

Temperature Control System  
MODELS Semistat S 1200, S 2400, S 4400  
POU 3300, POU 3500  
OPERATION MANUAL



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## INTENDED USE

The intended use for this product is for semiconductor temperature control applications. Desired temperature is achieved by heating/cooling a recirculating perfluorinated fluid, and rejecting heat to the facility's water loop. Each module is intended for installation with a LAUDA-Noah Power Supply Controller (PSC)

## PRODUCT USAGE STATEMENT



**DANGER:**

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or maintaining this equipment. Practice all plant and product safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. All personnel who work with or who are exposed to this equipment must take precautions to protect themselves against serious or possibly fatal bodily injury. LAUDA-Noah, LP, provides information on its products and associated hazards, but it assumes no responsibility for the after-sale operation of the equipment or the safety practices of the owner or user. This equipment produces or uses potentially lethal high-voltage, high-current, electrical power.

**NEVER DEFEAT INTERLOCKS OR GROUNDS.**

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# 1. INTRODUCTION

## 1.1. General Information

To ensure safe operation, read and understand this manual before attempting to install or operate this unit. Read the safety instructions and follow the safety practices under “Safety”.

### Interpreting the Manual

The following sections explain the type conventions, icons, and symbols that appear in this manual.

#### Type Conventions

To identify certain words and phrases in type that differ from the rest of the text quickly, please note the following type conventions:

- Pin and signal names appear in capitalized italics (*DUTY CYCLE.A*).
- Technical terms appear in italicized text when first introduced.
- Unit labels (switches, indicators, etc.) generally appear in boldface letters as they are labeled on the unit (**MODIFY**).
- Commands (**162**) and command names (**setpoint**) appear in boldface lowercase letters.

#### Icons (Symbols)



This symbol represents important notes concerning potential harm to this unit, or associated equipment.



**DANGER:**

This box identifies hazards or unsafe practices that could result in severe personal injury or death.



**WARNING:**

This box identifies hazards or unsafe practices that could result in personal injury.



**CAUTION:**

This box identifies hazards or unsafe practices that could result in product or property damage.

The following symbols may appear on labels on the unit:

Electrical Hazard



CE label



Heat Hazard



## 1.2. Safety and Certification

- Do not attempt to install or operate this equipment without proper training.
- Ensure that this unit is properly grounded.
- Ensure that all cables are properly connected.
- Verify that input line voltage and current capacity are within specifications before turning on the power supplies.
- Use proper electrostatic discharge (ESD) precautions.
- Do not attempt to operate product outside of its specified electrical range.

## 1.3. Risk of Burns

Avoid areas of the unit marked with the heat hazard label to reduce the risk of burns. Additionally, use insulation on process hose/tubing and fittings to reduce the exposure of potentially high temperature areas.

## Product Safety/Compliance

Certain options of this product will be tested for and comply with Electromagnetic Compatibility (EMC) standards. Certification is pending.

## Certification

Certain options of this product are pending certification by:

- CE certification
- EMC measurements
- SEMI S2

For more information, refer to the letter of conformance (US) or declaration of conformity (EU) accompanying the product.

## 2. Installation

### 2.1. Conditions of Use

Install this unit according to the following requirements.



**DANGER:**

Operating and maintenance personnel must receive proper training before installing, troubleshooting, or maintaining high-energy electrical equipment. Potentially lethal voltages could cause death, serious personal injury, or damage to the equipment. Ensure that all appropriate safety precautions are taken.



**DANGER:**

**RISK OF DEATH OR BODILY INJURY.** Disconnect all sources of input power before working on this unit or anything connected to it.

To be in compliance with the stated directives and standards, the following conditions of use must be met:

- Operate the point-of-use module only within a system configuration that contains accessory components authorized and provided by LAUDA-Noah, LP, or one of its authorized agents.
- Install and operate this device in an over voltage category II installation only.
- Install and operate this device only in a pollution degree 2 or better environment (an indoor location such as a computer room, office, or factory floor), where only non-conductive pollution occurs during operation.
- To prevent toppling, the point-of-use module must also be securely mounted by a bracket or in a subfloor tile mount.
- When dealing with any fluids such as coolant or facility water, utilize PPE such as gloves and protective eyewear to avoid direct contact with skin or eyes.

## 2.2. Unpacking and Handling

**WARNING:**

Heavy Load. The 3300 /2400 module weighs 25 kg (55 lb). The 3500/4400 module weighs 38 kg (84 lbs). The power supply/ controller weighs up to 30 kg (66 lbs).

Lifting can cause muscle strain or back injury. Use lifting aids and proper lifting techniques when installing, removing or replacing.

Unpack the unit carefully. Verify that all items checked on the packing slip are in the crate.

Inspect the unit for obvious physical damage. Contact LAUDA-Noah, LP Customer Support and the carrier immediately if there are signs of shipping damage. Save the shipping container for submitting necessary claims to the carrier.

Utilize the handles on the top of the unit for transport, and use a 2 person lift for the POU 3500 and S 4400.

## 2.3. Site and Climate

The unit must be installed vertically, according to the markings on the side of the unit. We recommend that the unit be located no more than 3.8m (12.5 ft) away from the temperature control target.

The electrical protection degree of the unit is IP2X, indicating the unit is for indoor use only, with no protection against water droplets.

Since the unit is liquid cooled, there are no requirements for spacing and ventilation. However, accommodations must be made for the unit's fluid and electrical connections. Do not position the equipment so that it is difficult to access these connections.

Additionally, avoid installing the unit's process loop through areas where someone may come into contact with tubing/hose in order to reduce risk of burns.



The following table denotes the climatic specifications of the unit.

