

**Thermo Scientific**  
**NESLAB**  
**ThermoFlex™**  
**Recirculating Chillers**  
**(Basic Controller)**

Thermo Scientific Manual P/N U00933 Rev. 01/07/11

**Installation**  
**Operation**  
**Basic Maintenance**


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208/230V 60HZ; 200V 50HZ 11.1 AMP  
R134A 29 OZ HIGH 348 PSIG LOW 200 PSIG

CE 

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SOFTWARE CODE:  
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PUMP FLOW DIAGRAM: F01035  
WIRING DIAGRAM: 6.4015  
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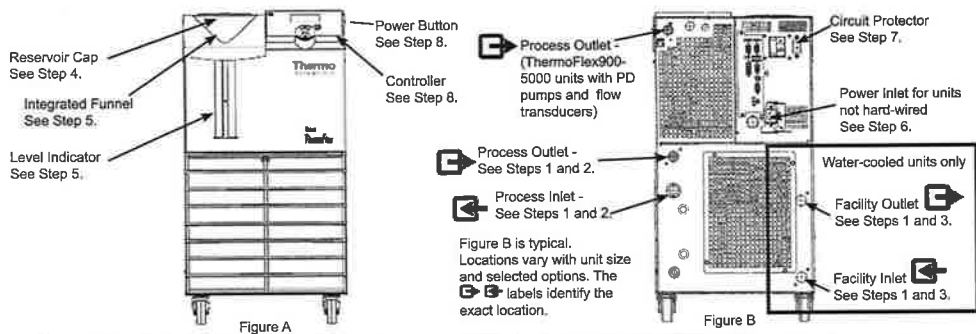
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<b>WARRANTY</b>		



**What you need to get started:**

- An adjustable wrench
- Facility water supply and return (water-cooled units)
- Appropriate hose or plumbing
- Appropriate size clamps or connection type
- Teflon® Tape or appropriate sealant

**Process Fluid Connections (FNPT)**

Outlet	
ThermoFlex900 - 10000	P1 P2 T1 1/2" cast bronze
ThermoFlex3500 - 5000	P3 P4 3/4" cast bronze
ThermoFlex7500 - 24000	P3 P5 1" wrought copper
Inlet - Same size as outlet all units stainless steel	

**Facility Water Connections (FNPT)**

ThermoFlex1400 - 5000 Inlet/Outlet 1/2" cast bronze	Supplied Adapters	
ThermoFlex7500 - 10000 Inlet/Outlet 3/4" cast bronze	P1 P2 T1	1/2" x 3/8" Polyethylene and 1/2" x 1/2" Nylon
ThermoFlex15000 - 24000 Inlet 3/4" cast bronze	P3 P4	3/4 MPT x 1/2 barb PVC
ThermoFlex15000 - 24000 Outlet 3/4" stainless steel	P3 P5	1" MPT x 1" Barb PVC and 1" MPT x 3/4" Barb PVC

**1** Pull out the plastic shipping plugs.

Locations vary with unit size and selected options. The labels identify the exact location.

See Figure B.

**2** Connect the ThermoFlex PROCESS OUTLET (A) to the fluid inlet on your application. Connect the ThermoFlex PROCESS INLET (B) to the fluid outlet on your application. Ensure the connections are sealed and secure. **For air-cooled units skip to Step 4.**

See Figure B.

**3** Connect the ThermoFlex FACILITY OUTLET (A) to your facility water return or drain. Connect the ThermoFlex FACILITY INLET (B) to your facility water supply. Ensure the connections are sealed and secure.

**For water-cooled units only.**

See Figure B.

**4** Remove the reservoir cap by unscrewing it counter-clockwise.

See Figure A.

**5** Slowly fill reservoir with clean process fluid (see Table 1), utilizing sight tube for easy fluid level monitoring. When the reservoir is full replace the reservoir cap, hand tight. Since the reservoir capacity may be small compared to your application and air may need to be purged from the lines, have extra cooling fluid on hand to keep the system topped off when external circulation is started.

Note: Be careful not to fill the reservoir above MAX LEVEL fill line. This will result in a unit over flow error (O FLO) which will cause the unit to shut down.

See Figure A.

**6** Verify the appropriate voltage. For units supplied with a line cord, insert female end of power cord into chiller and then insert male end of power cord into power outlet. (The line cord is located under the shipping crate's lid. Do not discard the lid until the cord is located.)

Note: ThermoFlex900-5000 units equipped with the Variable Voltage or Global Voltage option have a voltage configuration panel located behind an access panel on the rear of the unit. Refer to the Voltage Instruction Sheet shipped with the unit, or see manual Appendix B.

Note: For units requiring hard wiring see Section 3 in the manual.

See Figure B.

**7** For ThermoFlex900 through 10000 units, place the circuit protector to the on (I) position. The controller display will indicate a series of scrolling bars (≡ ≡). The bars will scroll upward indicating the unit is initializing, this takes approximately 15 seconds. For other units the bars appear when power is supplied to the unit.

See Figure B.

**8** Press .

The controller will display **SETUP**.

Note: If the unit is equipped with a deionization filter cartridge refer to the manual, Section 5, for installation.

Please see reverse side for additional steps.

See Figure A.

**Safety Precautions:**



- The unit is designed for indoor use only.
- Never place unit in a location where excessive heat, moisture, inadequate ventilation, or corrosive materials are present.
- Never use flammable or corrosive fluids with this unit.
- Never connect process fluid lines to your facility water supply or to any pressurized liquid source.
- If your unit is equipped with a positive displacement pump (P1 or P2), ensure your application plumbing lines and fittings are rated to withstand a minimum of 185 psi.
- Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's MSDS for handling precautions.

**Table 1 - Acceptable Fluids:**

Use of any fluid not listed below will void the manufacturer's warranty.

- Filtered/Single Distilled Water
- Deionized water (1-3 MΩ-cm, compensated)
- 0 - 75% Ethylene Glycol/Water
- 0 - 75% Propylene Glycol/Water

**Quick Start - Used for Initial Start Up Only — perform steps 9 to 20 for all units.**

<p><b>NOTE:</b> Some ranges/defaults are pump dependent, see Section 4 in the manual. Once any Setup step is completed, meaning you pressed the  key a second time, you can not repeat the step to make corrections. You <i>can</i> make changes after the unit is started.</p> <p><b>SETUP</b> Press  to continue the setup procedure.</p>	<p><b>9 UnitS</b> UnitS are the temperature, fluid flow (optional) and pressure scales.</p> <p>Scales: °C/°F GPM/LPM PSI/Bar/KPAS</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between UnitS and °C</li> <li>• If desired, use  to change the scale to °F</li> </ul> </li> <li>• Press  to sequence to the next display</li> <li>• Do the same for Flow and Pressure scales</li> </ul>	<p><b>10 Hi t</b> Hi t sets the fluid's High Temperature Alarm Limit.</p> <p>Range: +3°C to +42°C Factory Default: +42°C</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between Hi t and 42</li> <li>• If desired, use  to adjust the value</li> </ul> </li> <li>• Press  to sequence to the next display</li> </ul>
<p><b>11 Lo t</b> Lo t sets the fluid's Low Temperature Alarm Limit.</p> <p>Range: +3°C to +42°C Factory Default: 3°C</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between Lo t and 3</li> <li>• If desired, use  to adjust the value</li> </ul> </li> <li>• Press </li> </ul>	<p><b>12 Hi P1</b> Hi P1 sets the Pump's High Pressure Discharge Alarm Limit.</p> <p>Range: Varies by pump Factory Default: Varies by pump</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between Hi P1 and the default</li> <li>• If desired, use  to adjust the value</li> </ul> </li> <li>• Press </li> </ul>	<p><b>13 dELAY</b> dELAY is the length of time the pump can exceed the Hi P1 Alarm Limit before shutting down.</p> <p>Range: Varies by pump Factory Default: 0 seconds</p> <ul style="list-style-type: none"> <li>• The display will flash between dELAY and 0</li> <li>• If desired, use  to adjust the value</li> <li>• Press  <ul style="list-style-type: none"> <li>NOTE This feature is active only if the unit is configured to shut down, see Step 16.</li> </ul> </li> </ul>
<p><b>14 Lo P1</b> Lo P1 sets the Pump's Low Pressure Discharge Alarm Limit.</p> <p>Range: Varies by pump Factory Default: Varies by pump</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between Lo P1 and the default</li> <li>• If desired, use  to adjust the default</li> </ul> </li> <li>• Press </li> </ul>	<p><b>15 dELAY</b> dELAY is the length of time the pump can exceed the Lo P1 Alarm Limit before shutting down.</p> <p>Range: 0 to 30 seconds Factory Default: 10 seconds</p> <ul style="list-style-type: none"> <li>• The display will flash between dELAY and 10</li> <li>• If desired, use  to adjust the value</li> <li>• Press  <ul style="list-style-type: none"> <li>NOTE This feature is active only if the unit is configured to shut down, see Step 16.</li> </ul> </li> </ul>	<p><b>16 ALr</b> ALr configures the unit's reaction to temperature, pressure, and flow (optional) alarm limits - either shut down (fLt) or continue to run (indC). See Section 4 in the manual for more information.</p> <p>Range: fLt* or indC** Factory Default: fLt</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between ALr and fLt</li> <li>• If desired, press  to display indC</li> </ul> </li> <li>• Press  <ul style="list-style-type: none"> <li>*fLt = fault (shut down)</li> <li>**indC = indicate (continue to run)</li> </ul> </li> </ul>
<p><b>17 Sound</b> Turns the unit's audible alarm on or off.</p> <p>Range: on or OFF Factory Default: on</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between Sound and on</li> <li>• If desired, press  to display OFF</li> </ul> </li> <li>• Press </li> </ul>	<p><b>18 StArE</b> StArE enables/disables auto restart.</p> <p>Range: on or OFF Factory Default: OFF</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between StArE and OFF</li> <li>• If desired, press  to display on</li> </ul> </li> <li>• Press </li> </ul>	<p><b>19 CArE</b> CArE is used to set the preventative care cleaning frequency reminder for the unit's air and fluid filters.</p> <p>Range: off, L1 - 1000 hours, L2 - 2000 hours, L3 - 3000 hours Factory Default: L1</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between CArE and L1</li> <li>• If desired, use  to change display to off, L2 or L3</li> </ul> </li> <li>• Press </li> </ul>

If applicable, see boxes on right to set up options. For units with Analog I/O (ACOM) refer to the additional quick start supplied with your unit.

<p><b>20 StArE</b></p> <ul style="list-style-type: none"> <li>• Press  to save all settings</li> </ul> <p><b>The unit will automatically start.</b></p> <ul style="list-style-type: none"> <li>• Press  to disregard all changes and restore the factory default values. The display will go blank.</li> </ul>	<p>The Setup procedure is now complete.</p> <p>When the unit starts the controller will display the process fluid temperature.</p> <p>If desired, you can change/verify the unit's setpoint by pressing </p>	<p><b>SP</b> SP is used to adjust the setpoint.</p> <p>Range: +5°C to +40°C Factory Default: +20°C</p> <ul style="list-style-type: none"> <li>• The display will flash between SP and 20</li> <li>• If desired, use  to change the setting</li> <li>• Press  to save the new setpoint and return to the temperature display</li> </ul>
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**Option - Voltage — Step A**

**A HZ**

HZ is used to identify the incoming frequency for units with P3 - P5 pumps and variable voltage capability. The selected frequency automatically adjusts the firmware's fixed high pressure default setting.

- Press
  - The display will flash between HZ and 60
  - If needed, use to change the frequency
- Press
  - If your unit does not have a flow transducer or serial communications see Step 20.

**Option - Flow Transducer — Steps B and C**

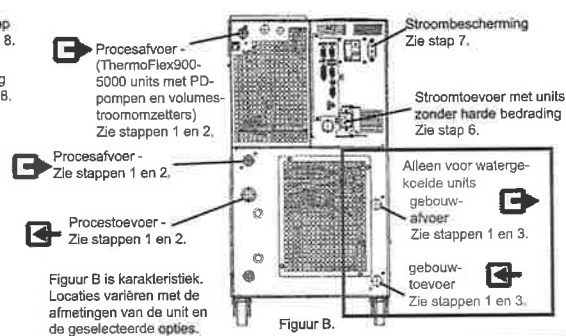
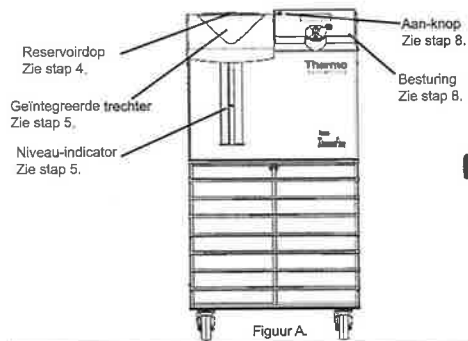
<p><b>B Hi FLo</b> HiFLO sets the high flow alarm limit.</p> <p>Range: Varies by pump Factory Default: Varies by pump</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between HiFLO and the default</li> <li>• If desired, use  to adjust the value</li> </ul> </li> <li>• Press </li> </ul>	<p><b>C Lo FLo</b> LoFLO sets the low flow alarm limit.</p> <p>Range: Varies by pump Factory Default: Varies by pump</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between LoFLO and the default</li> <li>• If desired, use  to adjust the value</li> </ul> </li> <li>• Press  <ul style="list-style-type: none"> <li>If your unit does not have serial communications see Step 20.</li> </ul> </li> </ul>
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**Option - Serial Communications (DCOM) — Steps D to I**

<p><b>D SEr</b> SEr is used to enable/disable and to configure serial communications mode.</p> <p>Range: off, rS232, rS485 Factory Default: off</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between SEr and OFF</li> <li>• If desired, use  to change the mode</li> </ul> </li> <li>• Press </li> </ul>	<p><b>E BAud</b> BAud is used to select the baud rate (speed) for serial communication.</p> <p>Range: 9600, 4800, 2400, 1200, 600, or 300 bits per second.</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between BAud and 9600</li> <li>• If desired, use  to change the rate</li> </ul> </li> <li>• Press </li> </ul>
<p><b>F dAtA</b> dAtA is used to display the number of bits.</p> <p>Display: 8</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between dAtA and 8</li> </ul> </li> <li>• Press </li> </ul>	<p><b>G StOp</b> StOp is used to indicate the number of stop bits.</p> <p>Range: 2 or 1 Factory Default: 1</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between StOp and 1</li> <li>• If desired, use  to change the setting</li> </ul> </li> <li>• Press </li> </ul>

<p><b>H PARr</b> PARr is used as a means to check for communication errors.</p> <p>Range: even, odd, or none Factory Default: none</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between PARr and none</li> <li>• If desired, use  to change the setting</li> </ul> </li> <li>• Press </li> </ul>	<p><b>I u id</b> u id (unit id) is used in RS485 only. Identifies devices connected to the RS485 port.</p> <p>Range: 1 to 99 Factory Default: 1</p> <ul style="list-style-type: none"> <li>• Press  <ul style="list-style-type: none"> <li>• The display will flash between u id and 1</li> <li>• If desired, use  to change the setting</li> </ul> </li> <li>• Press </li> </ul>
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See Step 20.



Figuur B is karakteristiek.  
Locaties variëren met de  
afmetingen van de unit en  
de geselecteerde opties.

