AEC warranty does not cover chiller failures from tampering with controller settings*!**

 **Down Key**

Each press of the  **Down Arrow** key decrements or reduces the values or settings on the **SV** Set Value display.

 **Up Key**

Each press of the  **Up Arrow** key increments or advances the values or settings on the **SV** Set Value display.

4-5 Using Graphic Panel Buttons

ON/OFF Switch

Push the **ON/OFF** rocker switch to the **ON** (|)energize the unit and begin the temperature control cycle. The switch will be illuminated whenever the unit is on.

VENT Switch

Push the **VENT** switch for additional manual venting.

ALARM SILENCE Button

Optional

Push the **ALARM SILENCE** button to silence the alarm. You should investigate the alarm condition and restore the unit to normal operation before continuing with the temperature control cycle.

AIR PURGE

Optional

Press the **AIR PURGE** switch to initiate the purge. It is a momentary switch and must be pressed to keep the purge valve open. Releasing the switch closes the cooling/vent and compressed air solenoid valves.

QUICK COOL Button

Optional

Press the **QUICK COOL** button to open the cooling valve and quickly cool the process.

4-6 Alarms

Audible/Visual General Fault Alarm

Optional

The audible/visual general fault alarm sounds if any fault triggers, such as low water pressure, over-temperature, or pump overload. A signal from any of the safety devices activates a horn and flashing strobe.

- Push the **ALARM SILENCE** button to silence the alarm.

The optional mechanical high temperature safety alarm is interlocked with the heater. When triggered, the heater cuts out and the pump continues to run.

4-7 Controller Factory Setup

The controller is set up and tested at the factory for optimum operation, and doesn't need to be adjusted. If the controller does not work properly, or you suspect someone has accidentally changed some settings, you can do two things. First, perform the Auto-Tune Procedure described in the following section. If that doesn't work, restore the controller to the original factory settings as described later in this manual.

4-8 Controller Factory Setup

The controller is set up and tested at the factory for optimum operation, and in most cases doesn't need to be adjusted. If the controller does not work properly, or you suspect someone has accidentally changed some settings, you can do two things. First, perform the Auto-Tune Procedure described in the following section. If that doesn't work, restore the control to the original factory settings as described in Section 6-3 on Pages 63.

For your protection, all menu modes and levels except 0 and 1 are locked out at the factory. Level 2 is unlocked for units with factory-installed communications options.

4-9 Auto-Tuning the Controller

The Auto-Tune function lets you fine-tune the control PID to process requirements. Activate the Auto-Tune function whenever the process under control changes. Don't be alarmed by control response. It may take the process temperature above and below the set points as many as three (3) times. It will then level off and control to the process set point. **Auto-tuning can take up to 45 minutes**, and is best done *before* any product is run.

To auto-tune the controller:

■ Press **Level** key for less than one second. Press the **Up** key to change the value to start the auto-tuning. "On" is displayed in the **PV** screen. "Off" is displayed when the auto-tuning is finished.

To return to operation, press the Level key.

4-10 Changing from Fahrenheit to Celsius

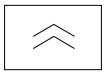
Changing the control display from ºF to ºC is done in the Initial Setup mode, which is pre-set and locked out at the factory. Contact Customer Service if you need to change the display.

4-11 Operating the Unit with the Controller

Operation Level

To change the process temperature set point:

- Press the  Down Arrow key to lower the set point to the temperature you want.

- Press the  Up Arrow key to raise the set point to the temperature you want.

The set point automatically updates after a two (2) -second display.

-Notes-

5 Startup and Operation

5-1 Introduction

The checklist below outlines start-up procedures for TrueTemp II Series water temperature control units. This list assumes that installation information located in this manual has been read and followed.