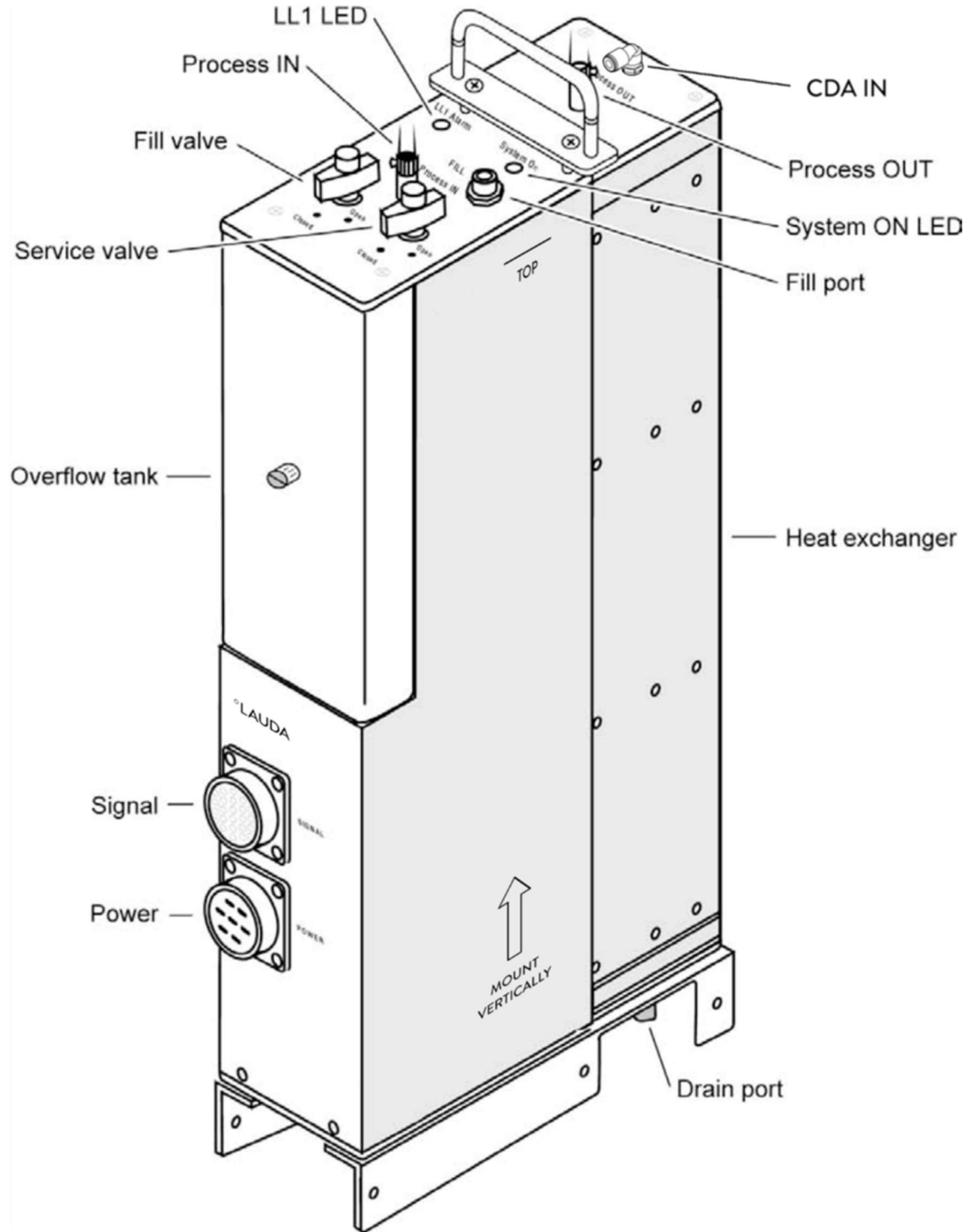
	Temperature	Relative Humidity	Air Pressure
<b>Operating</b>	0°C to +50°C (+32°F to +122°F)	10% to 90% <sup>1</sup> +2 g/m <sup>3</sup> to +25g/m <sup>3</sup>	1 Atm
<b>Storage and Transportation</b>	-20°C to +60°C (-4°F to +140°F)	10% to 90% <sup>1</sup> +2 g/m <sup>3</sup> to +25g/m <sup>3</sup>	1 Atm

---

<sup>1</sup> Noncondensing

## 2.4. Identification of Ports and Connections

The following illustration depicts the unit's external fittings and connectors.



## 2.5. Fluid Connections

### Process Side

The following pictures depict the top view of the unit. The Process OUT and Process IN ports have a LAUDA-Noah proprietary connector that can be adapted to either a barb fitting or a ½ Swagelok® compression/tube adapter.

**WARNING:**

For applications where the temperature set point of the unit is less than the dew point of the environment, CDA (Clean Dry Air) must be used to protect the unit from condensation. Be sure to supply this port with the recommended CDA flow rate. CDA specifications are listed in a label on the unit.