#### Dit heeft u nodig om te kunnen beginnen:

- Een verstelbare steeksleutel
- Watertoevoer en -afvoer op de locatie (watergekoelde units)
- Een geschikte slang of leiding
- Klemmen van de juiste grootte of type aansluiting
- Teflon® Tape of een geschikte afsluiting

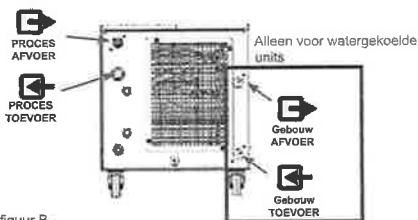
#### Aansluitingen Procesvloeistof (FNPT)

Afvoer	ThermoFlex900 - 10000	P1 P2 T1	1/2" gietbrons
	ThermoFlex3500 - 5000	P3 P4	3/4" gietbrons
	ThermoFlex7500 - 24000	P3 P5	1" gesmeed koper
Toevoer - Zelfde maat als afvoer			alle units roestvrij staal

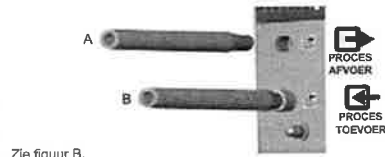
#### Wateraansluitingen locatie (FNPT)

ThermoFlex1400 - 5000 Toevoer/Afvoer	1/2" gietbrons
ThermoFlex7500 - 10000 Toevoer/Afvoer	3/4" gietbrons
ThermoFlex15000 - 24000 Toevoer	3/4" gietbrons
ThermoFlex15000 - 24000 Afvoer	3/4" roestvrij staal

① Trek de plastic transportpluggen eruit.



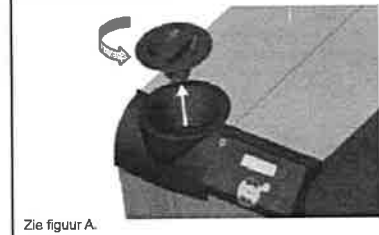
② Sluit de ThermoFlex PROCESAFVOER (A) aan op de vloeistoftoevoer op uw toepassing. Sluit de ThermoFlex PROCESTOEVOER (B) aan op de vloeistofafvoer op uw toepassing. Zorg ervoor dat de verbindingen afgesloten zijn en goed vastzitten. Ga voor luchtgekoelde units door naar stap 4.



③ Sluit de ThermoFlex FACILITY-OUTLET (A) aan op de waterinvoer of -afvoer van uw gebouw. Sluit de ThermoFlex FACILITY- INLET (B) aan op de watervoorziening van uw gebouw. Zorg ervoor dat de verbindingen afgesloten zijn en goed vastzitten.

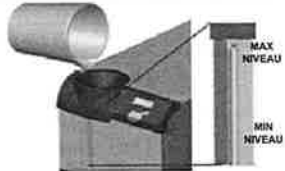


④ Verwijder de dop van het reservoir door deze tegen de klok in los te draaien.

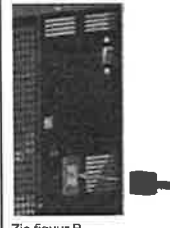


⑤ Vul het reservoir langzaam met schone procesvloeistof (zie tabel 1) met gebruik van het kijkbuisje voor het gemakkelijk in de gaten houden van het vloeistofniveau. Plaats als het reservoir vol is de dop er weer op, handvast. Aangezien de capaciteit van het reservoir klein kan zijn in vergelijking tot uw toepassing en het nodig koelvloeistof bij de hand te houden om het systeem bijgevoerd te houden als de uitwendige circulatie wordt gestart.

Let op: Let goed op dat het reservoir niet boven de lijn MAX NIVEAU wordt gevuld. Dit zal leiden tot een overflowfout (O FLO) van de unit waardoor de unit zal uitschakelen.



⑥ Controleer de juiste spanning. Voor units die worden geleverd met een netsnoer, steek de vrouwelijke kant van de stroomkabel in de koeler en steek de mannelijke kant van de stroomkabel in de vermogensuitgang. (Het netsnoer bevindt zich onder de deksel van de transportdoos. Gooi het deksel niet weg voordat u het snoer heeft gevonden.)



Let op: ThermoFlex900-5000 units uitgerust met de optie Variabele spanning of Universele spanning hebben een configuratiepaneel voor de spanning achter een inspectieluik aan de achterkant van de unit. Raadpleeg het Instructieblad Spanning dat bij de unit is geleverd, of zie Appendix B van de handleiding.

Let op: Raadpleeg voor units die harde bedrading nodig hebben hoofdstuk 3 in de handleiding.

⑦ Zet de stroombescherming op de aan(I)-stand. Het besturingsdisplay zal een reeks schuifbalken (I 0) laten zien. De balken schuiven naar boven, wat aangeeft dat de unit aan het initialiseren is. Dit duurt ongeveer 15 seconden.



⑧ Druk op

De besturing geeft SetUP weer. Let op: Als de unit is uitgerust met een deïoniseringsfiltercassette, raadpleeg dan de handleiding, hoofdstuk 5, voor de installatie ervan. Zie de achterkant voor extra stappen.



#### Veiligheidsmaatregelen:

De unit is alleen ontworpen voor gebruik binnenshuis.

Plaats een unit nooit op een plek met overmatige warmte, vocht, onvoldoende ventilatie of corrosieve materialen.

Gebruik nooit ontvlambare of corrosieve vloeistoffen met deze unit.

Sluit nooit procesvloeistofleidingen aan op de watervoorziening van uw locatie of andere vloeistofbronnen onder druk.

Als uw unit is uitgerust met een PD pomp, zorg er dan voor dat de leidingen en aansluitingen van uw toepassing geschikt zijn voor minimaal 185 psi.

Raadpleeg voordat u vloeistoffen gebruikt of onderhoud uitvoert op plekken waar waarschijnlijk contact is met vloeistof, de veiligheidsbladen van de fabrikant voor voorzorgsmaatregelen.

#### Tabel 1 - Toegestane vloeistoffen:

Door gebruik van vloeistoffen die niet hieronder worden vermeld komt de fabrieksgarantie te vervallen.

- Gefiltreerd/enkelvoudig gedestilleerd water
- Gedeïoniseerd water (1-3 MΩ-cm, gecompenseerd)
- 0 - 75% Ethyleenglycol/water
- 0 - 75% Propyleenglycol/water

## Quick Start - Alleen gebruikt voor het initieel opstarten - voer de stappen 9 tot 20 uit voor alle units.

<p>Let op: Sommige bereiken/standaardwaarden zijn afhankelijk van de pomp, zie hoofdstuk 4 in de handleiding. Als een Setup-stap eenmaal is voltooid, wat betekent dat u de <b>enter</b> toets een tweede maal hebt ingedrukt, kunt u de stap niet meer herhalen om correcties aan te brengen. U <i>kunt</i> wijzigingen doorvoeren nadat de unit is gestart.</p> <p><b>SETUP</b> Druk op <b>enter</b> om naar de setupprocedure te gaan.</p>	<p><b>9 UnitS</b> UnitS zijn de schalen voor temperatuur, flow van de vloeistof (optioneel) en druk. Schalen: °C/°F GPM/LPM PSI/Bar/KPAS Fabrieksstandaard: °C, Gallons, PSI</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen UnitS en °C</li> <li>Gebruik, indien gewenst, <b>←</b> om de schaal in "F" te veranderen</li> <li>Druk op <b>enter</b> om naar het volgende display te gaan</li> <li>Doe hetzelfde voor de schalen voor Flow en druk</li> </ul>	<p><b>10 Hi t</b> Met Hi t kan de Alarmlimiet voor hoge temperatuur voor de vloeistof worden ingesteld. Bereik: +3°C tot +42°C Fabrieksstandaard: +42°C</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen Hi t en 42</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b> om naar het volgende display te gaan</li> </ul>
<p><b>11 Lo t</b> Met Lo t wordt de onderste alarmlimiet voor de temperatuur van de vloeistof ingesteld. Bereik: +3°C tot +42°C Fabrieksstandaard: 3°C</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen Lo t en 3</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>12 Hi P1</b> Met Hi P1 wordt de bovenste alarmlimiet voor drukafvoer van de pomp ingesteld. Bereik: Verschilt per pomp Fabrieksstandaard: Verschilt per pomp</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen Hi P1 en de standaardwaarde</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>13 dELAY</b> dELAY is de tijdsduur dat de pomp de Hi P1 Alarmlimiet kan overschrijden voor hij uitschakelt. Bereik: Verschilt per pomp Fabrieksstandaard: 0 seconden</p> <ul style="list-style-type: none"> <li>Het display zal knipperen tussen dELAY en 0</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b> LET OP Deze functie is alleen actief als de unit geconfigureerd is om uit te schakelen, zie stap 16.</li> </ul>
<p><b>14 Lo P1</b> Met Lo P1 wordt de onderste alarmlimiet voor drukafvoer van de pomp ingesteld. Bereik: Verschilt per pomp Fabrieksstandaard: Verschilt per pomp</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen Lo P1 en de standaardwaarde</li> <li>Gebruik, indien gewenst, <b>←</b> om de standaardwaarde aan te passen</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>15 dELAY</b> dELAY is de tijdsduur dat de pomp de Lo P1 kan overschrijden Alarmlimiet voordat het uitschakelen plaatsvindt. Bereik: 0 tot 30 seconden Fabrieksstandaard: 10 seconden</p> <ul style="list-style-type: none"> <li>Het display zal knipperen tussen dELAY en 10</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b> LET OP Deze functie is alleen actief als de unit geconfigureerd is om uit te schakelen, zie stap 16.</li> </ul>	<p><b>16 ALr</b> ALr configureert de reactie van de unit op alarmlimieten voor temperatuur, druk en flow (optioneel) - ofwel uitschakelen (fLT) of in werking blijven (indC). Zie Hoofdstuk 4 van de handleiding voor meer informatie. Bereik: fLT* of indC** Fabrieksstandaard: fLT</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen ALr en fLT</li> <li>Druk, indien gewenst, op <b>←</b> om indC weer te geven</li> <li>Druk op <b>enter</b> *fLT = fault (uitschakelen) **indC = indicate (in werking blijven)</li> </ul>
<p><b>17 Sound</b> Zet het hoorbare alarm van de unit aan of uit. Bereik: aan of UIT Fabrieksstandaard: aan</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen Sounden aan</li> <li>Druk, indien gewenst, op <b>←</b> om OFF weer te geven</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>18 StArt</b> StArt schakelt de auto restart in en uit. Bereik: aan of UIT Fabrieksstandaard: UIT</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen StArt en UIT</li> <li>Druk, indien gewenst, op <b>←</b> om aan weer te geven</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>19 CARe</b> CARe wordt gebruikt om de frequentie van de herinnering voor het preventief schoonmaken van de lucht- en vloeistoffilters van de unit in te stellen. Bereik: uit, L1 - 1000 uur, L2 - 2000 uur, L3 - 3000 uur Fabrieksstandaard: L1</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen CARe en L1</li> <li>Gebruik, indien gewenst, <b>←</b> om het display te wijzigen in uit, L2 of L3</li> <li>Druk op <b>enter</b></li> </ul>

## Raadpleeg, indien van toepassing, de kaders rechts voor het instellen van de opties. Raadpleeg voor units met AnalooG I/O (ACOM) de additionele quick start die bij de unit is geleverd.

<p><b>20 StOrE</b></p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b> om alle instellingen op te slaan</li> </ul> <p><b>De unit zal automatisch starten.</b></p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b> om alle wijzigingen ongedaan te maken en de standaard fabrieksstanden te herstellen. Het display zal blanco zijn.</li> <li>Druk op <b>enter</b> om de procedure opnieuw te starten.</li> </ul>	<p>De Setup-procedure is nu voltooid.</p> <p>Als de unit start, zal de besturing de temperatuur van de procesvloeistof weergeven.</p> <p>Indien gewenst kunt u het setpoint van de unit wijzigen/controleren door op <b>mode</b> te drukken.</p>	<p><b>SP</b> SP wordt gebruikt om het setpoint aan te passen. Bereik: +5°C tot +40°C Fabrieksstandaard: +20°C</p> <ul style="list-style-type: none"> <li>Het display zal knipperen tussen SP en 20</li> <li>Indien gewenst kunt u <b>←</b> gebruiken om de instelling te wijzigen</li> <li>Druk op <b>enter</b> om het nieuwe setpoint op te slaan en naar de temperatuurweergave terug te keren</li> </ul>
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## Optie - Universele spanning - Stap A

<p><b>A HZ</b></p> <p>HZ wordt gebruikt om de binnenkomende frequentie te identificeren voor units met universele spanning. De geselecteerde frequentie past automatisch de vaste standaardinstelling van de fabrikant voor hoge druk aan. Bereik: 50 of 60 Hz Standaard: 60 Hz</p>	<ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen HZ en 60</li> <li>Gebruik, indien nodig, <b>←</b> om de frequentie te wijzigen</li> <li>Druk op <b>enter</b> Als uw unit geen volumestroomomzetter of seriële communicatie heeft, zie stap 20.</li> </ul>
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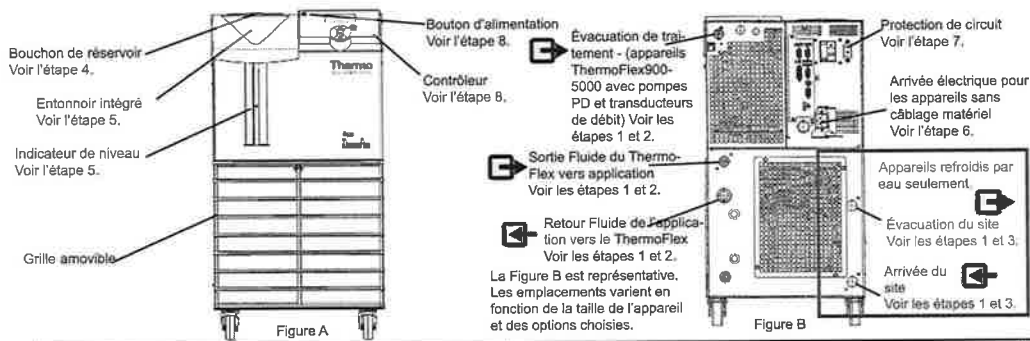
## Optie - Volumestroomomzetter - Stappen B en C

<p><b>B Hi FLo</b> Met HiFLO wordt de bovenste alarmlimiet voor de flow ingesteld. Bereik: Verschilt per pomp Fabrieksstandaard: Verschilt per pomp</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen HiFLO en de standaardwaarde</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>C LoFLo</b> Met LoFLO wordt de onderste alarmlimiet voor de flow ingesteld. Bereik: Verschilt per pomp Fabrieksstandaard: Verschilt per pomp</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen LoFLO en de standaardwaarde</li> <li>Gebruik, indien gewenst, <b>←</b> om de waarde aan te passen</li> <li>Druk op <b>enter</b> Als uw unit geen seriële communicatie heeft, zie stap 20.</li> </ul>
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## Optie - Seriële communicatie (DCOM) - Stappen D tot I

<p><b>D SEr</b> SEr wordt gebruikt voor het inschakelen/uitschakelen en configureren van de seriële-communicatiemodus Bereik: uit, rS232, rS485 Fabrieksstandaard: uit</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen SEr en UIT</li> <li>Indien gewenst kunt u <b>←</b> gebruiken om de modus te wijzigen</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>E BRud</b> BAud wordt gebruikt om de baudrate (snelheid) voor seriële communicatie te kiezen. Bereik: 9600, 4800, 2400, 1200, 600 of 300 bits per seconde. Fabrieksstandaard: 9600</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen BAud en 9600</li> <li>Indien gewenst kunt u <b>←</b> gebruiken om de snelheid te wijzigen</li> <li>Druk op <b>enter</b></li> </ul>
<p><b>F dAtA</b> dAtA wordt gebruikt om het aantal bits weer te geven. Display: 8</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen dAtA en 8</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>G StOp</b> StOp wordt gebruikt om het aantal stopbits aan te geven. Bereik: 2 of 1 Fabrieksstandaard: 1</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen StOp en 1</li> <li>Indien gewenst kunt u <b>←</b> gebruiken om de instelling te wijzigen</li> <li>Druk op <b>enter</b></li> </ul>
<p><b>H PARr</b> PARr wordt gebruikt als een middel om op communicatiefouten te controleren. Bereik: even, oneven of geen Fabrieksstandaard: geen</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen PARr en geen</li> <li>Indien gewenst kunt u <b>←</b> gebruiken om de instelling te wijzigen</li> <li>Druk op <b>enter</b></li> </ul>	<p><b>I u id</b> u id (unit id) wordt alleen in RS485 gebruikt. Identificeert apparaten die op de RS485-poort zijn aangesloten. Bereik: 1 tot 99 Fabrieksstandaard: 1</p> <ul style="list-style-type: none"> <li>Druk op <b>enter</b></li> <li>Het display zal knipperen tussen u id en 1</li> <li>Indien gewenst kunt u <b>←</b> gebruiken om de instelling te wijzigen</li> <li>Druk op <b>enter</b></li> </ul> <p style="text-align: right;">Zie stap 20.</p>





#### Matériel nécessaire pour commencer :

- Une clé à molette
- Alimentation et évacuation d'eau du site (pour les appareils refroidis par eau)
- Tuyau et accessoires de plomberie appropriés
- Pincettes ou type de raccord de dimension appropriée
- Ruban adhésif au Teflon® ou produit étanchéifiant approprié

#### Raccordements du fluide de traitement (FNPT)

##### Évacuation

ThermoFlex900 - 10000	P1 P2 T1	fonte de bronze 1/2"
ThermoFlex3500 - 5000	P3 P4	fonte de bronze 3/4"
ThermoFlex7500 - 24000	P3 P5	cuivre forgé 1"

Arrivée - taille identique à l'évacuation tous appareils en acier inoxydable

#### Raccordements à l'eau du site (FNPT)

ThermoFlex1400 - 5000	Arrivée/évacuation	fonte de bronze 1/2"
ThermoFlex7500 - 10000	Arrivée/évacuation	fonte de bronze 3/4"
ThermoFlex15000 - 24000	Arrivée	fonte de bronze 1/2"
ThermoFlex15000 - 24000	Évacuation	fonte de bronze 3/4"

**1** Retirer les bouchons d'expédition en plastique.

Voir la Figure B.