5-2 Startup Checklist

- ☑ Check the shipping papers against the serial tag to make sure that system size, type, and voltage is correct for the process under control.
- ☑ Check the transformer primary voltage connections to be sure they are configured for the electrical power you are using. The voltage at the main power connection must be within plus or minus ten percent (±10%) of the voltage listed on the serial tag. Electrical connections must conform to all applicable codes. Make sure that a qualified electrician checks all electrical connections.
- ☑ The safety thermostat is preset at the factory to 250ºF or 300ºF (121ºC or 149ºC), depending on configuration. It trips at 265ºF or 315ºF (129ºC or 157ºC), depending on configuration.
- ☑ The relief valve should be piped to an open, unrestricted drain.
- ☑ **TO PROCESS**, **FROM PROCESS**, **WATER IN**, **WATER OUT**, and **MOLD PURGE** connections should be complete.

! CAUTION

Only use components rated at a minimum of 150 psig and 250°F (1,034.25 kPa/10.34 bar and 121ºC).

- ☑ **All outer panels must be in place**.
- ☑ All external process valving should be set for proper operation of the unit.
- ☑ Cooling and/or makeup water between 16 psig and 65 psig (110.32 kPa/1.1 bar and 448.2 kPa/4.48 bar) must be available for the unit to operate properly.

☑ Connect the main power to the unit disconnect switch, and press the **START** switch to check for proper pump rotation direction as described in Section 5-6 on Page 42. Pump rotation should be clockwise, viewed from the **motor** end.

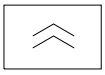
☑ Check your work and proceed to the **Startup Procedure** section.

5-3 Starting the Temperature Control Unit

☑ Turn on the water supply, apply main power to unit, press ON/OFF switch to the ON position.

☑ The unit automatically executes a one-minute venting sequence to expel air trapped in the process piping. We recommend a longer venting sequence on larger process systems. Press and hold the **VENT** button to force the cooling/vent valve open and eliminate air trapped in the process piping in larger process systems.

The controller is **OFF** and the **Vent Cycle** indicator is lighted during the vent sequence.

☑ Set the microprocessor controller to the process temperature you want by pressing the  **Up Arrow** button or the  **Down Arrow** button on the front of the controller.

☑ Allow your process to reach the set point temperature, then auto-tune the control by pressing the **AT** key. See Section 4-10 on Page 36 for more information.

☑ Watch the drain for any bubbles or erratic flow, which indicates if the system has been properly vented. If the stream is steady, the unit was properly vented and all air is out of the system.

☑ Operate the unit, checking for anything unusual that could indicate improper operation.

Note: You can stop your temperature control unit at any time by pressing the **STOP** button.

! CAUTION

1) Your system 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 panels or shields removed.**
- **Pipe the relief valve to an open drain.**
- **Never install a fitting or hose that is rated less than 150 psig and 250°F (1,034.25 kPa/10.34 bar and 121ºC).**

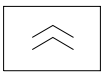
2) To reduce the risk of electrical shock:

- **All electrical installation and repairs should be done by a qualified electrician.**
- **Ground the unit in accordance with electrical codes.**
- **Never attempt any repairs without first opening and locking out the main disconnect.**
- **Never deactivate or neutralize any safety device.**

5-4 Operating the Unit with the Controller

To change the process temperature set point:

• Press the  Down Arrow key to lower the set point to the temperature you want.

• Press the  Up Arrow key to raise the set point to the temperature you want.

5-5 Sequence of Operation

The simplicity of design and the highly engineered controller make this unit almost self-operating. The **ON/OFF** and **VENT** switches and the temperature controller buttons are all that is required to operate this unit.

After you complete all connections, turn the water supply **ON**, then turn control power **ON**. The unit automatically vents for a preset time of one (1) minute. If you need additional vent time, press the **VENT** button on the control panel.

As the water comes in the water supply line, the water must enter the pump, up through the tank and out through the **TO PROCESS** line, through the process, back through the **FROM PROCESS** line, and through the solenoid line and out the drain line.

At this time, watching the drain for bubbles or erratic flow will indicate whether or not the system has been properly vented. If a steady stream flows from the drain line, it is certain that all the air is out of the system.