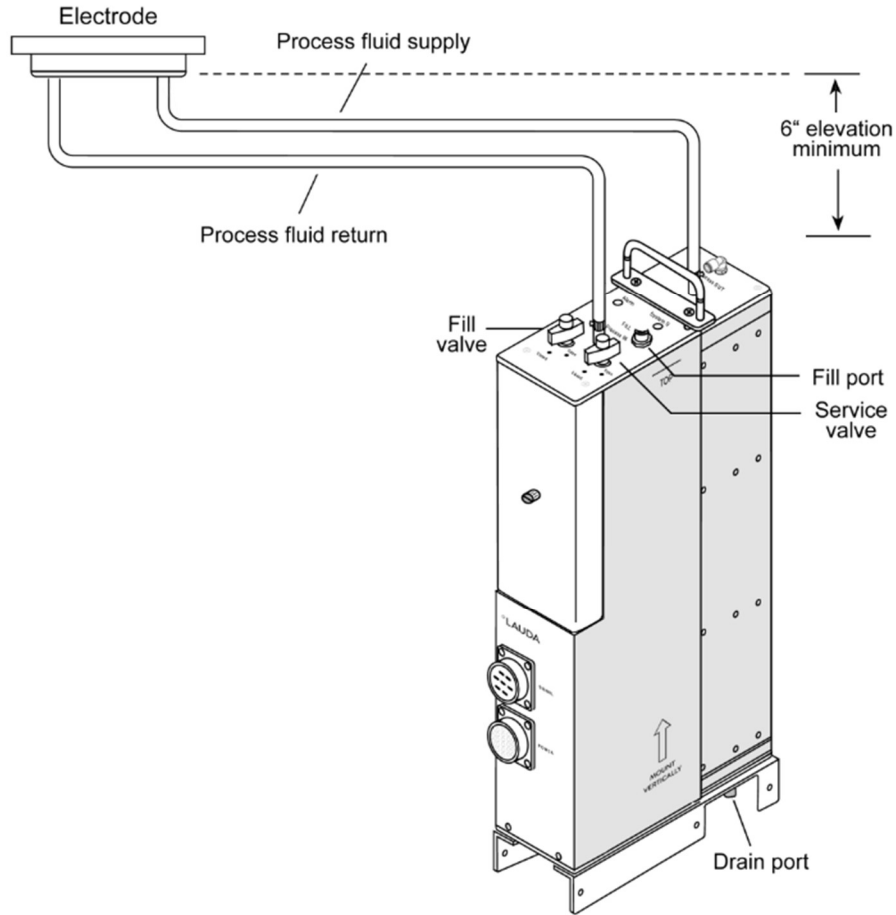


POU 3300/S 2400



POU 3500

When connecting the process supply and return lines, follow the following diagram. Recall that the unit must be installed no more than 3.8m (12.5 ft) away from the temperature control target.



We strongly advise the installation of thermal insulation for all process side hoses to minimize thermal losses and to prevent the buildup of moisture due to condensation.

**Caution – Working with Perfluorinated Fluids**

**Contain any spills and absorb with available inorganic material.**

**Perfluorinated fluids are not considered hazardous, but do have high global warming potential. Care should be taken to minimize emissions.**

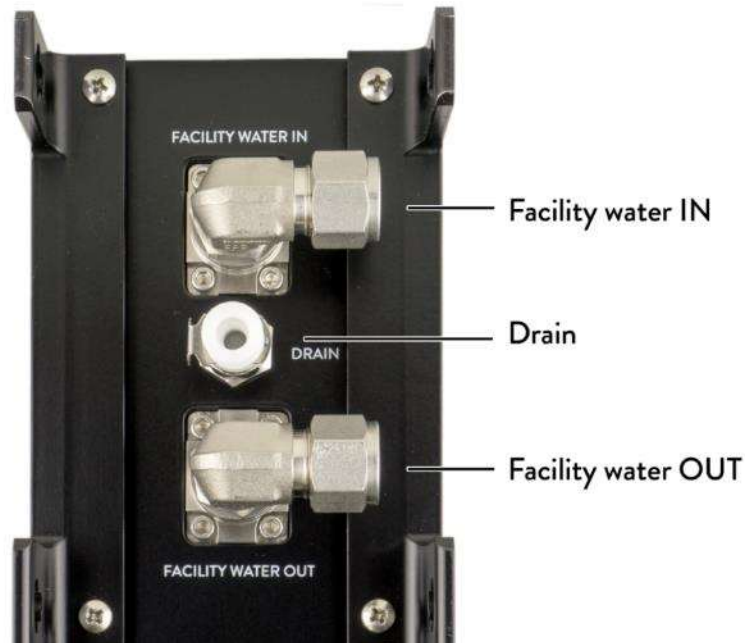
**Check with the manufacturer’s MSDS for the specific process loop cooling fluid used for more information**

## Facility Water Side

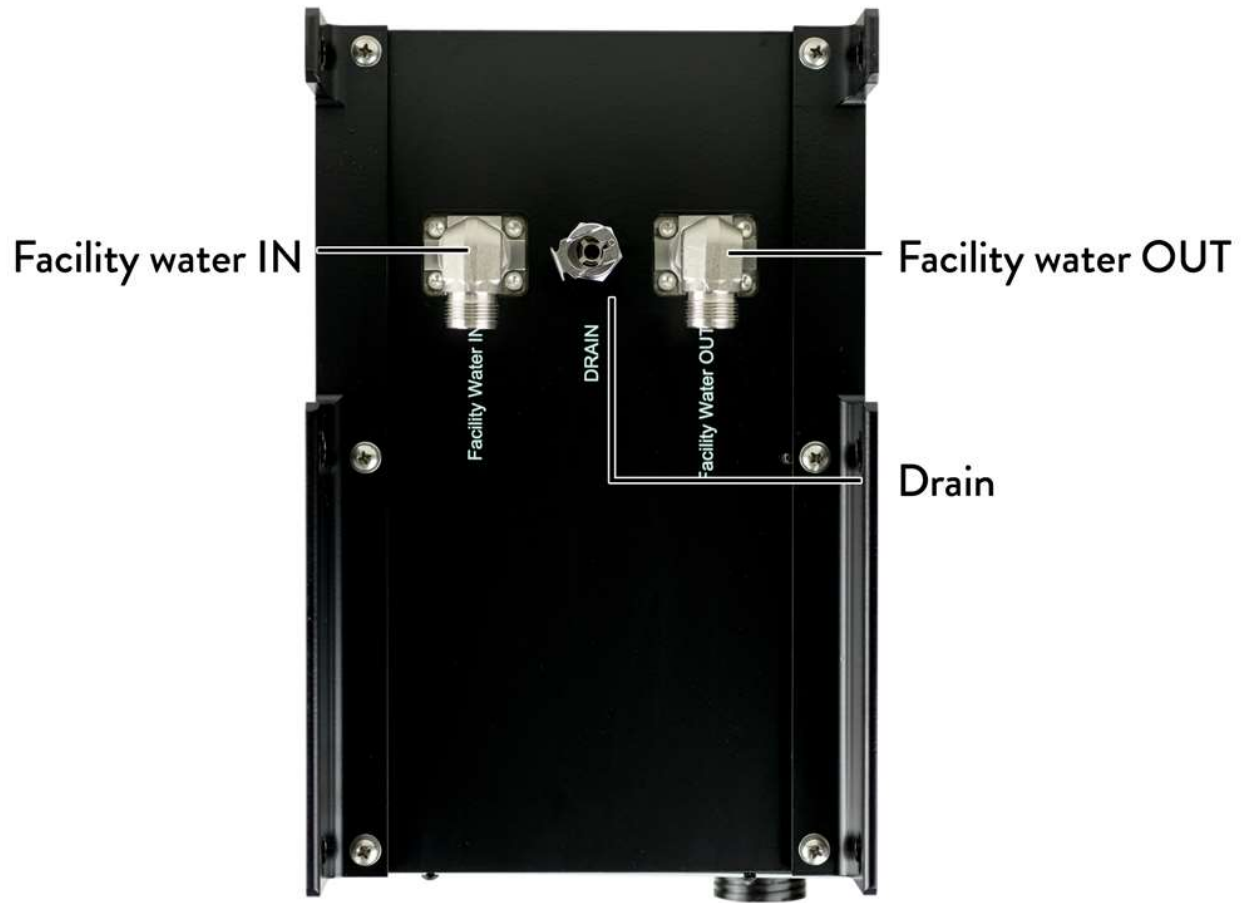
The facility water connections are ½” Swagelok® compression fittings, illustrated below. Be sure to follow the directionality of the water flow for optimal performance.