**2** Raccordez l'application : Sortie Fluide du ThermoFlex (A) à l'arrivée de liquide de votre application, et le Retour Fluide de l'application du ThermoFlex (B) à l'évacuation de liquide de votre application. Vérifiez que les raccords sont étanches et sûrs. **Pour les appareils refroidis par air, passez à l'étape 4.**

Voir la Figure B.

**3** Raccordez le ThermoFlex vers ÉVACUATION DU SITE (A) à l'évacuation d'eau de votre site. Raccordez le ThermoFlex de l'ARRIVÉE DU SITE (B) sur l'arrivée d'eau de votre site. Vérifiez que les raccords sont étanches et sûrs.

Uniquement pour les appareils refroidis par eau.

Voir la Figure B.

**4** Déposez le réservoir en le dévissant dans le sens inverse aux aiguilles d'une montre.

Voir la Figure A.

**5** Remplissez lentement le réservoir avec du liquide de traitement approprié (voir le Tableau 1) en utilisant le regard pour contrôler facilement le niveau de liquide. Une fois le réservoir rempli, remettez le bouchon en le serrant à la main. La capacité du réservoir pouvant être réduite par rapport à l'application, et l'air devant être purgé des conduites, gardez du liquide supplémentaire à portée de la main pour faire le niveau du système une fois la circulation externe démarrée.

Remarque : Veillez à ne pas remplir le réservoir au-dessus de la ligne MAX LEVEL (NIVEAU MAXI). Cela entraîne une erreur de débordement de l'appareil (O FLO) qui peut provoquer son arrêt.

Voir la Figure A.

**6** Vérifiez que la tension est correcte. Pour les appareils fournis avec un cordon d'alimentation, insérez l'extrémité femelle de ce dernier dans le refroidisseur, et l'extrémité mâle dans la prise électrique. (Le cordon d'alimentation se trouve sous le couvercle de la caisse d'expédition. Ne jetez pas le couvercle avant d'avoir localisé le cordon. Remarque : Les appareils ThermoFlex900-5000 équipés de l'option Tension variable ou Tension globale possèdent un panneau de configuration de la tension situé derrière une trappe d'accès à l'arrière de l'appareil. Consultez la fiche d'instructions relative à la tension livrée avec l'appareil, ou l'annexe B du manuel. Remarque : Pour les appareils exigeant un câblage matériel, consultez la Section 3 du manuel.

Voir la Figure B.

**7** Placez la protection de circuit en position (I). L'affichage du contrôleur indique une série de barres de défilement (≡ ≡). Les barres défilent vers le haut, indiquant l'initialisation de l'appareil ; cette opération prend environ 15 secondes.

Voir la Figure B.

**8** Appuyez sur .

Le contrôleur affiche SEtUP.

Remarque : Si l'appareil est équipé d'une cartouche de filtre de déionisation, consultez le manuel, Section 5, pour l'installation.

Voir au dos les étapes supplémentaires.

Voir la Figure A.



#### Précautions de sécurité :

































- L'appareil est conçu pour fonctionner exclusivement à l'intérieur.
- Ne jamais l'exposer à une chaleur ou une humidité excessive, une ventilation inadéquate ou à des matières corrosives.
- Ne jamais utiliser de fluides inflammables ou corrosifs avec cet appareil.
- Ne jamais raccorder les conduites de liquide de traitement à l'arrivée d'eau de votre site ou à une source de liquide sous pression.
- Si votre appareil est équipé d'une pompe à déplacement positif, vérifiez que les conduites de plomberie et les raccords de votre application ont la capacité de supporter au moins 185 psi.
- Avant d'utiliser un liquide quelconque ou d'effectuer des travaux d'entretien susceptibles d'entraîner un contact avec le liquide, consultez les recommandations de santé-sécurité du fabricant.

#### Tableau 1 - Liquides acceptables :







L'utilisation d'un quelconque liquide ne figurant pas dans la liste ci-dessous annule la garantie du fabricant.



























- Eau filtrée/mono distillée
- Eau déionisée (1 à 3 MΩ-cm, compensée)
- Éthylène glycol/eau 0 à 75 %
- Propylène glycol/eau 0 à 75 %

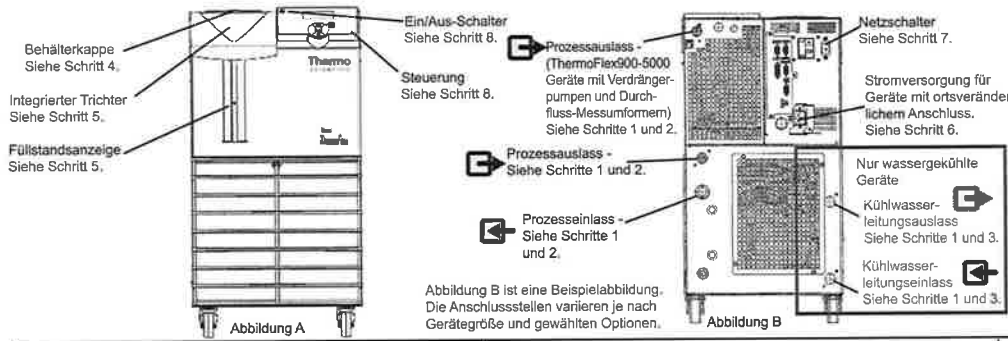
**Démarrage rapide - Ne sert que pour le premier démarrage - effectuer les étapes 9 à 20 pour toutes les unités.**

<p><b>REMARQUE :</b> Certaines plages/valeurs par défaut dépendent de la pompe, voir la Section 4 du manuel. Une fois l'étape de configuration terminée, c'est-à-dire après avoir appuyé sur la touche  une deuxième fois, il devient impossible de recommencer l'étape pour effectuer des corrections. Vous pouvez faire des modifications après le démarrage de l'appareil.</p>		
<p><b>SETUP</b> Appuyez sur  pour poursuivre la procédure de l'étape.</p>	<p><b>9 Units</b> Units représente les échelles de température, de débit de liquide (en option) et de pression. Échelles : °C/°F GPM/LPM PSI/Bar/KPAS Réglages d'usine par défaut : °C, Gallons, PSI</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Units (unités) et °C</li> <li>Au besoin, utilisez  pour passer à un affichage en °F</li> </ul>	<p><b>10 Hi t</b> Hi t règle la limite d'alarme de haute température du liquide. Plage : +3°C à +42°C Réglage d'usine par défaut : +42°C</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Hi t et 42</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur  pour passer à l'affichage suivant</li> </ul>
<p><b>11 Lo t</b> Lo t règle la limite d'alarme de basse température du liquide. Plage : +3°C à +42°C Réglage d'usine par défaut : 3°C</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Lo t et 3</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur </li> </ul>	<p><b>12 Hi P1</b> Hi P1 règle la limite d'alarme de décharge haute pression de la pompe. Plage : Varie en fonction de la pompe Réglage d'usine par défaut : Varie en fonction de la pompe</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Hi P1 et la valeur par défaut</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur </li> </ul>	<p><b>13 DELAY</b> DELAY représente la durée pendant laquelle la pompe peut dépasser la valeur d'alarme Hi P1 avant l'arrêt. Plage : Varie en fonction de la pompe Réglage d'usine par défaut : 0 secondes</p> <ul style="list-style-type: none"> <li>L'affichage clignote en alternant DELAY et 0</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur  <b>REMARQUE</b> Cette fonction n'est active que si l'appareil est configuré pour l'arrêt, voir l'étape 16.</li> </ul>
<p><b>14 Lo P1</b> Lo P1 règle la limite d'alarme de décharge basse pression de la pompe. Plage : Varie en fonction de la pompe Réglage d'usine par défaut : Varie en fonction de la pompe</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Lo P1 et la valeur par défaut</li> <li>Au besoin, utilisez  pour ajuster la valeur par défaut</li> <li>Appuyez sur </li> </ul>	<p><b>15 DELAY</b> DELAY représente la durée pendant laquelle la pompe peut dépasser la valeur Lo P1 Limite d'alarme avant arrêt. Plage : 0 à 30 secondes Réglage d'usine par défaut : 10 secondes</p> <ul style="list-style-type: none"> <li>L'affichage clignote en alternant DELAY et 10</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur </li> </ul> <p><b>REMARQUE</b> Cette fonction n'est active que si l'appareil est configuré pour l'arrêt, voir l'étape 16.</p>	<p><b>16 ALr</b> ALr configure la réaction de l'appareil aux limites d'alarme de température, de pression, et de débit (en option) - ferme (fLT) ou continue l'exécution (indC). Voir la section 4 du manuel pour des informations plus détaillées. Plage : fLT* ou indC** Réglage d'usine par défaut : fLT</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant ALr et fLT</li> <li>Au besoin, appuyez sur  pour afficher indC</li> <li>Appuyez sur  *fLT = erreur (arrêt) ** indC = indiquer (poursuite de l'exécution)</li> </ul>
<p><b>17 Sound</b> Active ou désactive le signal sonore d'alarme de l'appareil. Plage : on (marche) ou OFF (ARRÊT) Réglage d'usine par défaut : on (marche)</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Sound et on (marche)</li> <li>Au besoin, appuyez sur  pour afficher OFF (ARRÊT)</li> <li>Appuyez sur </li> </ul>	<p><b>18 StArEt</b> StArEt active/désactive le redémarrage automatique. Plage : on (marche) ou OFF (ARRÊT) Réglage d'usine par défaut : OFF (ARRÊT)</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant StArEt et OFF (ARRÊT)</li> <li>Au besoin, appuyez sur  pour afficher on (marche)</li> <li>Appuyez sur </li> </ul>	<p><b>19 CARrE</b> CARrE sert à définir le rappel de nettoyage d'entretien préventif pour les filtres à air et à liquide de l'appareil. Plage : off, L1 - 1000 heures, L2 - 2000 heures, L3 -3000 heures Réglage d'usine par défaut : L1</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant CARrE et L1</li> <li>Au besoin, utilisez  pour modifier l'affichage sur arrêt, L2 ou L3</li> <li>Appuyez sur </li> </ul>

**S'il y a lieu, consultez les cadres de droite pour définir des options. Pour les appareils I/O analogiques (ACOM) consultez la documentation de démarrage rapide supplémentaire fournie avec l'appareil.**

<p><b>20 StOrE</b></p> <ul style="list-style-type: none"> <li>Appuyez sur  pour enregistrer tous les réglages</li> </ul> <p><b>L'appareil démarre automatiquement.</b></p> <ul style="list-style-type: none"> <li>Appuyez sur  pour ignorer toutes les modifications et rétablir les valeurs par défaut d'usine. L'affiche est vide.</li> <li>Appuyez sur  pour recommencer la procédure</li> </ul>	<p><b>La procédure de configuration est désormais terminée.</b></p> <p><b>Au démarrage de l'appareil, le contrôleur affiche la température du liquide de l'application.</b></p> <p><b>Au besoin, vous pouvez changer/vérifier la valeur de consigne de l'appareil en appuyant sur </b></p>	<p><b>SP</b> SP sert à régler la valeur de consigne. Plage : +5°C à +40°C Réglage d'usine par défaut : +20°C</p> <ul style="list-style-type: none"> <li>L'affichage clignote en alternant SP et 20</li> <li>Au besoin, utilisez  pour modifier le réglage</li> <li>Appuyez sur  pour enregistrer la nouvelle valeur de consigne et revenir à l'affichage de la température</li> </ul>
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<p><b>Option - Tension globale - Étape A</b></p> <p><b>A HZ</b> HZ sert à identifier la fréquence d'entrée pour les unités de tension globales. La fréquence sélectionnée ajuste automatiquement le réglage de haute pression par défaut fixe du microprogramme. Plage : 50 ou 60 Hz Par défaut : 60 Hz</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant HZ et 60</li> <li>Au besoin, utilisez  pour modifier la fréquence</li> <li>Appuyez sur </li> </ul> <p><b>Si votre appareil n'est pas équipé d'un transducteur de débit ou de communications série, voir l'étape 20.</b></p>	
<p><b>B Hi FLo</b> HiFLO définit la limite d'alarme de débit élevé. Plage : Varie en fonction de la pompe Réglage d'usine par défaut : Varie en fonction de la pompe</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant HiFLO et la valeur par défaut</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur </li> </ul>	<p><b>C LoFLo</b> LoFLO définit la limite d'alarme de faible débit. Plage : Varie en fonction de la pompe Réglage d'usine par défaut : Varie en fonction de la pompe</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant LoFLO et la valeur par défaut</li> <li>Au besoin, utilisez  pour modifier la valeur</li> <li>Appuyez sur </li> </ul> <p>Si l'unité ne comporte pas de communications série, voir l'étape 20.</p>
<p><b>Option - Communications série (DCOM) - étapes D à I</b></p> <p><b>D SEr</b> SEr sert à activer/désactiver et à configurer le mode de communications série. Plage : off, rS232, rS485 Réglage d'usine par défaut : off</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant SEr et OFF (ARRÊT)</li> <li>Au besoin, utilisez  pour modifier le mode</li> <li>Appuyez sur </li> </ul>	
<p><b>E dAtA</b> dAtA sert à indiquer le nombre de bits. Affichage : 8</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant dAtA et 8</li> <li>Appuyez sur </li> </ul>	<p><b>E BAud</b> BAud sert à sélectionner le débit (la vitesse) de communication série. Plage : 9600, 4800, 2400, 1200, 600 ou 300 bits par seconde. Réglage d'usine par défaut : 9600</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant BAud et 9600</li> <li>Au besoin, utilisez  pour modifier le débit</li> <li>Appuyez sur </li> </ul>
<p><b>F StOP</b> StOP sert à indiquer le nombre de bits d'arrêt. Plage : 2 ou 1 Réglage d'usine par défaut : 1</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant StOP et 1</li> <li>Au besoin, utilisez  pour modifier le réglage</li> <li>Appuyez sur </li> </ul>	<p><b>H PARr</b> PARr sert de moyen de vérification des erreurs de communication. Plage : pair, impair, ou aucun Réglage d'usine par défaut : aucun</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant Par et none (aucun)</li> <li>Au besoin, utilisez  pour modifier le réglage</li> <li>Appuyez sur </li> </ul>
<p><b>I u id</b> u id (identification de l'appareil) sert uniquement en RS485. Identifie les appareils raccordés au port RS485. Plage : 1 à 99 Réglage d'usine par défaut : 1</p> <ul style="list-style-type: none"> <li>Appuyez sur </li> <li>L'affichage clignote en alternant u id et 1</li> <li>Au besoin, utilisez  pour modifier le réglage</li> <li>Appuyez sur </li> </ul> <p>Voir l'étape 20.</p>	