- ☑ TCU systems provide temperature control on processes by directly heating the process water and injecting cooling water into the process water.
- ☑ When the unit is energized, the pump starts and a one minute vent sequence opens the cooling/vent valve to remove any air trapped in the process piping.
- ☑ If the cooling water supply pressure is insufficient, the low cooling water pressure cutout switch (set at 16 psig, 10 psig differential [110.32 kPa/1.10 bar, 68.95 kPa/0.69 bar differential]) opens. **You need at least 16 psig** (110.32 kPa/1.10 bar) for the best cooling capacity and to prevent water boiling in the process circuit at high temperatures, particularly at the pump suction.
- ☑ After venting, the microprocessor controller monitors the **TO PROCESS** probe, cycling open the cooling/vent valve to discharge warm water or energizing the immersion heater to maintain the process set temperature.

5-6 Checking Motor Rotation Direction

Check for correct pump rotation direction by looking at the end of the motor. Press the **ON/OFF** switch from the **OFF** (**O**) position to the **ON** (|) button, and note the direction that the motor turns. Rotation should be **clockwise** when viewed from the motor end.

Note: Make sure that a qualified electrician performs the following steps.

To change rotation direction:

Disconnect and lock out power at the fused disconnect.

Reverse any two incoming leads at the local disconnect switch.

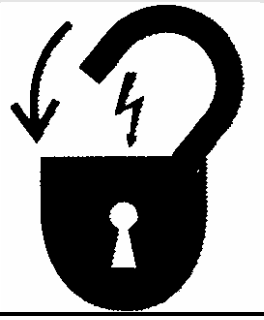
Do not switch leads at the motor or motor starters.

5-7 Shutting Down the Temperature Control Unit

Cool the unit down by selecting a set point of zero (***0***). Let the unit stabilize at one temperature close to the incoming water temperature, then press the **STOP** button. Now press the **VENT** button to relieve any remaining pressure in the system.

6 Unit Maintenance

! CAUTION



Never attempt to service a unit until a qualified electrician has opened and locked out the main disconnect using OSHA 1910.147 standards.

The water supply should be turned off and internal pressure should be relieved before you remove panels.

All electrical connections must be done by a qualified electrician.

! WARNING

Disconnect all power to the unit, let the unit cool down, and turn off the water *prior to any servicing*.

Failure to do so can result in SERIOUS INJURY OR DEATH!

6-1 Preventive Maintenance

Draining

Drain the unit thoroughly if you are taking it out of service for a long period of time, or you expose it to freezing. Drain plugs are provided at the base of the heater tank and at the base of the pump.

Periodic Checks

Every Six Months

Inspect all electrical connections for secure attachment and for safe and secure ground connections. Inspect the power cable, especially at the entrance point to the unit. This inspection should be made by a qualified electrician. Check for leaks, especially under the pump, as it may indicate a worn pump seal.

6-2 Corrective Maintenance

Pumps and Seals

Before leaving our factory, we test each unit extensively, then we calibrate each unit. Afterwards, the unit is drained and blown out with air to remove water from piping systems. If the unit is allowed to stand idle for a long time before being installed in your factory, the housing gasket at the pump can dry out and can possibly leak when the unit is started. In most cases these gaskets will soon swell and form a tight seal. In other cases, it may be necessary for you to tighten the pump bolts to stop a leaking condition.

Pump seal surfaces can separate slightly because of rough handling or from vibration during transit. This could cause a leak at the pump seal when the pump is started, but in most cases the surfaces will mate again after the pump is allowed to run for a short period of time. If they do not reseal, you may need to open the pump and free the seal by hand. *It is seldom necessary to install a replacement seal in a new unit unless the seal has been damaged because the unit was started without water.*

Our pump seals have a long period of service life. Some conditions, of course, can shorten seal life, including the presence of grit, operation of the unit without water, sustained high water temperature, or presence of certain chemicals in the water. Our pump seal assembly has been developed to resist abrasive particles that are present in many water systems. This is done by a special flushing system that uses water exiting the pump to constantly wash the seal area.