Using a flow meter, verify that the unit is receiving the recommended flow rate for that particular module.

Be sure that shutoff valves for the incoming facility water are located close to the location of install for ease of access. These valves must be lockable in the “OFF” position for proper energy isolation.



POU 3300/S 2400



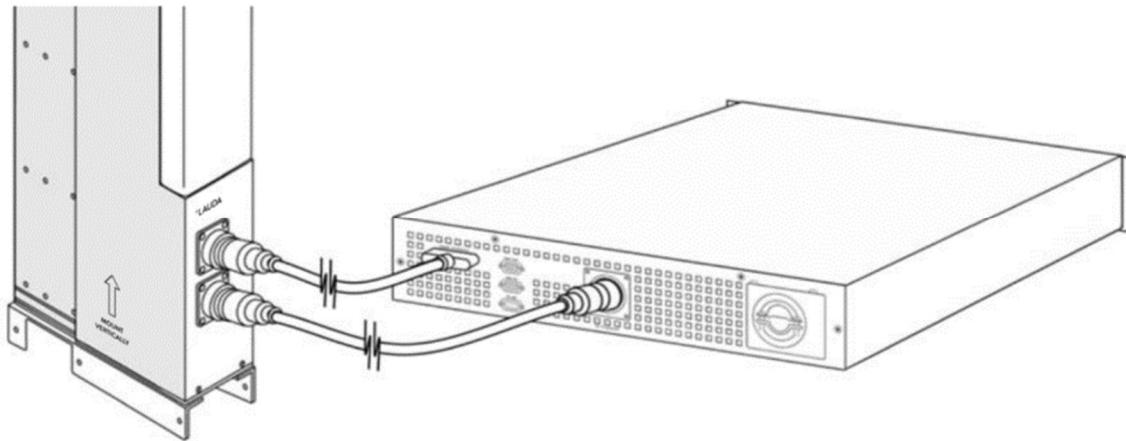
POU 3500

## 2.6. Electrical Connections

Install the power supply/controller (PSC) in a 19-inch rack or other appropriate location. Orient the PSC so that the front panel and electrical connections in the back are accessible. Note that the standard PSC AC power cable is 3 m (10' long).

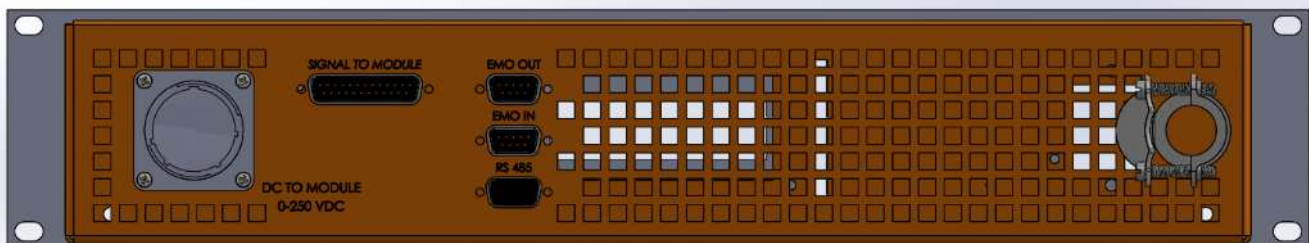
Connect the DC power cable from the 7-pin connector on the module to the connector on the PSC. This is labeled **Power to Module**.

Connect the signal cable from the module to the connector on the PSC. This is a 25-pin circular connector, female end, connecting with the module and a 25-pin, D-subminiature connector connecting to the PSC. This is labeled **Signal to Module**.



Connect the PSC's AC power cable to either tool or facility power via a receptacle fed from a circuit breaker. (*Note:* A hardwired power connection is *NOT* recommended). The power cable is supplied with a plug and the minimum service requirements can be found in the technical specifications table. (*Note:* The Short Circuit Current Rating (SCCR) of the system is dependent on the PSCX, not the Module. The PSCX's SCCR is 5000A.)

Additional connections, such as the RS-485 to a Remote Communication Module and the EMO circuitry, are described in detail in the respective manuals of those products.





## 2.7. Secondary Containment

As a precaution, it is recommended that the user of this equipment install a secondary containment container for potential leaks. This container shall installed under the unit to catch any leaks, be large enough to contain the volume of each particular unit – see table below.

These secondary containment devices should not interfere with access to the PCW or drain fittings on the bottom of the unit and be designed for easy removal of the collected fluids.