**Sie benötigen:**

- Einen verstellbaren Schraubenschlüssel
- Leitungswasserzu- und -ablauf (wassergekühlte Geräte)
- Passende Schläuche bzw. Leitungen
- Passende Klemmen oder Anschlussstücke
- Teflonband® oder geeignete Dichtungen

**Anschlüsse für Prozessflüssigkeiten (FNPT)**

Einlass	Auslass	Material
ThermoFlex900 - 10000 P1 P2 T1	1/2"	Gussbronze
ThermoFlex3500 - 5000 P3 P4	3/4"	Gussbronze
ThermoFlex7500 - 24000 P3 P5	1"	geschmiedetes Kupfer
Einlass - Selbe Größe wie Auslass		alle Geräte Edelstahl

**Kühlwasserleitungsanschlüsse (FNPT)**

ThermoFlex1400 - 5000 Einlass/Auslass	1/2"	Gussbronze
ThermoFlex7500 - 10000 Einlass/Auslass	3/4"	Gussbronze
ThermoFlex15000 - 24000 Einlass	3/4"	Gussbronze
ThermoFlex15000 - 24000 Auslass	3/4"	Edelstahl

**1** Ziehen Sie die Kunststoff-Versandstopfen heraus.

Siehe Abbildung B.

**2** Verbinden Sie den ThermoFlex PROZESSAUSGANG (A) mit dem Flüssigkeitseingang Ihrer Applikation. Verbinden Sie den ThermoFlex PROZESSEINGANG (B) mit dem Flüssigkeitsausgang Ihrer Applikation. Überprüfen Sie, dass die Verbindungen dicht und gesichert sind. **Luftgekühlte Geräte: Weiter mit Schritt 4.**

Siehe Abbildung B.

**3** Verbinden Sie den ThermoFlex KÜHLWASSERLEITUNGS-AUSLASS (A) mit Ihrem Wasserücklauf oder -abfluss. Verbinden Sie den ThermoFlex KÜHLWASSERLEITUNGS-EINLASS (B) mit Ihrer Wasserleitung. Überprüfen Sie, dass die Verbindungen dicht und gesichert sind.

Nur für wassergekühlte Geräte.

Siehe Abbildung B.

**4** Schrauben Sie die Behälterkappe entgegen dem Uhrzeigersinn ab.

Siehe Abbildung A.

**5** Befüllen Sie den Behälter langsam mit sauberer Prozessflüssigkeit (siehe Tabelle 1) und kontrollieren Sie den Füllstand über die Füllstandsanzeige. Wenn der Behälter voll ist, schrauben Sie die Behälterkappe handfest auf. Da möglicherweise die Kapazität des Behälters im Vergleich zu Ihrer Applikation eher gering ist und Luft aus den Leitungen gespült werden muss, halten Sie weitere Kühlflüssigkeit zum Nachfüllen bereit, wenn der externe Kreislauf gestartet wird.

Hinweis: Achten Sie darauf, den Behälter nicht über die Markierung MAX LEVEL zu befüllen. Dies führt zu einem Überlauf-Fehler (O FLO) und somit zu einer Abschaltung des Geräts.

Siehe Abbildung A.

**6** Kontrollieren Sie, dass die korrekte Spannung eingestellt ist. Stecken Sie bei Geräten mit Stromkabel zunächst das geräteseitige Ende in das Kühlgerät und anschließend den Stecker in eine Steckdose. (Das Stromkabel befindet sich unter dem Deckel der Transportkiste. Werfen Sie den Deckel nicht weg, bevor Sie das Stromkabel gefunden haben.) Hinweis: Bei ThermoFlex900-5000 Geräten mit der Option Variabler Spannungsbereich befindet sich hinter einer Abdeckung auf der Geräterückseite ein Bedienfeld zur Konfiguration der Spannung. Siehe beigefügte Anweisung zum Einstellen der Spannung oder Anhang B im Handbuch.

Hinweis: Für Geräte, bei denen ein Festanschluss erforderlich ist, siehe Abschnitt 3 im Handbuch.

Siehe Abbildung B.

**7** Schalten Sie den Netzschalter auf Ein (I). Die Steuerung zeigt eine Reihe laufender Balken an (≡ ≡ ≡). Die Balken laufen aufwärts, um anzuzeigen, dass das Gerät initialisiert wird. Dieser Vorgang dauert ca. 15 Sekunden.

Siehe Abbildung B.

**8** Drücken Sie . Die Steuerung zeigt **SEtUP** an. Hinweis: Falls das Gerät mit einer Deionisierungs-Filterkartusche ausgestattet ist, finden Sie Hinweise zum Einsetzen in Abschnitt 5 des Handbuchs. Weitere Schritte siehe Rückseite.

Siehe Abbildung A.



**Sicherheitsvorkehrungen:**




































- Das Gerät darf nur in geschlossenen Räumen betrieben werden.
- Stellen Sie das Gerät niemals an Orten auf, wo es übermäßiger Hitze, Feuchtigkeit, unzureichender Belüftung oder korrosiven Stoffen ausgesetzt ist.
- Verwenden Sie niemals brennbare oder korrosive Flüssigkeiten in diesem Gerät.
- Schließen Sie niemals Prozessflüssigkeitsleitungen an die Kühlwasserversorgung oder an einen Anschluss für unter Druck stehende Flüssigkeiten an.
- Falls Ihr Gerät mit einer Verdrängerpumpe ausgestattet ist, stellen Sie sicher, dass die Leitungen und Fittings Ihrer Applikation einem Druck von mindestens 185 psi/ca. 9,8 bar standhalten.
- Bevor Sie Flüssigkeiten einsetzen oder eine Wartung durchführen, bei denen Sie möglicherweise mit Flüssigkeiten in Berührung kommen, beachten Sie die im Sicherheitsdatenblatt des Herstellers beschriebenen Vorsichtsmaßnahmen.

**Tabelle 1 - Zulässige Flüssigkeiten:**







Die Verwendung anderer Flüssigkeiten als der nachstehend aufgeführten führt zum Verlust der Herstellergarantie.

Gefiltertes/destilliertes Wasser
Deionisiertes Wasser (1-3 MOhm-cm, kompensiert)
0 - 75 % Ethylenglycol/Wasser
0 - 75 % Propylenglycol/Wasser




**Schnellstart - Nur für die erste Inbetriebnahme — führen Sie die Schritte 9 bis 20 für alle Geräte aus.**

<p><b>HINWEIS:</b> Einige Bereiche/Standardwerte sind abhängig von der Pumpe, siehe Abschnitt 4 im Handbuch. Nach Abschluss eines Setup-Schritts (d.h. nach dem zweiten Drücken der Taste ) können Sie den Schritt nicht wiederholen, um Korrekturen vorzunehmen. Änderungen können Sie nach dem Einschalten des Geräts vornehmen.</p>	
<p><b>9 UnitS</b> UnitS sind die Einheiten für Temperatur, Flüssigkeitsdurchfluss (optional) und Druck. Einheiten: °C/°F GPM/LPM PSI/Bar/KPAS Werkseinstellungen: °C, Gallonen, PSI</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd UnitS und °C an</li> <li>• Falls erforderlich, drücken Sie , um die Skala auf °F umzuschalten</li> <li>• Drücken Sie , um zur nächsten Anzeige zu wechseln</li> <li>• Wiederholen Sie den Vorgang für die Skalen Flow (Durchfluss) und Pressure (Druck)</li> </ul>	<p><b>10 Hi t</b> Über Hi t wird die Alarmschwelle für den Übertemperaturalarm der Flüssigkeit eingestellt. Bereich: +3°C bis +42°C Werkseinstellung: +42°C</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd Hi t und 42 an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie , um zur nächsten Anzeige zu wechseln</li> </ul>
<p><b>11 Lo t</b> Über Lo t wird die Alarmschwelle für niedrige Flüssigkeitstemperatur eingestellt. Bereich: +3°C bis +42°C Werkseinstellung: 3°C</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd Lo t und 3 an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie </li> </ul>	<p><b>12 Hi P1</b> Über Hi P1 wird die Alarmschwelle für die Entlastung der Pumpe bei hohem Druck eingestellt. Bereich: Je nach Pumpe verschieden Werkseinstellung: Je nach Pumpe verschieden</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd Hi P1 und den Standardwert an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie </li> </ul>
<p><b>14 Lo P1</b> Über Lo P1 wird die Alarmschwelle für die Entladung der Pumpe bei niedrigem Druck eingestellt. Bereich: Je nach Pumpe verschieden Werkseinstellung: Je nach Pumpe verschieden</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd Lo P1 und den Standardwert an</li> <li>• Falls erforderlich, drücken Sie , um den Standardwert einzustellen</li> <li>• Drücken Sie </li> </ul>	<p><b>13 dELAY</b> dELAY gibt an, wie lange die Pumpe nach Überschreiten der Lo P1 Alarmschwelle noch weiterläuft, bevor sie abschaltet. Bereich: 0 bis 30 Sekunden Werkseinstellung: 10 Sekunden</p> <ul style="list-style-type: none"> <li>• Die Anzeige blinkt und zeigt abwechselnd dELAY und 10 an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie </li> </ul> <p><b>HINWEIS</b> Diese Funktion ist nur aktiv, wenn das Gerät auf Abschalten konfiguriert ist, siehe Schritt 16.</p>
<p><b>17 Sound</b> Schaltet den akustischen Alarm des Geräts ein bzw. aus. Bereich: on oder OFF Werkseinstellung: on</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd Sound und ON an</li> <li>• Falls gewünscht, drücken Sie , um OFF anzuzeigen</li> <li>• Drücken Sie </li> </ul>	<p><b>16 ALr</b> ALr konfiguriert die Reaktion des Geräts auf Temperatur-, Druck- und (optional) Durchfluss-Alarmzustände - entweder Abschaltung (fLT) oder Betrieb fortsetzen (indC). Weitere Informationen siehe Abschnitt 4 im Handbuch. Bereich: fLT* oder indC** Werkseinstellung: fLT</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd ALr und fLT an</li> <li>• Falls gewünscht, drücken Sie , um indC anzuzeigen</li> <li>• Drücken Sie </li> </ul> <p>*fLT = Fehler (Abschalten) **indC = Anzeigen (Betrieb fortsetzen)</p>
<p><b>20 Store</b></p> <ul style="list-style-type: none"> <li>• Drücken Sie , um alle Einstellungen zu speichern</li> <li>• Das Gerät startet automatisch.</li> <li>• Drücken Sie , um alle Änderungen zu verwerfen und zu den Werks-Standard-Einstellungen zurückzukehren. Die Anzeige bleibt leer.</li> <li>• Drücken Sie , um den Vorgang neu zu starten</li> </ul>	<p><b>18 StArt</b> Über StArt wird der automatische Neustart ein- bzw. ausgeschaltet. Bereich: on oder OFF Werkseinstellung: OFF</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd StArt und OFF an</li> <li>• Falls gewünscht, drücken Sie , um ON anzuzeigen</li> <li>• Drücken Sie </li> </ul>
<p><b>19 CARe</b> Über CARe wird das Erinnerungsintervall für die vorbeugende Reinigung der Luft- und Flüssigkeitsfilter des Geräts eingestellt. Bereich: off, L1 - 1000 Stunden, L2 - 2000 Stunden, L3 - 3000 Stunden Werkseinstellung: L1</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd CARe und L1 an</li> <li>• Falls erforderlich, drücken Sie , um die Anzeige auf OFF, L2 oder L3 zu ändern</li> <li>• Drücken Sie </li> </ul>	<p><b>15 dELAY</b> dELAY gibt an, wie lange die Pumpe nach Überschreiten der Lo P1 Alarmschwelle noch weiterläuft, bevor sie abschaltet. Bereich: 0 bis 30 Sekunden Werkseinstellung: 10 Sekunden</p> <ul style="list-style-type: none"> <li>• Die Anzeige blinkt und zeigt abwechselnd dELAY und 10 an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie </li> </ul> <p><b>HINWEIS</b> Diese Funktion ist nur aktiv, wenn das Gerät auf Abschalten konfiguriert ist, siehe Schritt 16.</p>

Falls zutreffend, stellen Sie die Optionen entsprechend den Feldern auf der rechten Seite ein. Für Geräte mit analogen Ein- und Ausgängen (ACOM) siehe mitgelieferte zusätzliche Hinweise für den Schnellstart.