It is also fitted with high temperature flexible components for maximum heat resistance. These same components remain flexible even at low temperatures. Thus, the standard seal is a fine combination of heat resistant and wear resistant components. Unfortunately, even under normal use, the seal will eventually wear and require replacement.

A small puddle underneath the unit is a sign of rotary seal wear, and if investigation confirms the pump as the source, the seal should be replaced as soon as practical. The water slinger is intended to provide temporary protection against this, but a continued and substantial leak will ruin the motor bearing and cause further damage.

After the unit has been in service for a period of years where abrasive conditions are present, you may find that the pump bracket (the top half of the pump casting), can be eroded away in the area around the seat of the rotary seal. This area should provide a straight, smooth bearing surface for the cup seal. Should your casting show signs of erosion in this area, the casting needs to be replaced. The replacement cost of the casting is very modest compared to the down time and maintenance cost for frequently replacing the seal.

Under some conditions, the pump may not start. After turning off the power supply, check the motor shaft to be certain it is free to turn. By removing the drip cover on top of the motor, you'll have access to the end of the shaft. It has been slotted to make it easy to turn with a screwdriver. If the shaft is free to turn, next check that the motor overloads are set, check for blown fuses, and finally check the power supply on each leg to the motor. A qualified electrician should check the motor and its circuit.

Important!

If the pump motor wiring is disconnected for removal from the unit, make sure that you check the actual rotation direction when the motor is rewired to the unit.

A phase sensor does not always indicate proper rotation if motor wire leads are reversed at installation.

Consult the electrical schematic for more information.

Heaters

Heaters may need to be cleaned chemically or mechanically to remove deposits and dirt that reduce heat transfer and cause hot spots. Hot spots cause premature heater failure. Install a new gasket when reassembling. Make sure a qualified electrician disconnects and reconnects heater wires.

Solenoid Valves

- ☑ Clean annually; more often if using high mineral content water or on high service level units.
- ☑ Sluggish operation, excessive leakage, and/or noise indicate cleaning is necessary. Inspect the components for excessive wear while the valve is disassembled.
- ☑ Rebuild kits are available from the Parts Department.

6-3 Restoring the Controller to Factory Setup

If the preset parameters on the controller have been tampered with and it no longer properly controls temperature, you can restore the controller to factory setup parameters.

E5CZ Operating Parameters

The E5CZ controller has several mode selections. Within each mode are numerous parameters that can be set.

Before you can gain access to the several modes of operating parameters, you must change the security lock-out of the controller. AEC sets the security level at the factory to protect the parameters from being accidentally changed. The explanation that begins on the following page is how to change operating modes, how to change out the security level, and how to reset factory default settings.

Available E5CZ Modes

Menu Display

Operation Level

For normal operation, and changing of the **SV** screen.

Adjustment Level

For adjusting primary control parameters. Execute: auto-tuning; Set alarm values; set the control period; set PID parameters.

Protect Level

The protect levels prevent unwanted operation of the keys on the controller in varying degrees.

Initial Setting Level

For setting basic specifications. Set parameters for input type, scaling, output assignments and direct/reverse operation.

Setting E5CZ Security in Protect Level

To access protect mode, press the **Level** and **Mode** keys together for at least three seconds. Press the **Mode** key to scroll through the parameters. "oAPt" is for setting the protection of the Operation and Adjustment levels. "iCPt" is for setting the protection of the Initial setting level. "utPt" is for setting the overall protection of the keys on the front of the controller.

With the display reading "oAPt", set the security of the Operation and Adjustment levels. Change the protect level to 0 or 1 to make changes to the operating parameters. TrueTemp II TCU units are factory set to for "oAPt" equal to 1.

Available Security Levels

Mode		Security level			
		0	1	2	3
Operation Level	PV	O	O	O	O
	PV/SP	◎	◎	◎	O
	Other	◎	◎	X	X
Adjustment Level		◎	X	X	X

◎: Can be displayed and changed
O : Can be displayed
X : Cannot be displayed and moving to other levels is not possible

To return to the operational level press and hold the Level and Mode key for 3 seconds.