Module	Minimum volume of Secondary Containment (L)
S1200	1.10
S 2400	1.50
S 4400	2.75
POU 3300	1.50
POU 3500	2.75

As a final precaution, these secondary storage containers must have fluid detection and alarm capabilities in order to prevent continuous leaks. This sensor must be installed at the lowest point of the storage container, and notify the end user in the case of activation.

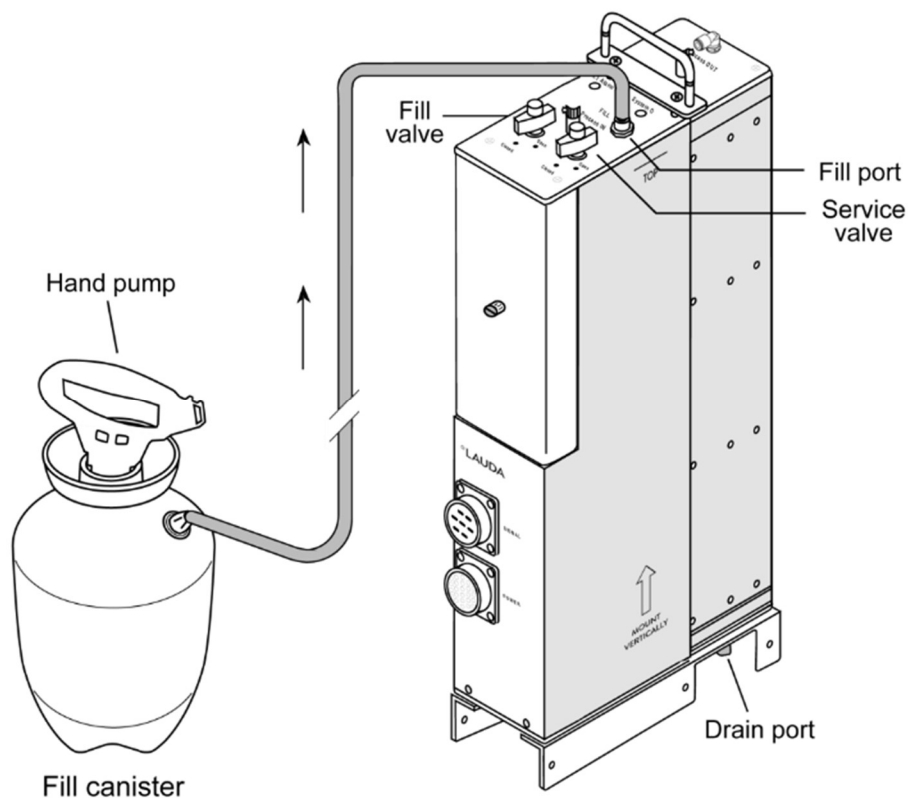
### 3. Startup

After the unit has had both its fluid and electrical connections made, the unit must be filled before operation. The 3300 and 2400 will require ~1.6L of perfluorinated fluid and the 3500 will require ~3.0L, not including external plumbing, as well as a pressurized fill canister.

**CAUTION:**

Use only approved process fluids. Do *not* use water or a mixture of water and ethylene glycol.

#### 3.1. Fill Procedure



- Fill the canister with process fluid to the 2.0 liter mark. Do *not* top off. Leave room for air.
- Connect the quick disconnect fitting on the fill canister's tube to the mating quick disconnect fill port on the top of the module.
- Pressurize the fill canister with its hand pump.

- Open both the **Fill** and **Service valves** on the top of the module by pushing in and turning the valves counter-clockwise to the **Open** position.
- Press and hold the trigger lever on the canister to begin filling the reservoir. Continue to pressurize the canister, pumping slowly.
- Be watchful for process fluid flowing into the overflow tank (~ 500ml after the LL1 LED goes out @ 20 °C). Continue to fill until the fluid in the overflow tank is about 1 inch from its bottom. When no more air bubbles come out, release the trigger and stop pumping. The reservoir is full.
- Close both the **Fill** and **Service** valves by turning them clockwise to the **Closed** position. The module is now ready for system startup.