<p><b>20 Store</b></p> <ul style="list-style-type: none"> <li>• Drücken Sie , um alle Einstellungen zu speichern</li> <li>• Das Gerät startet automatisch.</li> <li>• Drücken Sie , um alle Änderungen zu verwerfen und zu den Werks-Standard-Einstellungen zurückzukehren. Die Anzeige bleibt leer.</li> <li>• Drücken Sie , um den Vorgang neu zu starten</li> </ul>	<p><b>Der Setup-Vorgang ist nun abgeschlossen.</b></p> <p>Beim Start des Geräts wird die Temperatur der Prozessflüssigkeit angezeigt.</p> <p>Falls gewünscht, können Sie den Sollwert durch Drücken von  ändern/bestätigen.</p>	<p><b>SP</b> Über SP wird der Sollwert eingestellt. Bereich: +5°C bis +40°C Werkseinstellung: +20°C</p> <ul style="list-style-type: none"> <li>• Die Anzeige blinkt und zeigt abwechselnd SP und 20 an</li> <li>• Falls erforderlich, drücken Sie , um die Einstellung zu ändern</li> <li>• Drücken Sie , um den neuen Sollwert zu speichern und zur Anzeige der Temperatur zurückzukehren</li> </ul>
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














**Option - Variabler Spannungsbereich — Schritt A**

<p><b>A HZ</b></p> <p>Über HZ wird bei Geräten mit variablem Spannungsbereich die Frequenz des Stromnetzes angegeben. Über die gewählte Frequenz wird die festgelegte Überdruck-Standard-Einstellung der Firmware automatisch justiert. Bereich: 50 oder 60 Hz Standard: 60 Hz</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd HZ und 60 an</li> <li>• Falls erforderlich, drücken Sie , um die Frequenz zu ändern</li> <li>• Drücken Sie </li> </ul> <p>Wenn Ihr Gerät nicht über einen Durchfluss-Messumformer oder serielle Kommunikation verfügt, siehe Schritt 20.</p>
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**Option - Durchfluss-Messumformer — Schritte B und C**

<p><b>B Hi FLO</b> Über HiFLO wird die Alarmschwelle für hohen Durchfluss eingestellt. Bereich: Je nach Pumpe verschieden Werkseinstellung: Je nach Pumpe verschieden</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd HiFLO und den Standardwert an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie </li> </ul>	<p><b>C LoFlo</b> Über LoFLO wird die Alarmschwelle für niedrigen Durchfluss eingestellt. Bereich: Je nach Pumpe verschieden Werkseinstellung: Je nach Pumpe verschieden</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd LoFLO und den Standardwert an</li> <li>• Falls erforderlich, drücken Sie , um den Wert einzustellen</li> <li>• Drücken Sie </li> </ul> <p>Wenn Ihr Gerät nicht über eine serielle Kommunikation verfügt, siehe Schritt 20.</p>
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**Option - Serielle Kommunikation (DCOM) — Schritte D bis I**

<p><b>D SEr</b> Über SEr wird der Modus für die serielle Kommunikation ein- und ausgeschaltet und konfiguriert. Bereich: off, rS232, rS485 Werkseinstellung: off</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd SEr und OFF an</li> <li>• Falls erforderlich, drücken Sie , um den Modus zu ändern</li> <li>• Drücken Sie </li> </ul>	<p><b>E BRud</b> Über BRud wird die Baudrate (Geschwindigkeit) für die serielle Kommunikation ausgewählt. Bereich: 9600, 4800, 2400, 1200, 600 oder 300 Bit pro Sekunde. Werkseinstellung: 9600</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd BRud und 9600 an</li> <li>• Falls erforderlich, drücken Sie , um die Baudrate zu ändern</li> <li>• Drücken Sie </li> </ul>
<p><b>F dATA</b> Über dATA wird die Anzahl der Bits angezeigt. Anzeige: 8</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd dATA und 8 an</li> <li>• Drücken Sie </li> </ul>	<p><b>G StOp</b> Über StOp wird die Anzahl der Stopp-Bits angegeben. Bereich: 2 oder 1 Werkseinstellung: 1</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd StOp und 1 an</li> <li>• Falls erforderlich, drücken Sie , um die Einstellung zu ändern</li> <li>• Drücken Sie </li> </ul>
<p><b>H PAR</b> PAR wird verwendet, um Fehler in der Datenübertragung zu finden. Bereich: gleich, ungleich oder keine Werkseinstellung: keine</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd PAR und none an</li> <li>• Falls erforderlich, drücken Sie , um die Einstellung zu ändern</li> <li>• Drücken Sie </li> </ul>	<p><b>I u id</b> u id (Geräte-ID) wird nur bei RS485 verwendet. Zur Identifizierung von Geräten, die an den Port RS485 angeschlossen werden. Bereich: 1 bis 99 Werkseinstellung: 1</p> <ul style="list-style-type: none"> <li>• Drücken Sie </li> <li>• Die Anzeige blinkt und zeigt abwechselnd u id und 1 an</li> <li>• Falls erforderlich, drücken Sie , um die Einstellung zu ändern</li> <li>• Drücken Sie </li> </ul> <p>Siehe Schritt 20.</p>

# Preface

## Compliance Third Party:



**CSA Listed** - Laboratory equipment-electrical

**File #** 105974\_C\_000

**CLASS:** 8721-05 CAN/CSA-C22.2 No. 61010-1-04

**CLASS:** 8721-85 ANSI/UL Standard 61010-1

**NOTE** ThermoFlex15000 through 24000 CSA listings are pending. ▲

## European Union ( EU ) LVD & EMC



Our evaluation has demonstrated compliance with the following EU directives, as indicated by the CE Mark located on the unit nameplate and the Declaration of Conformity supplied with the unit.

2004/108/EC - Electromagnetic Compatibility Directive (EMC):

EN61326-1:2006 - Electrical equipment for measurement, control, and laboratory use - EMC requirements

2006/95/EC - Low Voltage Directive (LVD):

EN61010-1:2001 - Safety requirements for electrical equipment for measurement, control, and laboratory use - general requirements

## WEEE

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:



Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, dispose of or recycle this product through them. Further information on Thermo Fisher Scientific's compliance with these Directives is available at:

[www.thermo.com/WEEERoHS](http://www.thermo.com/WEEERoHS)

## **After-sale Support**

Thermo Fisher Scientific is committed to customer service both during and after the sale. If you have questions concerning the unit operation, or questions concerning spare parts or Service Contracts, call our Sales, Service and Customer Support phone number, see this manual's inside cover for contact information.

When calling, please refer to the labels on the inside cover. These labels list all the necessary information needed to properly identify your unit.

## **Feedback**

We appreciate any feedback you can give us on this manual. Please e-mail us at [thermoscientificmanuals@thermofisher.com](mailto:thermoscientificmanuals@thermofisher.com). Be sure to include the manual part number and the revision date listed on the front cover.

## **Warranty**

Thermo Scientific NESLAB ThermoFlex units have a warranty against defective parts and workmanship for 24 months from date of shipment. See back page for more details.

## **Unpacking**

If the unit has a line cord it is located under the shipping crate's lid. Do not discard the lid until the cord is located.

Retain all cartons and packing material until the unit is operated and found to be in good condition. If the unit shows external or internal damage contact the transportation company and file a damage claim. Under ICC regulations, this is your responsibility.

### **Out of Box Failure**

An Out of Box Failure is defined as any product that fails to operate in conformance with sellers published specifications at initial power up. Install the unit in accordance with manufacturer's recommended operating conditions within 30 days of shipment from the seller.

Any Temperature Control product meeting the definition of an Out of Box Failure must be packed and shipped back in the original packaging to Thermo Fisher Scientific for replacement with a new unit; seller to pay the cost of shipping. Customer must receive a Return Material Authorization (RMA) from Thermo Fisher prior to shipping the unit.

# Section 1 Safety

## Safety Warnings

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, please contact us. See inside cover for contact information.



**DANGER** indicates an imminently hazardous situation which, if not avoided, *will* result in death or serious injury.



**WARNING** indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.



**CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also be used to alert against unsafe practices.



The lightning flash with arrow symbol, within an equilateral triangle, is intended to alert the user to the presence of non-insulated "dangerous voltage" within the unit's enclosure. The voltage magnitude is significant enough to constitute a risk of electrical shock.



This label indicates read the manual.

**Never place the unit in a location where excessive heat, moisture, or corrosive materials are present. ▲**

**The unit construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided. ▲**

**Never connect the process fluid inlet or outlet fittings to your building water supply or any water pressure source. ▲**

**Never use flammable or corrosive fluids with this unit. Use of these fluids will void the manufacturer's warranty. ▲**

**Do not use automotive antifreeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of automotive antifreeze will void the manufacturer's warranty. ▲**

**To prevent freezing/glazing of the plate exchanger, ThermoFlex7500 through ThermoFlex24000 units require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature. ▲**

**Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's MSDS for handling precautions. ▲**

**When using a process fluid mixture of ethylene glycol and water or propylene glycol and water, check the fluid concentration and pH on a regular basis. Changes in concentration and pH can impact system performance. See Section 3. ▲**

**Many refrigerants which may be undetectable by human senses are heavier than air and will replace the oxygen in an enclosed area causing loss of consciousness. Contact with leaking refrigerant will cause skin burns. Refer to the unit's nameplate and the manufacturer's most current MSDS for additional information. ▲**

**Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty. ▲**

**Transport the unit with care. Sudden jolts or drops can damage the unit's components. ▲**

**Drain the unit before it is transported and/or stored in near or below freezing temperatures, see Draining in Section 8. Store the unit in the temperature range -25°C to 60°C (with packaging), and <80% relative humidity. ▲**

**For ThermoFlex900-10000 units, the circuit protector located on the rear of the unit is not intended to act as a disconnecting means. ▲**

**Observe and never remove warning labels. ▲**

**Never operate damaged or leaking equipment. ▲**

**Never operate the unit without process fluid in the reservoir. ▲**

**Always turn off the unit and disconnect the power cord from the power source before performing any service or maintenance procedures, or before moving the unit. ▲**

**Never operate the unit with panels removed. ▲**

**Never operate equipment with damaged power cords. ▲**

**Refer service and repairs to a qualified technician. ▲**



## Section 2 General Information

### Description

The Thermo Scientific NESLAB ThermoFlex™ recirculating chiller is designed to provide a continuous supply of fluid at a constant temperature and flow rate. The unit consists of an air-cooled or water-cooled refrigeration system, heat exchanger, recirculating pump, polyethylene reservoir, and a microprocessor controller.

### Specifications

	ThermoFlex900	ThermoFlex1400	ThermoFlex2500
<b>Process Fluid Temperature and Setpoint Range</b>	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F
<b>Ambient Temperature Range</b>	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F
<b>Temperature Stability</b>	±0.1°C	±0.1°C	±0.1°C
<b>Cooling Capacity at 20°C</b>	900 W (3074 BTU) 750 W (2561 BTU)	1400 W (4781 BTU) 1170 W (3996 BTU)	2500 W (8538 BTU)* 2200 W (7513 BTU)
	*To meet this specification, the ThermoFlex2500 air-cooled units require the fan to be operating in the high-speed mode, see Section 3.		
<b>Refrigerant</b>	R134A	R134A	R134A
<b>Reservoir Volume</b>			
Gallons	1.9	1.9	1.9
Liters	7.2	7.2	7.2
<b>Footprint or Dimensions (H x W x D)</b>			
Inches	27.3 x 14.2 x 24.6	27.3 x 14.2 x 24.6	29.0 x 17.2 x 26.5
Centimeters	69.2 x 36.0 x 62.4	69.2 x 36.0 x 62.4	73.6 x 43.6 x 67.3
<b>Unit Weight P2 Pump (empty)</b>			
lb	130.5	130.5	175.5
kg	59.2	59.2	79.6
<b>Pumping Capacity</b>			
P1 - Positive Displacement 60 Hz		2.1 gpm @ 60 psig (7.9 lpm @ 4.1 bar)	
50 Hz		1.7 gpm @ 60 psig (6.4 lpm @ 4.1 bar)	
P2 - Positive Displacement 60 Hz		4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)	
50 Hz		3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)	
T1 - Turbine 60 Hz*		3.5 gpm @ 60 psid (13.3 lpm @ 4.1 bar)	
50 Hz*		2.5 gpm @ 60 psid (9.5 lpm @ 4.1 bar)	

\* Pumping capacity pressure values for turbine pumps are differential pressures between the inlet and the outlet of the unit.

- Cooling capacity based on P2 pumps with no backpressure. Heat input from the pump will result in a reduction in cooling capacity. The cooling capacity reduction will vary based on the pump chosen as well as pump backpressure and flow.
- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance. See Section 3.
- Additional dimensions are at the end of this section, add 1/8" (3 mm) to height for SEMI units.
- Add 5 pounds (2 kilograms) for global voltage units.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

## Specifications

	ThermoFlex3500	ThermoFlex5000
<b>Process Fluid Temperature and Setpoint Range</b>	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F
<b>Ambient Temperature Range</b>	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F
<b>Temperature Stability</b>	± 0.1°C	± 0.1°C
<b>Cooling Capacity at 20°C</b>		
60 Hz	3500 W (11953 BTU)	5000 W (17076 BTU)
50 Hz	3050 W (10416 BTU)	4400 W (15027 BTU)
<b>Refrigerant</b>	R407C	R407C
<b>Reservoir Volume</b>		
Gallons	1.9	1.9
Liters	7.2	7.2
<b>Footprint or Dimensions (H x W x D)</b>		
Inches	38.9 x 19.3 x 30.9	38.9 x 19.3 x 30.9
Centimeters	98.7 x 48.8 x 78.4	98.7 x 48.8 x 78.4
<b>Unit Weight P1/ P2/P3/P4 (empty)</b>		
lb	264/264/270/303	NA/264/270/303
kg	120/120/123/138	NA/120/123/138
<b>Pumping Capacity</b>		
P1 - Positive Displacement		
60 Hz	2.1 gpm @ 60 psig (7.9 lpm @ 4.1 bar)	Not Available
50 Hz	1.7 gpm @ 60 psig (6.4 lpm @ 4.1 bar)	Not Available
P2 - Positive Displacement		
60 Hz	4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)	4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)
50 Hz	3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)	3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)
T1 - Turbine		
60 Hz*	3.5 gpm @ 60 psid (13.3 lpm @ 4.1 bar)	3.5 gpm @ 60 psid (13.3 lpm @ 4.1 bar)
50 Hz*	2.5 gpm @ 60 psid (9.5 lpm @ 4.1 bar)	2.5 gpm @ 60 psid (9.5 lpm @ 4.1 bar)
P3 - Centrifugal Pump		
60 Hz*	10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)	10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)
50 Hz*	10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)	10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)
P4 - Centrifugal Pump		
60 Hz*	15 gpm @ 57 psid (56.8 lpm @ 3.9 bar)	15 gpm @ 57 psid (56.8 lpm @ 3.9 bar)
50 Hz*	15 gpm @ 34 psid (56.8 lpm @ 2.3 bar)	15 gpm @ 34 psid (56.8 lpm @ 2.3 bar)

\* Pumping capacity pressure values for turbine and centrifugal pumps are differential pressures between the inlet and the outlet of the unit.

- Cooling capacity based on P2 pumps with no backpressure. Heat input from the pump will result in a reduction in cooling capacity. The cooling capacity reduction will vary based on the pump chosen as well as pump backpressure and flow.
- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance. See Section 3.
- Additional dimensions are at the end of this section, add 1/8" (3 cm) to height for SEMI units.
- Add 30 pounds (14 kilograms) for global voltage units.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

## Specifications

	ThermoFlex7500	ThermoFlex10000
<b>Process Fluid Temperature and Setpoint Range</b>	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F
<b>Ambient Temperature Range</b>	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F
<b>Temperature Stability</b>	±0.1°C	±0.1°C
<b>Cooling Capacity at 20°C</b> 60 Hz 50 Hz	7500 W (25575 BTU) 6425 W (21910 BTU)	10000 W (34100 BTU) 8500 W (28985 BTU)
<b>Refrigerant</b>	R407C	R407C
<b>Reservoir Volume</b> Gallons Liters	4.75 17.9	4.75 17.9
<b>Footprint or Dimensions (H x W x D)</b>		
Air-Cooled Inches	52.3 x 25.2 x 33.8	52.3 x 25.2 x 33.8
Centimeters	132.7 x 63.9 x 85.6	132.7 x 63.9 x 85.6
Water-Cooled Inches	45.9 x 25.2 x 33.8	45.9 x 25.2 x 33.8
Centimeters	116.6 x 63.9 x 85.6	116.6 x 63.9 x 85.6
<b>Unit Weight P2/P3/P5 (empty)</b>		
Air-Cooled lb	356/372.5/405.5	356/372.5/405.5
kg	161.5/169/184	161.5/169/184
Water-Cooled lb	315/331.5/364.5	315/331.5/364.5
kg	143/150/165	143/150/165
<b>Pumping Capacity</b>		
P2 - Positive Displacement 60 Hz 50 Hz	4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar) 3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)	4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar) 3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)
P3 - Centrifugal Pump 60 Hz* 50 Hz*	10 gpm @ 32 psid (37.9 lpm @ 2.2 bar) 10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)	10 gpm @ 32 psid (37.9 lpm @ 2.2 bar) 10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)
P5 - Centrifugal Pump 60 Hz* 50 Hz*	20 gpm @ 60 psid (75.7 lpm @ 4.1 bar) 20 gpm @ 35 psid (75.7 lpm @ 2.4 bar)	20 gpm @ 60 psid (75.7 lpm @ 4.1 bar) 20 gpm @ 35 psid (75.7 lpm @ 2.4 bar)

\* Pumping capacity pressure values for centrifugal pumps are differential pressures between the inlet and the outlet of the unit.