When the display is reading "iCPt", set the security of the Initial setting level. Change the protect level to 0 or 1 to make changes to the initial settings. TrueTemp II TCU units are factory set to for "oAPt" equal to 1.

Available Security Levels

Mode	Security level		
	0	1	2
Initial Setting Level	O	O	X

O : Movement possible
X : Movement not possible

E5CZ Factory Setting for Process Temperature

Press the **Level** and **Mode** key for three (3) seconds to enter Protect Level.

Press the **Mode** key to select which Protect level is to be changed. Use the **Up** or **Down** key to change the parameter to 0 or 1.

Once the Protect level has been properly selected, Press the **Level** and **Mode** key for three (3) seconds to enter Operational Level.

Figure 7
Setting List for Process Temperature Controller

Protect Level

Mode	Parameter	Setting range	Default	Set Value
oAPt	Operation/adjustment protect	0 to 3	0	1
iCPt	Initial setting protect	0 to 2	1	Default
utPt	Setting change protect	ON/OFF	OFF	Default

Initial Setting Level (Press ◎ for more than 3 seconds)

Mode	Parameter	Setting range	Default	Set Value
in-t	Input type	0 to 21	-	5
in-H	Scaling upper limit	1 to 9999	100	Default
in-L	Scaling lower limit	-1999 to -1	0	Default
dP	Decimal point	0 to 1	0	Default
d-U	°C/°F	C or F	C	F
SL-H	Set point upper limit	-	1300	300
SL-L	Set point lower limit	-	-200	0
Cntl	PID ON/OF	Pid/onoF	onoF	Pid
S-HC	Standard or heating/cooling	Stnd/H-C	Stnd	H-C
St	ST self-tuning	oFF/on	on	Default
CP	Control period (OUT1)	1 to 99	20	Default
C-CP	Control period (OUT2)	1 to 99	20	15
orEv	Direct/reverse operation	or-r/or-d	or-r	Default
ALt1	Alarm 1 type	0 to 11	2	0
ALt2	Alarm 2 type	0 to 11	2	0

Figure 8
Setting List for Process Temperature Controller (Cont'd.)

Adjustment Level (Press ◎ for less than 1 second)

Mode	Parameter	Setting range	Default	Set Value
At	AT execute/cancel	on/oFF	oFF	Default
Cnut	Communications writing	ON/OFF	OFF	Default
Ct1	Heater current value monitor	0.0 to 55.0	0	Default
Ct2	Heater current value monitor	0.0 to 55.0	0	Default
LCR1	Leakage current 1 monitor	0.0 to 55.0	0	Default
LCR2	Leakage current 2 monitor	0.0 to 55.0	0	Default
Hb1	Heater burnout detection	0.0 to 50.0	0	Default
Hb2	Heater burnout detection	0.0 to 50.0	0	Default
HS1	HS Alarm 1	0.0 to 50.0	50	Default
HS2	HS Alarm 2	0.0 to 50.0	50	Default
SP-0	Set point 0	SL-L to SL-H	0	Default
SP-1	Set point 1	SL-L to SL-H	0	Default
SP-2	Set point 2	SL-L to SL-H	0	Default
SP-3	Set point 3	SL-L to SL-H	0	Default
CnS	Temperature input shift	-199.9 to 999.9	0	Default
CnSH	Upper-limit temperature input shift value	-199.9 to 999.9	0	Default
CnSL	Lower-limit temperature input shift value	-199.9 to 999.9	0	Default
P	Proportional band	0.1 to 999.0	8.0	6.5
i	Integral time	0 to 3999	233	20
d	Derivative time	0 to 3999	40	Default
C-SC	Cooling coefficient	0.01 to 99.00	1	5.5
C-db	Dead band	-199.0 to 999.9	0.0	Default
oF-r	Manual reset value	0.0 to 100.0	50.0	Default
HYS	Hysteresis (OUT1)	0.1 to 999.0	1.0	Default
CHYS	Hysteresis (OUT2)	0.1 to 999.0	1.0	Default
SoAK	Soak Time	1 to 9999	1	Default
Wt-b	Wait Band	OFF or 0.1 to 999.9	oFF	Default
MV-S	MV at Stop	-105.0 to 105.0	0.0	Default
MV-E	MV at PV Error	-105.0 to 105.0	0.0	Default
SPRt	SP Ramp Set Value	OFF or 1 to 9999	oFF	Default
oL-H	MV Upper Limit	0.0 to 105.0	105.0	Default
oL-L	MV Lower Limit	-105.0 to 0.0	-105.0	Default