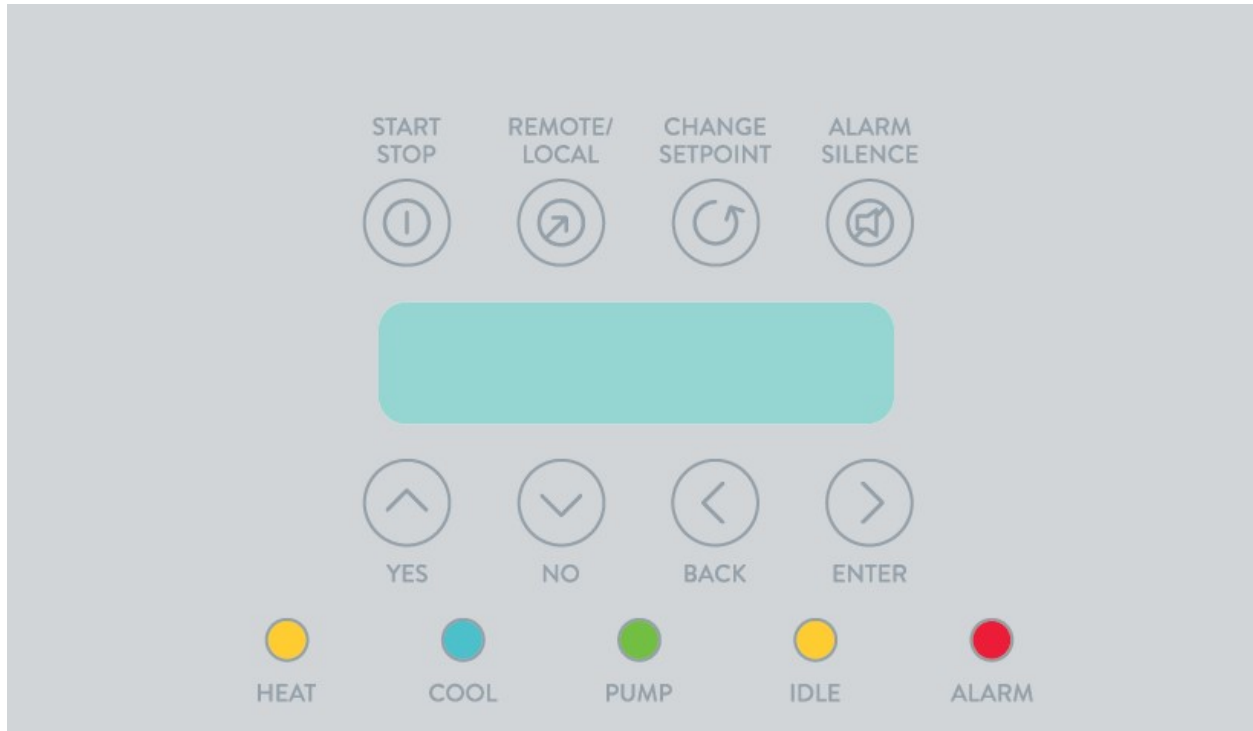
## 3.2. System Startup

The system startup procedure requires that all connections between the module and its PSC are connected and powered on, and all fluid connections are secured. Due to the small size of the unit's tank, an additional fill procedure is needed to purge the entire process loop of air.

- Check that the EMO button (located on the right side of the controller front panel) is protruding. If pressed in, twist clockwise to reset. (The **EMO Disable** key is used during servicing only.)
- Turn on the PSC and verify that the PSC is displaying the temperature of fluid in the module.
- Press the START/STOP button to start the system, noting that the green LED (System On) on top of the unit should turn on. Depending on the amount of external plumbing, the red LED (LL1) will turn on to indicate a low tank volume. The pump continues to run if only LL1 is active.
- If the green system LED turns off, the fluid level is at LL2 and will shut down the system (unless in CHX mode)
- Open the **Fill** valve, and, using the fill canister, add process fluid. The red LED goes out when the reservoir is half filled. Continue to fill until the fluid flows into the overflow tank. Continue filling until the fluid level in the overflow tank is 2 inches from the bottom.
- Close the fill valve and disconnect the fill canister. Empty the excess process fluid into an authorized storage container. The system is now ready for temperature control operation.

## 4. Operation

### 4.1. PSC Panel



The PSC front panel consists of 8 buttons, 5 main LED status lights, and one LED display.

**START/STOP** – Switches the module between IDLE mode and the ON state (ACTIVE mode). In the ON state, the pump turns on, and the system either activates HEAT or COOL mode, depending on the temperature set point and the process temperature.

**REMOTE/LOCAL** - Switches the system’s operation mode from tool controlled (REMOTE) to front panel controlled (LOCAL).

**CHANGE SETPOINT** - Press this button to initiate a change in the process setpoint while in local mode.

**ALARM SILENCE** - Press this button to mute any audible alarm, as well as clear an alarm once its condition has been rectified.

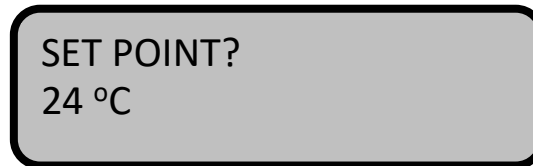
**YES, NO, BACK, ENTER** - In addition to confirming or denying inquiries from the PSC, these buttons also act as navigation keys for cycling through different menu options.

*Further information on the PSC operation and functionality can be found in the PSC operation manual.*

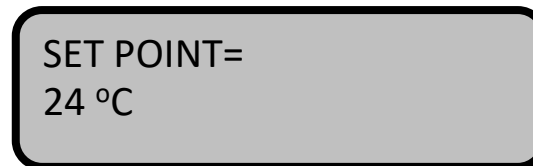
## 4.2. Basic Module Operation

### Changing the Setpoint

The **CHANGE SETPOINT** key is used to change the system's temperature set point while in Local control. Pressing this key brings up the following display.



The top line is the prompt with a blinking question mark; the second line is the current local set point. Press the **YES** key to make a change. The blinking question mark changes to an equal sign.



Use the **YES** (Up) and **NO** (Down) keys to reach the required set point. Press the **ENTER** key to save the new value.

## 4.3. Lockout Tagout Procedure

In order to remove the unit, the unit must be detached from the facility connections (water, electricity, and CDA).

1. Identify the connections to CDA, Facility water, and electrical connectors to the PSCX.
  - a. CDA is connected to the port on the top of the unit. Follow this tube to the valve monitoring the CDA pressure.
  - b. Facility water connections are on the bottom of the unit. Trace these tubes back to their flow meter and valves.
  - c. Electrical connections are on the front of the unit.
2. Make sure that the PSCX module is off, then disconnect the power and signal connectors on the front of the unit.
3. Shut off the water and air valves, and lock the valves in the off position.
4. Verify that water is shut off from the PCW flow meters, and that no pressure is built up in either line.

5. If pressure remains in the loop greater than 1PSIG, release the pressure by creaking open the compression fittings slowly, being sure to capture any released fluid into the unit's leak tray.
6. The unit is now deenergized and ready for removal.

## 5. Maintenance

### 5.1. Basic Maintenance

The modules require minimal maintenance. However, process fluids must be changed and added periodically as necessary. Completely replace the process fluid every two years.

To drain the process fluid when servicing the machine, use the following procedure:

- Press the **Start/Stop** key to enter idle mode, then toggle the power switch off.
- Depressurize the fill canister by unscrewing the trigger assembly from the top of the canister. Leave the bottom hose of the trigger assembly in the canister but do not screw back in place.
- Connect the fill canister hose to the quick disconnect fitting on the bottom of the module labeled **Drain**.
- Open the **Fill** and **Service** valves.
- Press the trigger on the canister and the process fluid will drain into the canister. Disconnect hose when process fluid is completely drained from the module.
- Close the **Fill** and **Service** valves. The equipment is dry and ready for servicing.