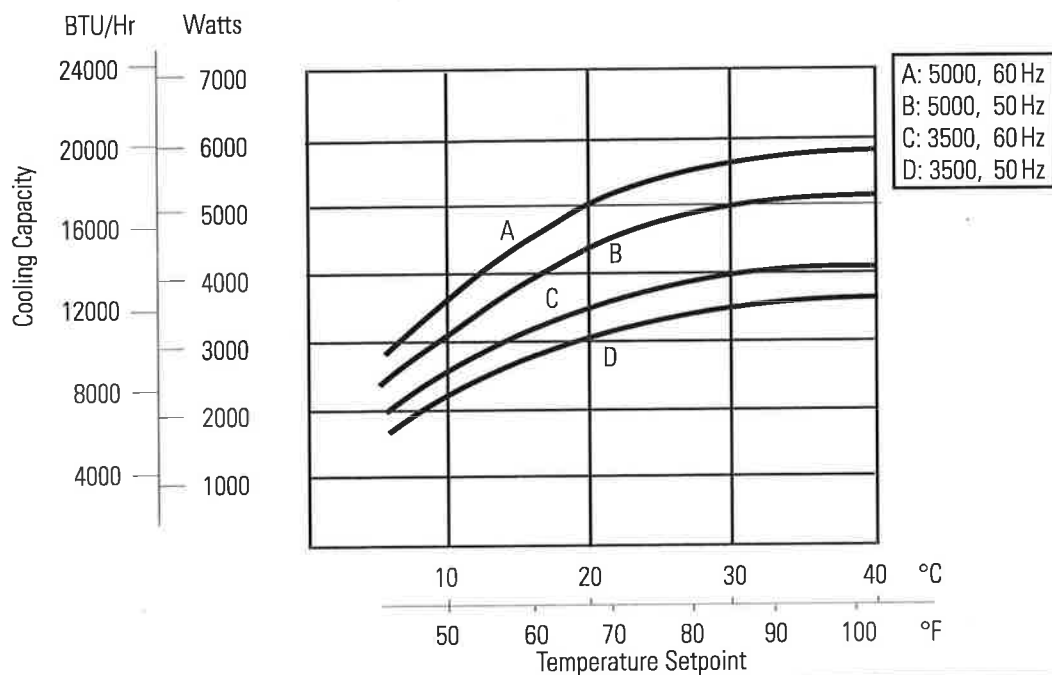
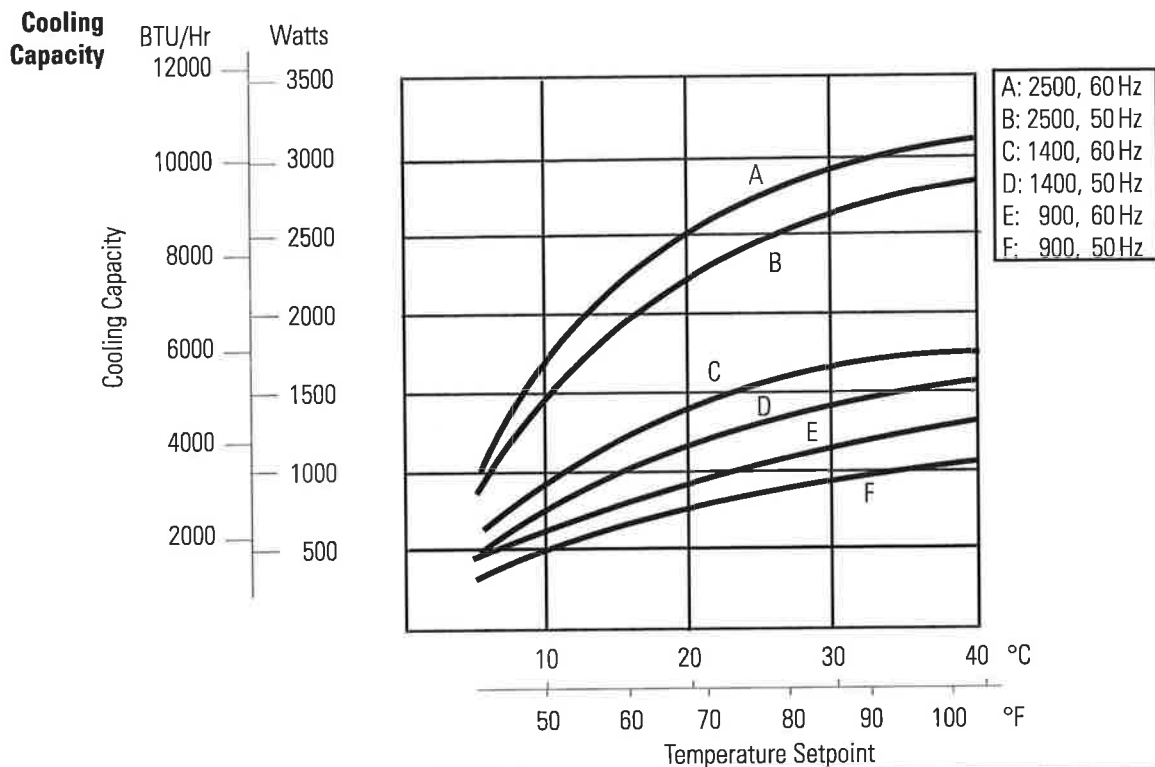
- Cooling capacity based on P2 pumps with no backpressure. Heat input from the pump will result in a reduction in cooling capacity. The cooling capacity reduction will vary based on the pump chosen as well as pump backpressure and flow.
- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance. See Section 3.
- Additional dimensions are at the end of this section.
- Add 30 pounds (14 kilograms) for global voltage units with a P2 pump. Add 10 pounds (4.5 kilograms) for units with a P3 or P5 pump.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

## Specifications

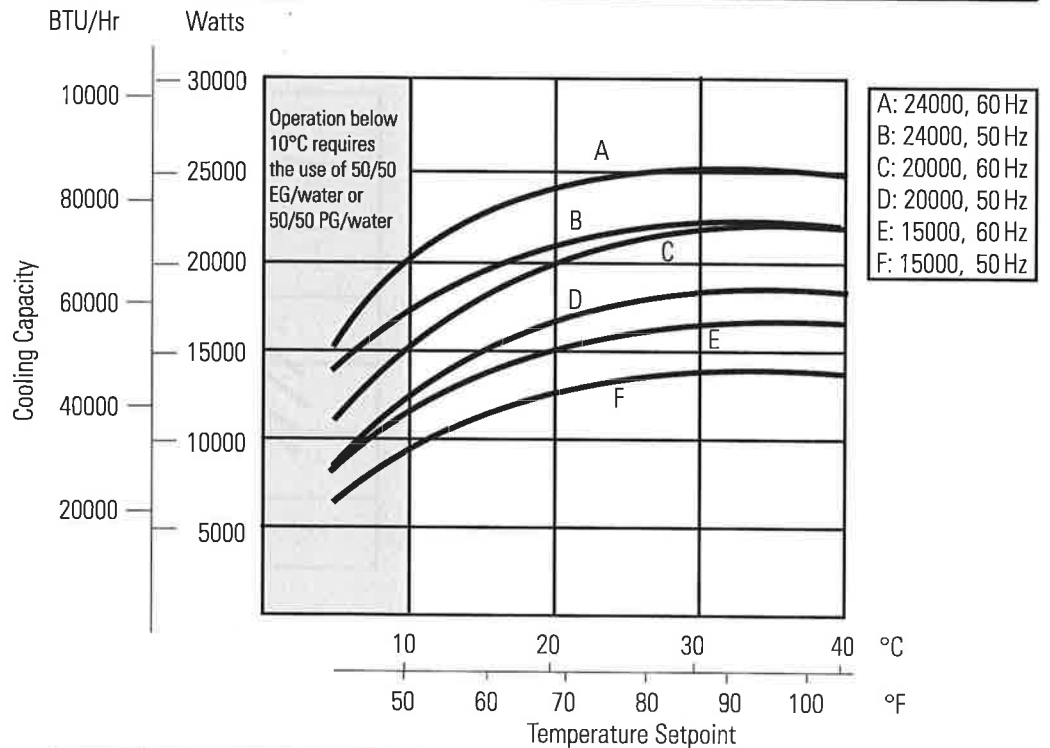
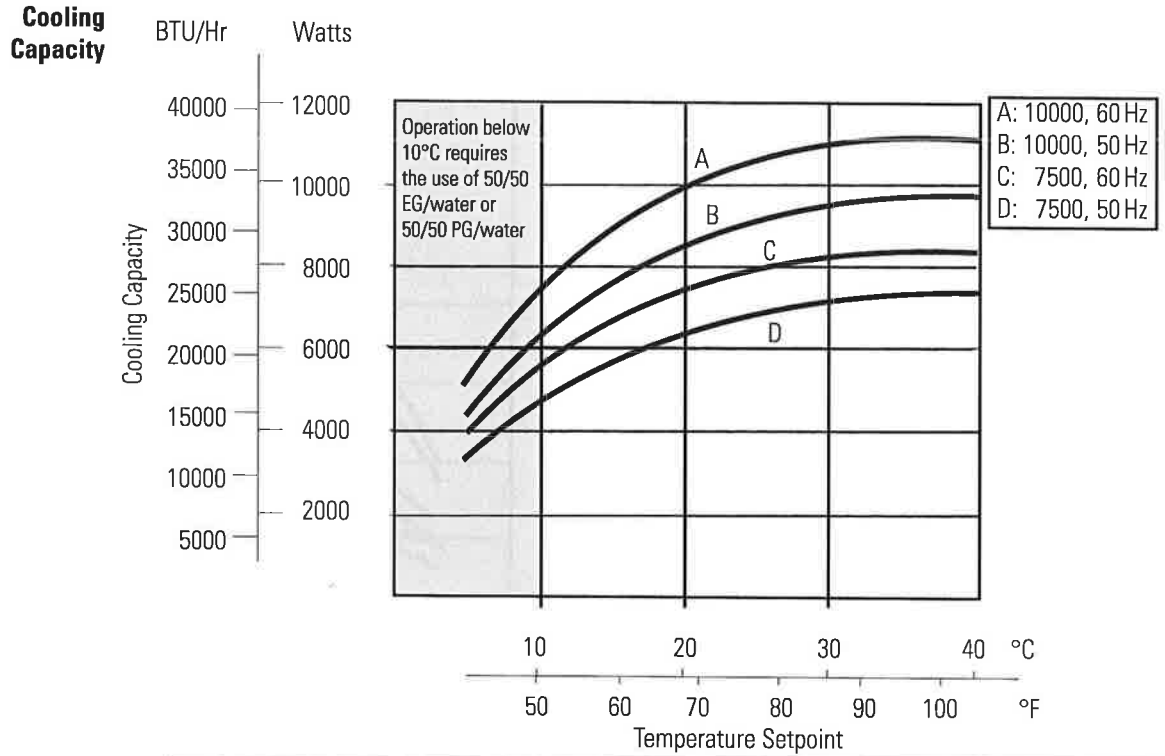
	ThermoFlex15000	ThermoFlex20000	ThermoFlex24000
<b>Process Fluid Temperature and Setpoint Range</b>	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F
<b>Ambient Temperature Range</b>	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F	+10°C to +40°C +50°F to +104°F
<b>Temperature Stability</b>	±0.1°C	±0.1°C	±0.1°C
<b>Cooling Capacity at 20°C</b>			
60 Hz	15000 W (51228 BTU)	20000 W (68304 BTU)	24000 W (81964 BTU)
50 Hz	12525 W (42775 BTU)	16700 W (57043 BTU)	21000 W (71719 BTU)
<b>Refrigerant</b>	R407C	R407C	R407C
<b>Reservoir Volume</b>			
Gallons	4.75	4.75	4.75
Liters	17.9	17.9	17.9
<b>Footprint or Dimensions (H x W x D)</b>			
Air-Cooled Inches	49.0 x 46.5 x 30.9	49.0 x 46.5 x 30.9	58.6 x 46.5 x 30.9
Centimeters	124.4 x 118.1 x 78.6	124.4 x 118.1 x 78.6	148.9 x 118.1 x 78.6
Water-Cooled Inches	49.0 x 46.5 x 30.9	49.0 x 46.5 x 30.9	49.0 x 46.5 x 30.9
Centimeters	124.4 x 118.1 x 78.6	124.4 x 118.1 x 78.6	124.4 x 118.1 x 78.6
<b>Unit Weight (empty)</b>			
Air-Cooled lb	550	550	650
kg	249.5	249.5	294.8
Water-Cooled lb	510	510	510
kg	231.3	231.3	231.3
<b>Pumping Capacity</b>			
P3 - Centrifugal Pump 60 Hz*		10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)	
50 Hz*		10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)	
P5 - Centrifugal Pump 60 Hz*		20 gpm @ 60 psid (75.7 lpm @ 4.1 bar)	
50 Hz*		20 gpm @ 35 psid (75.7 lpm @ 2.4 bar)	

\* Pumping capacity pressure values for centrifugal pumps are differential pressures between the inlet and the outlet of the unit.

- Cooling capacity based on P3 pumps set at 10 gpm. Heat input from the pump will result in a reduction in cooling capacity. The cooling capacity reduction will vary based on the pump chosen as well as pump backpressure and flow.
- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance. See Section 3.
- Additional dimensions are at the end of this section.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

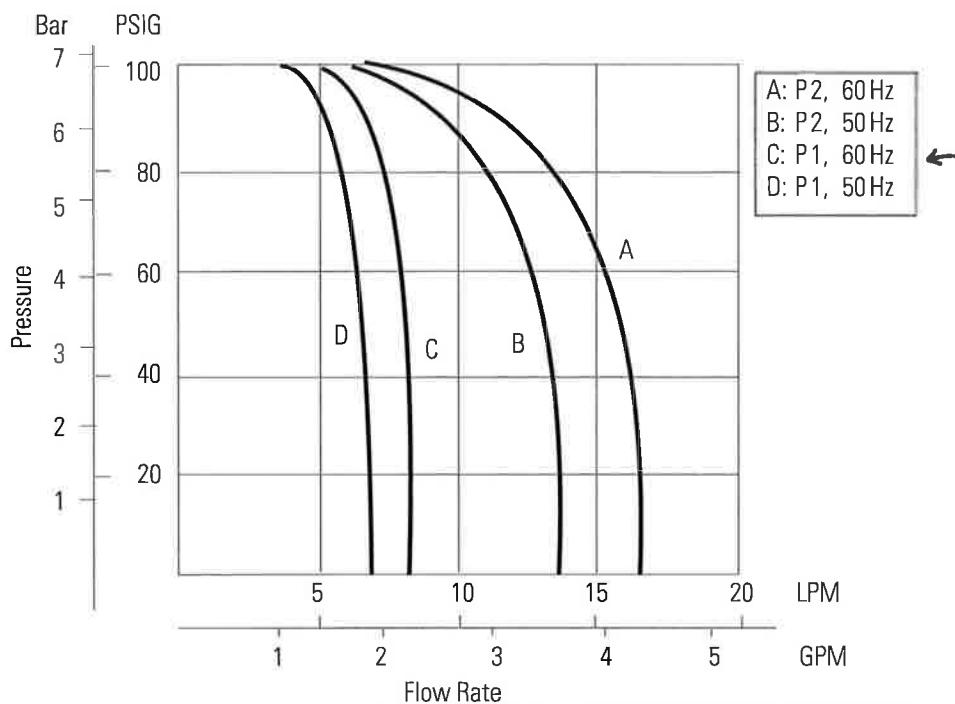


- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage, on units with P2 pumps with no back pressure. Other fluids, fluid temperatures, ambient temperatures, altitude, operating voltages or pumps will affect performance. See Section 3.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