6-4 Electrical Connections

Make sure that a qualified electrician inspects all electrical components and connections every six (6) months for secure attachment and ground connections. Inspect all wiring for fraying or damage, especially power lines where they enter the unit. **All wiring connections must be *tight*.**

6-5 Safety Devices

Caution!

Make sure that only qualified electricians test safety devices!

Safety devices should be tested for function **every six (6) months**. Perform the following procedures for testing:

Motor Overload

Disconnect main power. Open the electrical enclosure and rotate the manual **TEST** button on the motor overload to the tripped position. Close the enclosure and reconnect main power. Push the **START** button. The unit should **not** start and the **Pump Overload** indicator should illuminate.

Turn the circuit protector switch counter-clockwise to the OFF (O) position, then fully clockwise to run. The unit is now ready for operation.

Pressure Switch

With the unit running, program a set point of 30ºF (-1ºC). Allow the process temperature to drop under 100ºF (38ºC). When the process temperature reaches that point, turn off the water supply. The pump should stop and the Low Water Pressure indicator should illuminate. Turn the water supply on to reset the pressure switch.

Safety Thermostat

Disconnect main power. Open the electrical enclosure and disconnect the neutral lead on the safety thermostat from the terminal strip. Protect the stripped lead to prevent short circuits. Close the enclosure, reconnect main power, and push the **START** button and press ON/OFF switch to the ON position. The heater should **not** turn on and the

Over Temperature indicator should illuminate. **Disconnect main power before reconnecting the thermostat lead**.

6-6 Cleaning and Storage

- **Inspect the unit daily for leaks**. Wipe down the unit periodically to remove dirt and dust buildup, especially the motor casing.
- Drain and flush the unit every six (6) months to remove sediment buildup.
- Completely drain the unit and **carefully** blow out the piping with pressurized air before placing the unit in storage.

- Notes -

7 Troubleshooting

Condition	Possible cause	Solution
Unit does not turn on.	No power.	Check main disconnect, fuses, wiring, and power lead to unit.
	Wrong voltage supplied to unit.	Voltage must be within plus or minus 10% of nameplate rating.
	Defective on/off switch.	Replace.
	Transformer primary circuit fuse blown.	Replace.
	Defective control transformer.	Check transformer.
Unit does not run.	Broken or loose wire in pump motor control circuit.	Locate and repair.
	Pump motor contactor holding coil is open.	Repair or replace.
	Low water pressure light on.	Check for at least 16 psig (110.32 kPa/1.1 bar) water pressure on **WATER IN** or **CITY WATER MAKEUP**.
	Water supply to unit is turned off.	Open water supply.
	Pump overload light on.	Reset and test each leg for balanced amp draws.
Low pump pressure.	Pump running in reverse.	Verify proper rotation. If not clockwise, reverse any two incoming power leads.
	Foreign matter in the system.	Clean the system.
	System has minimal back pressure, and is operating at the far end of the pump curve.	As long as there is satisfactory process temperature control there is no problem.
High pump pressure.	Foreign matter obstructing system.	Clean the system.
	Restricted water flow.	Check for closed valves etc. Be sure all lines are properly sized.
	System has high back pressure, and is operating at the near end of the pump curve; a low flow condition.	As long as there is satisfactory process temperature control there is no problem.
Pressure switch circuit is open.	Insufficient cooling or makeup water pressure.	Check for 25 psig (172.38 kPa/1.72 bar) water pressure on **WATER IN** or **CITY WATER MAKEUP**.
	Switch is broken.	Jump power across switch and see if unit starts. Replace switch if needed.