### 5.2. Service

In case of need for service/repair, please contact LAUDA for assistance. No service is to be done by the user.

## 6. Troubleshooting

### 6.1. List of Alarms and Warnings

Soft Alarm Display	Description	Solution
"LIQUID LEVEL #1"	Low fluid level below liquid level switch #1	Inspect the process line for leaks, and refill the unit with the process described in the manual.
"LOW DEVIATION"	Process temperature below low limit but temperature control is still active	Verify that the deviation alarm values on the PSC are properly set, and that the unit is functioning normally.
"HIGH DEVIATION"	Process temperature above high limit but temperature control is still active	Verify that the deviation alarm values on the PSC are properly set, and that the unit is functioning normally.
"FAN FLOW FAULT"	Internal fan is not functioning properly	Contact LAUDA for service when able.

Hard Alarm Display	Description	Solution
"SEMISTAT POWER SUPPLY INTERRUPTION"	Power supply for thermoelectrics fails self-diagnostics.	Unit must be serviced. Verify if the alarm is caused by the module or PSC and contact your service provider for Lauda-Noah products.
"PROCESS SENSOR FAULT [RTD]"	Open RTD sensor	Verify that the signal connector between the PSC and the module is connected correctly.
"LIQUID LEVEL #2"	Low fluid level below liquid level switch #2	Inspect the process line for leaks, and refill the unit with the process described in the manual.
"TE_OPEN"	Open in thermoelectric circuit	Unit must be serviced. Verify that the alarm is caused by the module, and contact your service provider for Lauda Noah products.
"SHORT"	Short in system	Unit must be serviced. Verify that the alarm is caused by the

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		module, and contact your service provider for Lauda Noah products.
“HIGH PROCESS”	Process temperature above high limit. When the process temperature exceeds this value, the power supply outputs (pump, thermoelectrics, heater) are turned off.	Verify that the process value limits on the PSC are set to values within the range of the application.
“LOW PROCESS”	Process temperature below low limit. When the process temperature falls below this value, the power supply outputs (pump, thermoelectrics, heater) are turned off.	Verify that the process value limits on the PSC are set to values within the range of the application.
“TE OVERTEMP”	Open thermoelectric snap switch	Confirm that the temperature setpoint is in the acceptable operating range of the unit, and that facility water flow is meeting the required spec for the unit.
“PUMP FAULT”	Pump is not drawing power	Verify that the pump circuit is drawing the nominal current amount and that the plumbing line is connected correctly.
“INTERNAL FAULT ”	Unit has experienced an internal fault regarding safety of operation	Contact LAUDA for service when available.



## 6.2. Troubleshooting

Problem	Possible Cause	Possible Solution
<p>Controller does not turn on when the power switch is on</p>	<ol style="list-style-type: none"> <li>1. Power for facility is not correct or missing.</li> <li>2. The EMO button is pressed in.</li> <li>3. EMO IN jumper is not connected.</li> <li>4. EMO OUT jumper is not connected.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the voltages at the power receptacle. The phase voltages should be about 208 VAC.</li> <li>2. Turn the EMO button clockwise to end EMO condition.</li> <li>3. If the EMO IN input is not used, it must be jumpered. Connector is a 9-pin D-subminiature connector labeled <b>EMO IN</b> on the back of the controller. Connector is supplied with the unit.</li> <li>4. If the EMO OUT input is not used, it must be jumpered. Connector is a 9-pin D-subminiature connector labeled <b>EMO OUT</b> on the back of the controller. Connector is supplied with the unit.</li> </ol>
<p>Process temperature fluctuates</p>	<ol style="list-style-type: none"> <li>1. PID parameters are not properly tuned for the process.</li> <li>2. Controller software needs to be reset.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the heating and cooling PID parameters.</li> <li>2. Perform this step only when tool is not processing.               <ol style="list-style-type: none"> <li>a. Record all process parameters, since this step will reset the controller to its default state.</li> <li>b. Turn controller off with power switch.</li> <li>c. While holding down “NO” key, turn controller on with power switch.</li> <li>d. Reprogram controller.</li> </ol> </li> </ol>
<p>Process fluid cannot be pumped into the reservoir</p>	<ol style="list-style-type: none"> <li>1. Fill valve is not completely open.</li> <li>2. Fill canister is faulty</li> </ol>	<ol style="list-style-type: none"> <li>1. Follow the procedure “Filling the Reservoir” for filling the reservoir.</li> <li>2. Use another fill canister.</li> </ol>

Problem	Possible Cause	Possible Solution
Repeated Liquid Level #1 alarms and the reservoir needs filling	Leakage on the process plumbing loop	<p>LAUDA-Noah recommends using an automatic leak detector to locate Fluorinert™ leakages.</p> <ol style="list-style-type: none"> <li>1. Follow the operating instructions in the leak detector manual.</li> <li>2. Check along the process plumbing, especially the fitting and connectors.</li> <li>3. Repair any leaks. If leakage problems persist, try using two continuous hoses between the module and the process equipment.</li> </ol>
Controller does not communicate with host equipment	<ol style="list-style-type: none"> <li>1. Controller is not in Remote mode</li> <li>2. Communication connector is not attached securely</li> <li>3. Communication protocol is not correct</li> <li>4. Controller address set incorrectly</li> </ol>	<ol style="list-style-type: none"> <li>1. Press the <b>Remote/Local</b> key on the controller.</li> <li>2. Check communication connectors.</li> <li>3. Select the appropriate protocol in the Global Setup Menu. See “Communications Protocol” on page 4-26.</li> <li>4. CHX, CHX2 or RTU - Match address to tool setting. RCM, RCMT, or RCMe - Refer to respective RCM manuals for addressing scheme.</li> </ol>