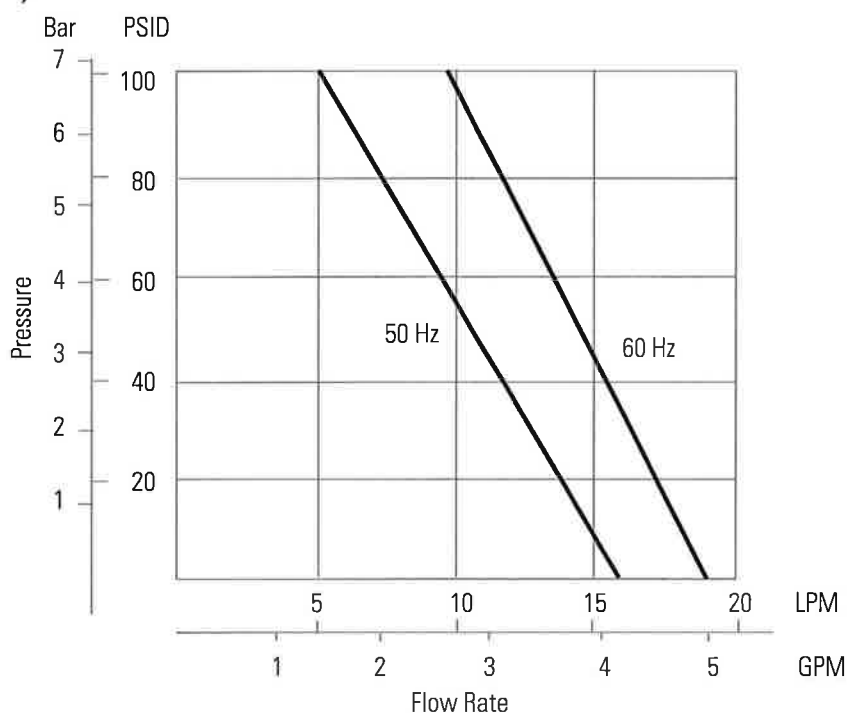


- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage, on units with P2 pumps with no back pressure (P3 pumps set to 10 gpm for ThermoFlex15000 to 24000). Other fluids, fluid temperatures, ambient temperatures, altitude, operating voltages or pumps will affect performance. See Section 3.
- Units require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature to prevent freezing/glazing of the plate exchanger.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

**Pumping Capacity  
Positive Displacement Pump P1/P2**

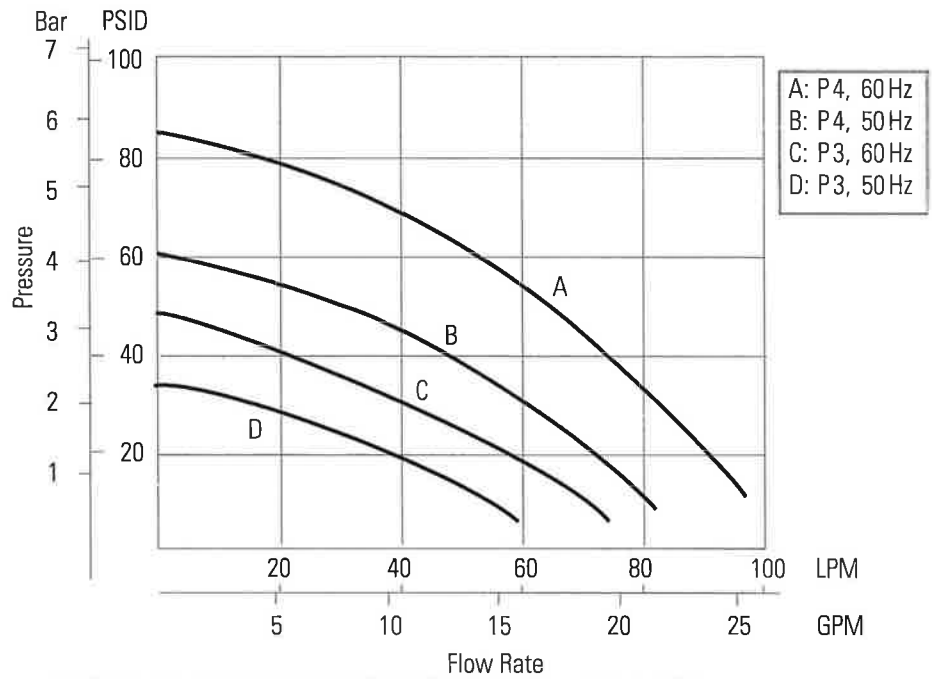


**Pumping Capacity  
Turbine Pump T1**

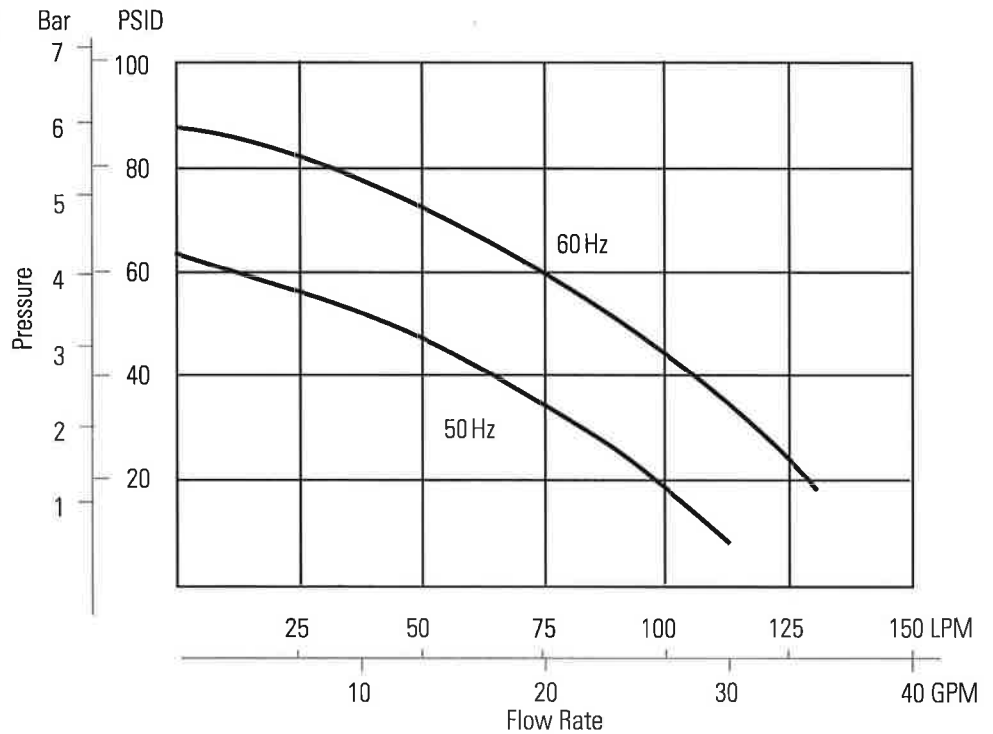


- Pump curves are nominal values. Pressure values for turbine pumps are differential pressures between the inlet and the outlet of the unit.
- Pump performance results were obtained with no restrictions on the return to the system or with any options installed. For example, utilizing the DI option will result in a 0.5 gpm flow reduction .
- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance. See Section 3.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

**Pumping Capacity  
Centrifugal Pump P3/P4**



**Pumping Capacity  
Centrifugal Pump P5**

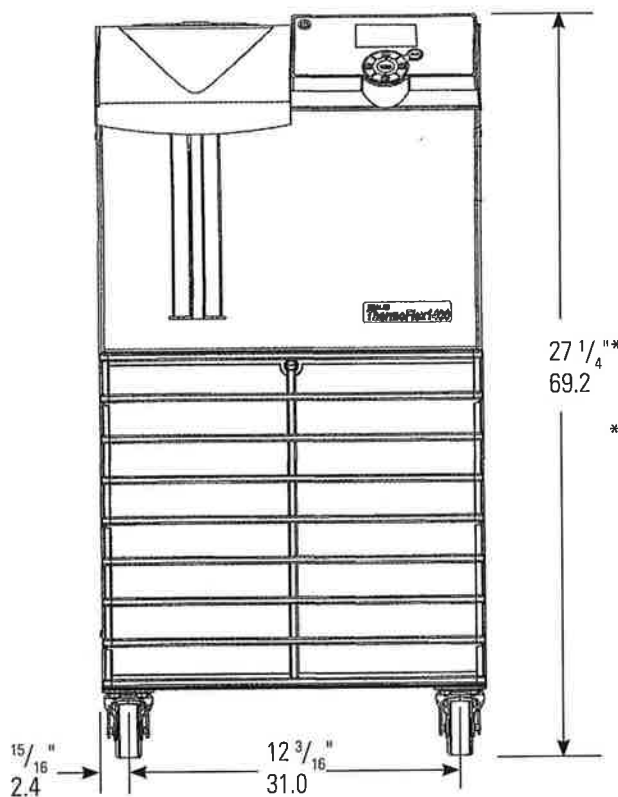


- Pump curves are nominal values. Pressure values for centrifugal pumps are differential pressures between the inlet and the outlet of the unit.
- Pump performance results were obtained with no restrictions on the return to the system or with any options installed. For example, utilizing the DI option will result in a 0.5 gpm flow reduction.
- Specifications obtained at sea level using water as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance. See Section 3.
- Thermo Fisher Scientific reserves the right to change specifications without notice.



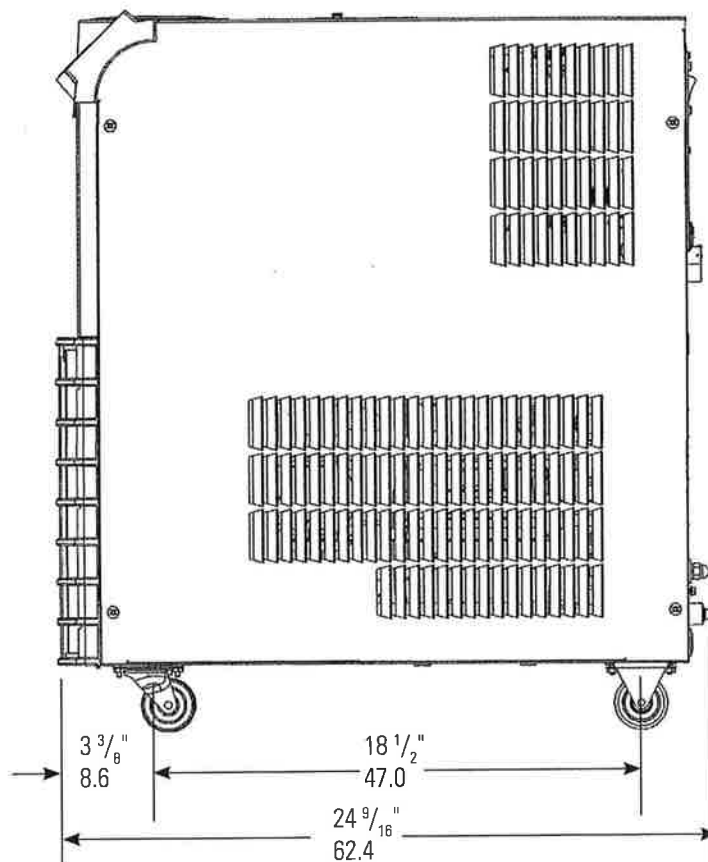
**ThermoFlex900/1400**  
**Dimensions**  
 (inches/centimeters)

Front View



\* Add 1/8" (3 mm) for SEMI units, see Section 5.

Side View



**ThermoFlex900/1400**

Process discharge fluid connection  
for units with a flow transducer  
1/2" FNPT Stainless Steel



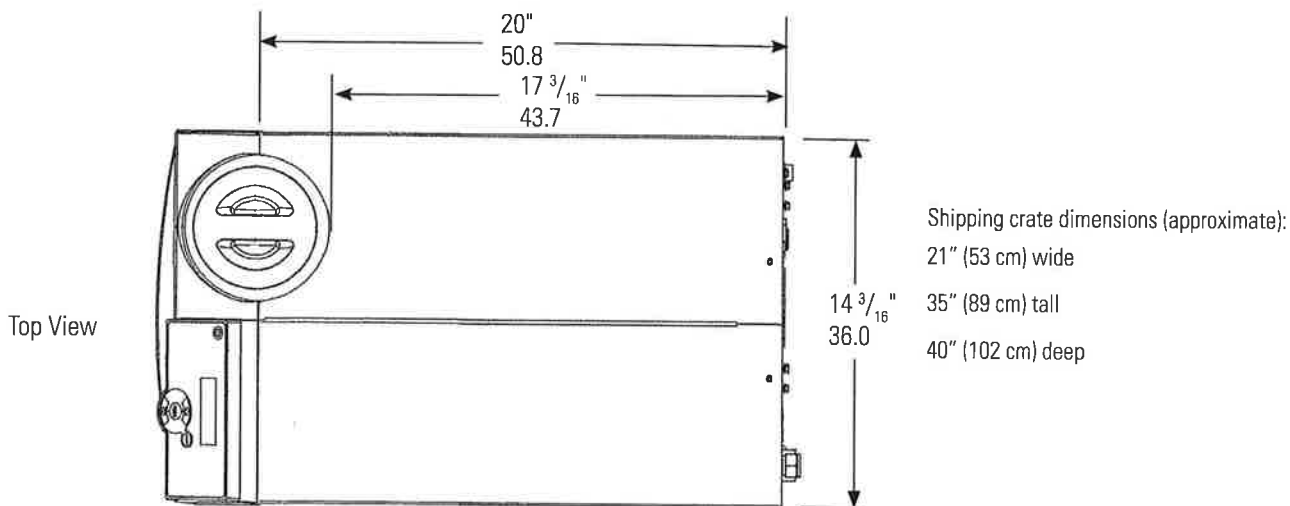
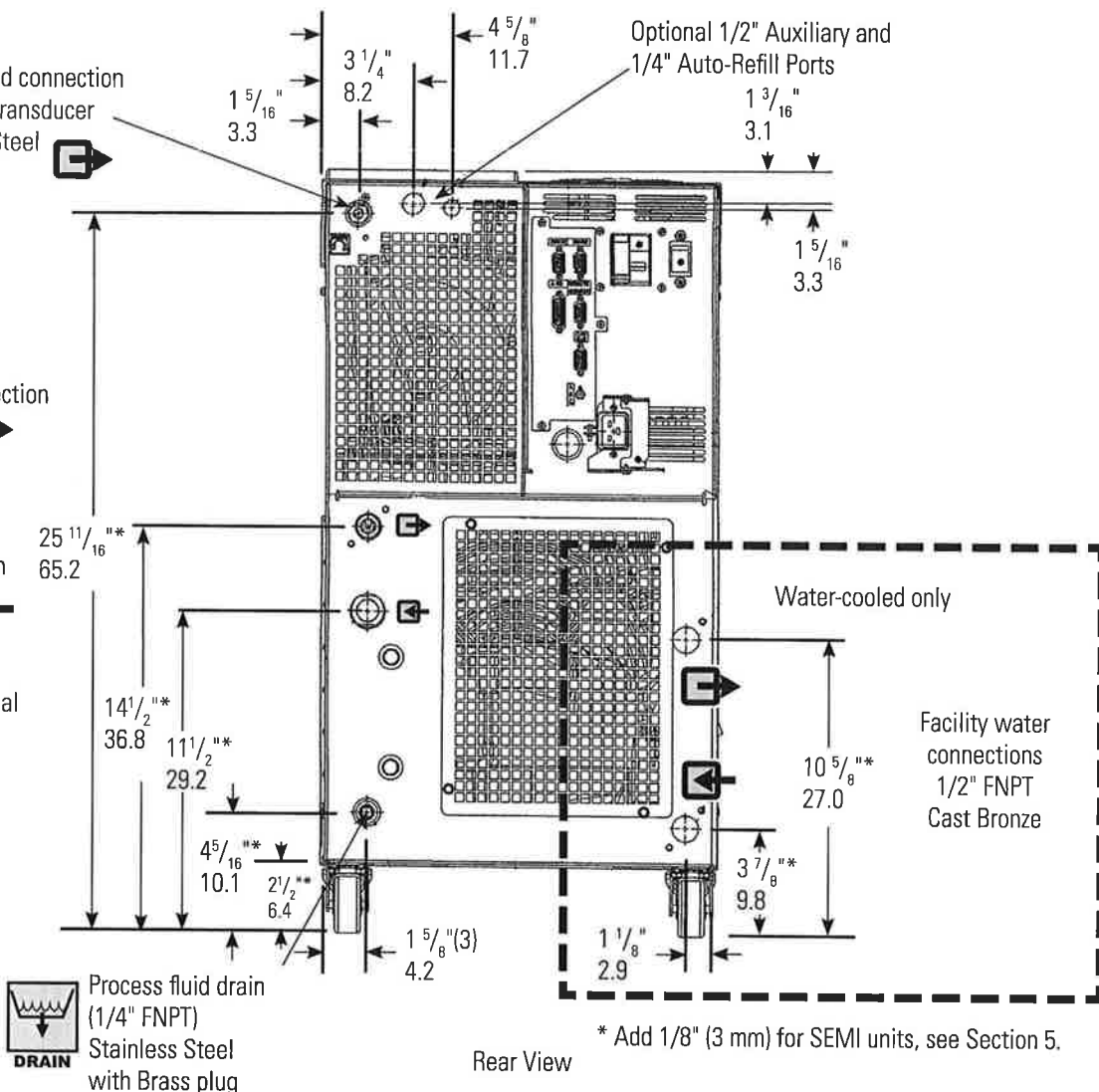
Process discharge fluid connection  
1/2" FNPT Cast Bronze