Condition	Possible cause	Solution
Temperature fluctuations/rapid cycling from hot to cold.	Undersized connectors/water lines.	Increase size of connectors/ water lines.
	Long connecting lines between unit and mold.	Move the unit closer to the mold and shorten connecting lines.
	Serpentine flow through mold.	Connect lines for parallel flow instead of series flow.
	Blocked water line in mold.	Check mold for metal chips or lime buildup. Clean mold.
	Quick disconnect fitting with check valve.	Remove and replace fitting or valve.
	Lime buildup in unit piping.	Clean or replace.
	Faulty TCU.	Check unit by connecting ¾" line directly from To Process to From Process line. Run unit to determine if TCU controls set point temperature.
Unit overheats or does not cool.	Drain is plugged or excessive back pressure is in drain line.	Clear drain line or eliminate back pressure condition.
	Faulty solenoid valve.	Test solenoid valve by pressing **VENT** button and listen for valve operation. Replace if faulty.
	Controller Cool output relay open.	Replace controller.
	Solenoid valve is not operating, but **COOL** LED is on.	Set process temperature to minimum and check for mag-netism on solenoid coil top.
	Solenoid coil circuit is open.	Check coil resistance. If MΩ range, replace solenoid coil.
	Modulating valve is not operating, but **OUT2** LED is on.	Set process temperature to minimum and check for complete travel of valve.
	Insufficient pressure differential between cooling **WATER IN** and **OUT** lines.	Find a means to get less back pressure in the **WATER OUT** line.
	Cooling valve is undersize.	Replace cooling valve with a larger valve.
Relief valve leaks.	Foreign material under valve seat.	Manually open valve to clear seat of material.
	High system pressure.	Reduce **WATER IN** or **MAKEUP** water pressure.
Unit runs continuously cooling or heating, and cannot attain set point.	Unit under-sized for application.	Call sales representative.

Condition	Possible cause	Solution
Unit does not heat/cannot achieve set point.	Defective heater contactor.	Visually inspect coil and contacts; repair/replace defective contactors.
	Defective immersion heater.	Check resistance on all three (3) legs of the heater with an ohm meter. If not all equal, contact factory for replacement heater.
	Controller heat output open.	Check the heater output with an ohm meter to ground. It should read in the mega-ohm range. Infinite or zero readings indicate a defective output.
	Heater contactor is not energizing, but **HEAT** LED is on.	Set process temperature to maximum and check for control voltage at heater contactor.
	Immersion heater elements dirty.	Remove heater and clean elements.
	Immersion heater element is burned out.	Check heater tank for scorched/discolored paint. Check resistance on all three (3) legs of the heater with an ohm meter. Replace heater as required.
		Check for balanced amp draws, and supply voltage. If not present replace immersion heater.
	OUT1 indicator is on, but no voltage on heater contact.	Replace controller.
	Cooling valve is leaking.	Dismantle valve and clean out.
	Solenoid valve is not operating, but **COOL** LED is on.	Set process temperature to minimum and check for magnetism on top of solenoid coil.
	Magnetism on coil.	Clean coil.
	Faulty/dirty solenoid valve.	Press **VENT** button several times to flush the valve.

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Technical Assistance

Parts Department

Call toll-free 7am–5pm CST [800] 423-3183 or call [847] 273-7700, Fax [847] 273-7804
AEC Customer Service Group will provide your company with genuine OEM quality parts manufactured to engineering design specifications, which will maximize your equipment's performance and efficiency. To assist in expediting your phone or fax order, please have the model and serial number of your unit when you contact us. A customer replacement parts list is included in this manual for your convenience. AEC welcomes inquiries on all your parts needs and is dedicated to providing excellent customer service.

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