## 7. Technical Features

	Unit	S 1200*	POU 3300	S 2400*	POU 3500	S 4400*
<b>Refrigeration</b>						
Cooling capacity at -20 °C	W	80	200	350	500	700
Cooling capacity at -10 °C	W	350	450	875	1000	1650
Cooling capacity at 0 °C	W	600	700	1400	1500	2600
Cooling capacity at 10 °C	W	900	950	1925	2000	3500
Cooling capacity at 20 °C	W	1200	1200	2450	2400	4400
<b>Heater</b>						
Heating capacity	W	>3000	>3000	>6000	>6000	>12000
<b>Temperature</b>						
Working temperature range	°C	-20 - 90	-20 - 90	-20 - 90	-20 - 90	-20 - 90
Absolute measurement accuracy	K	± 1.0 (additive calibratable)	± 1.0 (additive calibratable)	± 1.0 (additive calibratable)	± 1.0 (additive calibratable)	± 1.0 (additive calibratable)
Temperature stability	K	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1
<b>Hydraulics</b>						

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Pump type		Magnetically coupled DC pump	Magnetically coupled DC pump	Magnetically coupled DC pump	Magnetically coupled DC pump	Magnetically coupled DC pump
Pump pressure	psi [bar]	40 [2.8] (max. condition)	40 [2.8] (max. condition)	40 [2.8] (max. condition)	40 [2.8] (max. condition)	40 [2.8] (max. condition)
Pump flow	gpm [Lp m]	5.8 [22] (max. condition)	5.8 [22] (max. condition)	5.8 [22] (max. condition)	7.1 [27] (max. condition)	7.1 [27] (max. condition)
Volume of the tank	gal [L]	» .25 [1.0]	» .33 [1.25]	» .33 [1.25]	» .66 [2.50]	» .66 [2.50]
Interfaces		½” Barb (Process)  ½” Swagelok Compression (PCW)	½” Barb (Process)  ½” Swagelok Compression (PCW)	½” Barb (Process)  ½” Swagelok Compression (PCW)	½” Barb (Process)  ½” Swagelok Compression (PCW)	½” Barb (Process)  2X ½” Swagelok Compression (PCW)
Heat transfer liquids		Perfluorinated Fluid (3M FC-3283, Galden HT135)	Perfluorinated Fluid (3M FC-3283, Galden HT135)	Perfluorinated Fluid (3M FC-3283, Galden HT135)	Perfluorinated Fluid (3M FC-3283, Galden HT135)	Perfluorinated Fluid (3M FC-3283, Galden HT135)
PCW Temperature	°C	<20	<20	<20	<20	<20
Min PCW Flow Rate	gpm [Lp m]	3 [11.4]	3 [11.4]	5 [18.9]	3 [11.4]	8-10 [30.0-38.0]
<b>Power Supply</b>						
Input Voltage	VD C	0V - 250V from PSC	0V - 200V from PSC	0V - 250V from PSC	0V - 200V from PSC	0V - 250V from PSC

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Input Current	IDC	0A - 17.5A from PSC	0A - 30A from PSC	0A - 35A from PSC	0A - 30A from PSC	0A - 52.5A from PSC
<b>CDA</b>						
Required for setpoint	°C	-20 - 30	-20 - 30	-20 - 30	-20 - 30	-20 - 30
Interface		¼" OD Tube	¼" OD Tube	¼" OD Tube	2X ¼" OD Tube	2X ¼" OD Tube
Pressure	Psig [KPa ]	7 - 9 [48 - 62]	7 - 9 [48 - 62]	7 - 9 [48 - 62]	7 - 9 [48 - 62]	7 - 9 [48 - 62]
Flow Rate	Scfh [m <sup>3</sup> / h]	80-120 [2-3]	80-120 [2-3]	80-120 [2-3]	80-120 [2-3]	80-120 [2-3]
Dewpoint	°C	-30 or lower	-30 or lower	-30 or lower	-30 or lower	-30 or lower
<b>User Interface</b>						
Display		N/A	N/A	N/A	N/A	N/A
Value input		PSC Keypad	PSC Keypad	PSC Keypad	PSC Keypad	PSC Keypad
<b>Safety Concept</b>						
Safety Class		I, NFL (non-flammable liquids)	I, NFL (non-flammable liquids)	I, NFL (non-flammable liquids)	I, NFL (non-flammable liquids)	I, NFL (non-flammable liquids)
<b>Electronic interface</b>						
RTDs, Fill Sensor, Overtemperature switches, TE and Pump Power		Power and Signal Cable to PSC	Power and Signal Cable to PSC	Power and Signal Cable to PSC	Power and Signal Cable to PSC	Power and Signal Cable to PSC
<b>Mechanics</b>						

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Unit dimensions (w x d x h)	in [mm]	4.6 x 9.25 x 19.75 [116 x 232 x 500]	4.6 x 11.8 x 22 [116 x 300 x 560]	4.6 x 11.8 x 22 [116 x 300 x 560]	7.64 x 11.8 x 22 [194 x 300 x 560]	7.64 x 11.8 x 22 [194 x 300 x 560]
Weight	lb [kg]	33 [15]	55 [25]	55 [25]	84[38]	84[38]
Handles		Single handle, top.	Single handle, top.	Single handle, top.	Double handle, top.	Double handle, top.
<b>Environmental conditions</b>						
Ambient temperature	°C	5 to 40	5 to 40	5 to 40	5 to 40	5 to 40
Relative humidity		maximal 80 % at 31°C	maximal 80 % at 31°C	maximal 80 % at 31°C	maximal 80 % at 31°C	maximal 80 % at 31°C
Operational area		for internal use; altitude up to 2000 m	for internal use; altitude up to 2000 m	for internal use; altitude up to 2000 m	for internal use; altitude up to 2000 m	for internal use; altitude up to 2000 m
Overvoltage category		Category II	Category II	Category II	Category II	Category II
Pollution degree		Degree 2	Degree 2	Degree 2	Degree 2	Degree 2
Degree of protection		IP2X	IP2X	IP2X	IP2X	IP2X
<b>Quality markings</b>						
CE marking		yes	yes	yes	yes	yes
SEMI S2 Certification		yes	yes	yes	yes	yes
ISO 9000 (2015)		yes	yes	yes	yes	yes