Process fluid return connection  
1/2" FNPT Stainless Steel



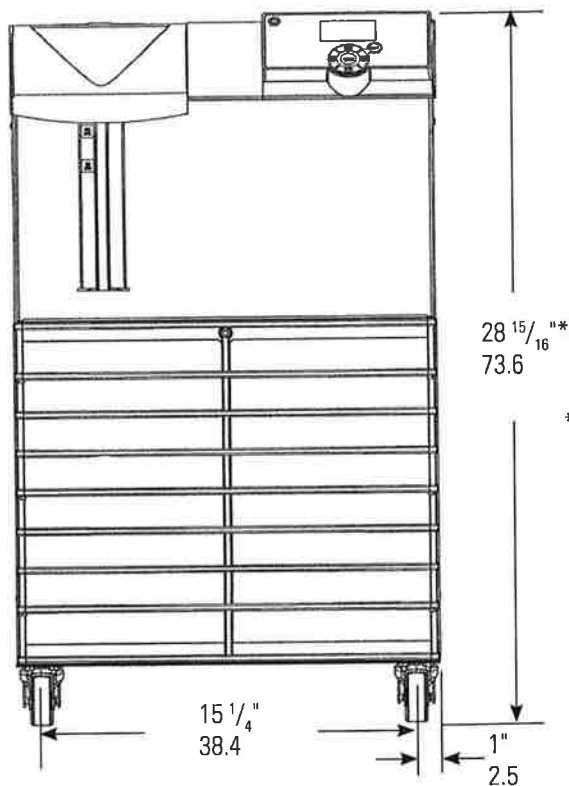
See Section 3 for additional  
plumbing information.



• Thermo Fisher Scientific reserves the right to change specifications without notice.

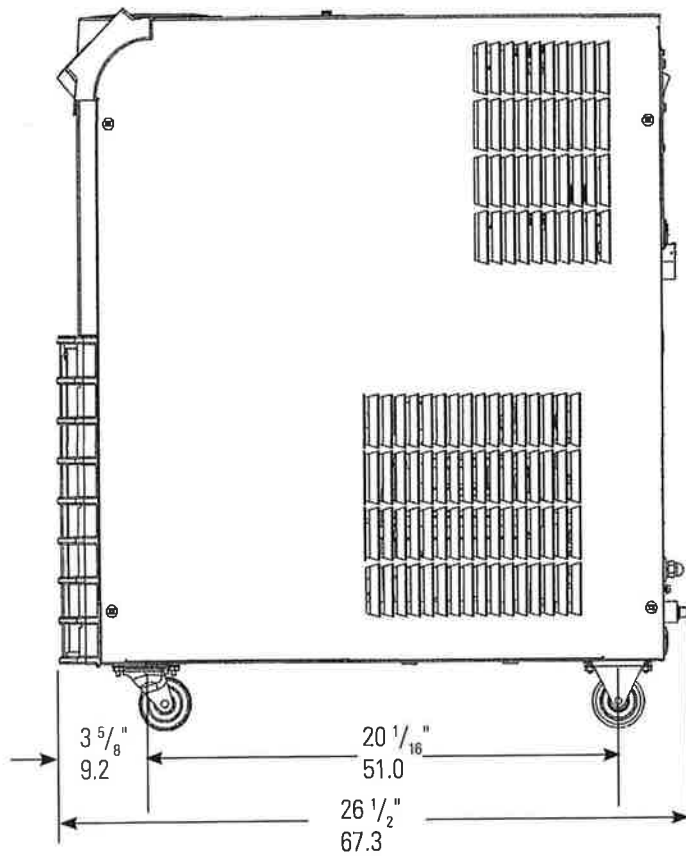
**ThermoFlex2500**  
**Dimensions**  
 (inches/centimeters)

Front View

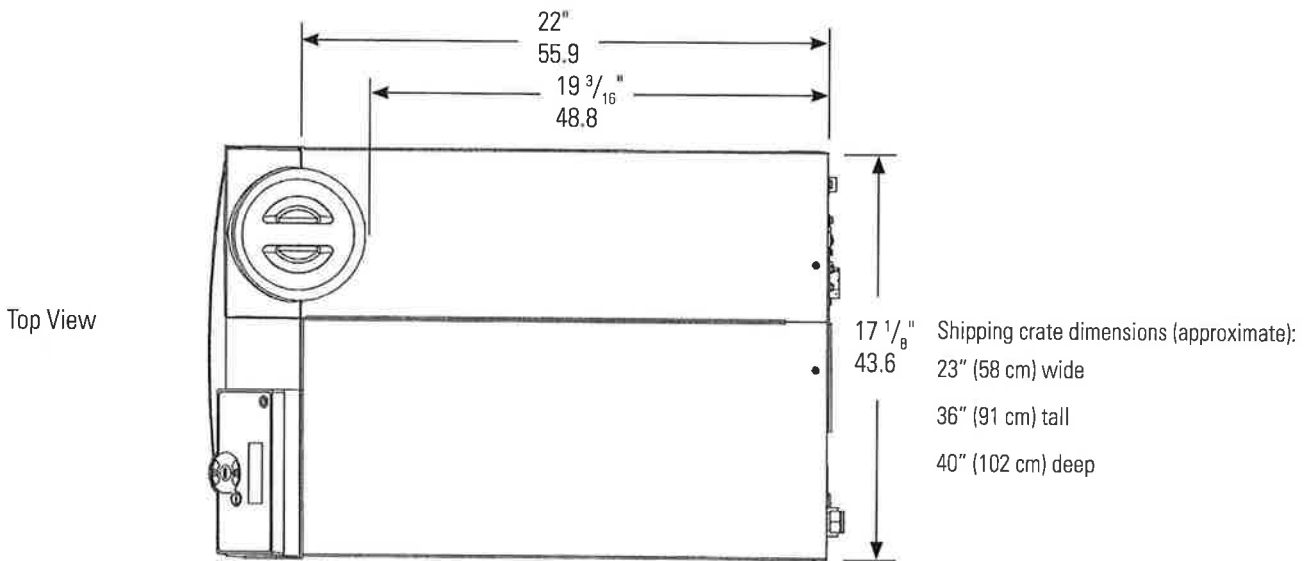
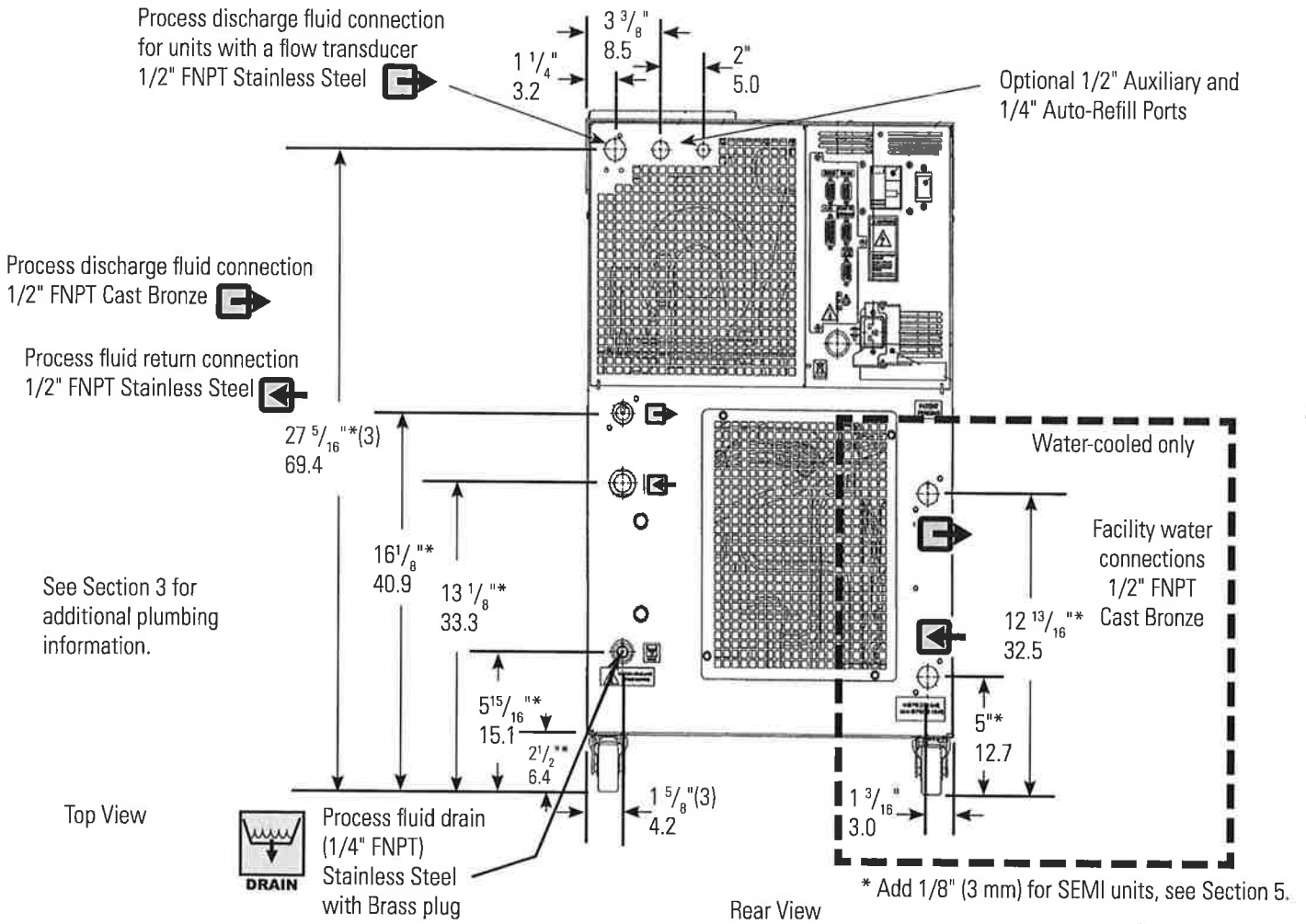


\* Add 1/8" (3 mm) for SEMI units, see Section 5.

Side View



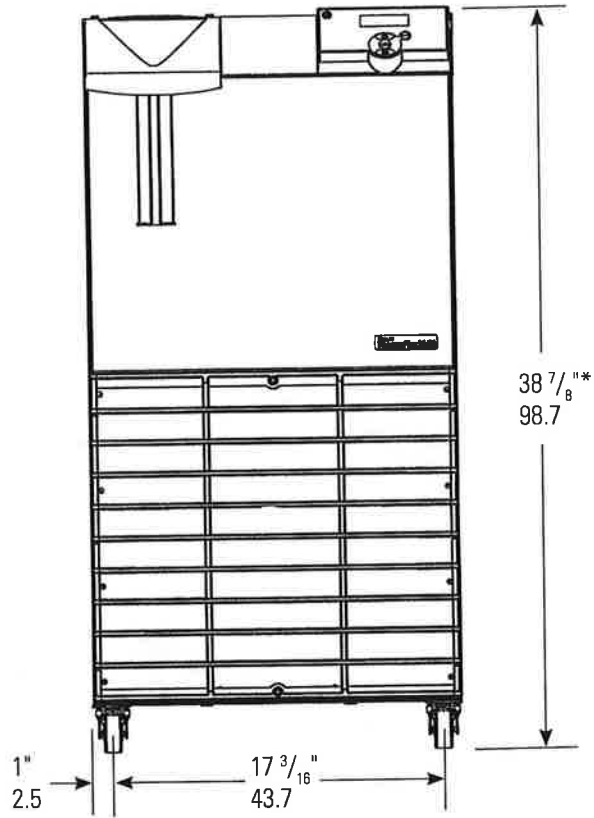
**ThermoFlex2500**



• Thermo Fisher Scientific reserves the right to change specifications without notice.

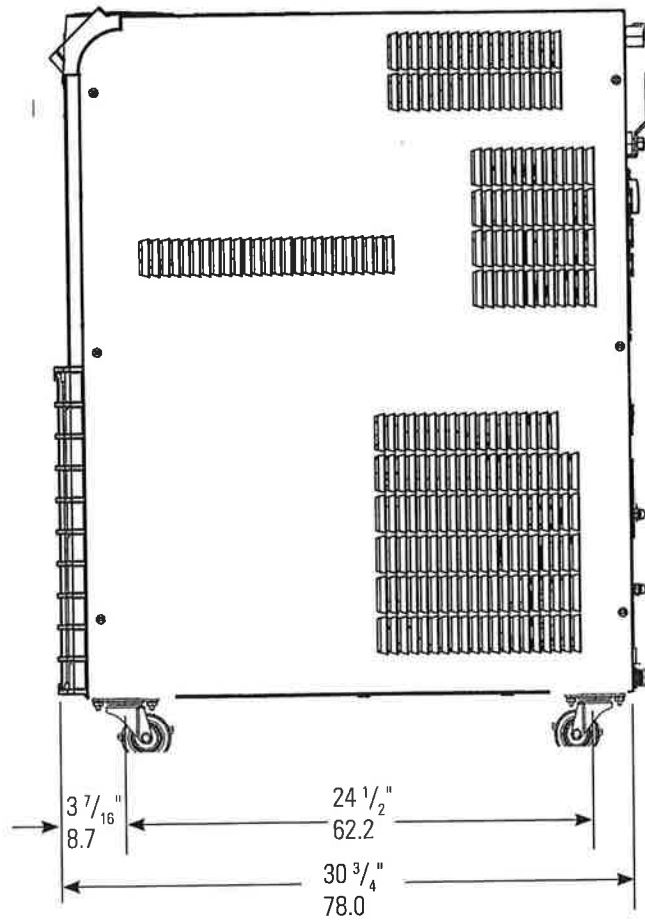
**ThermoFlex3500/5000**  
**Dimensions**  
 (inches/centimeters)

Front View



\* Add 1/8" (3 mm) for SEMI units, see Section 5.

Side View

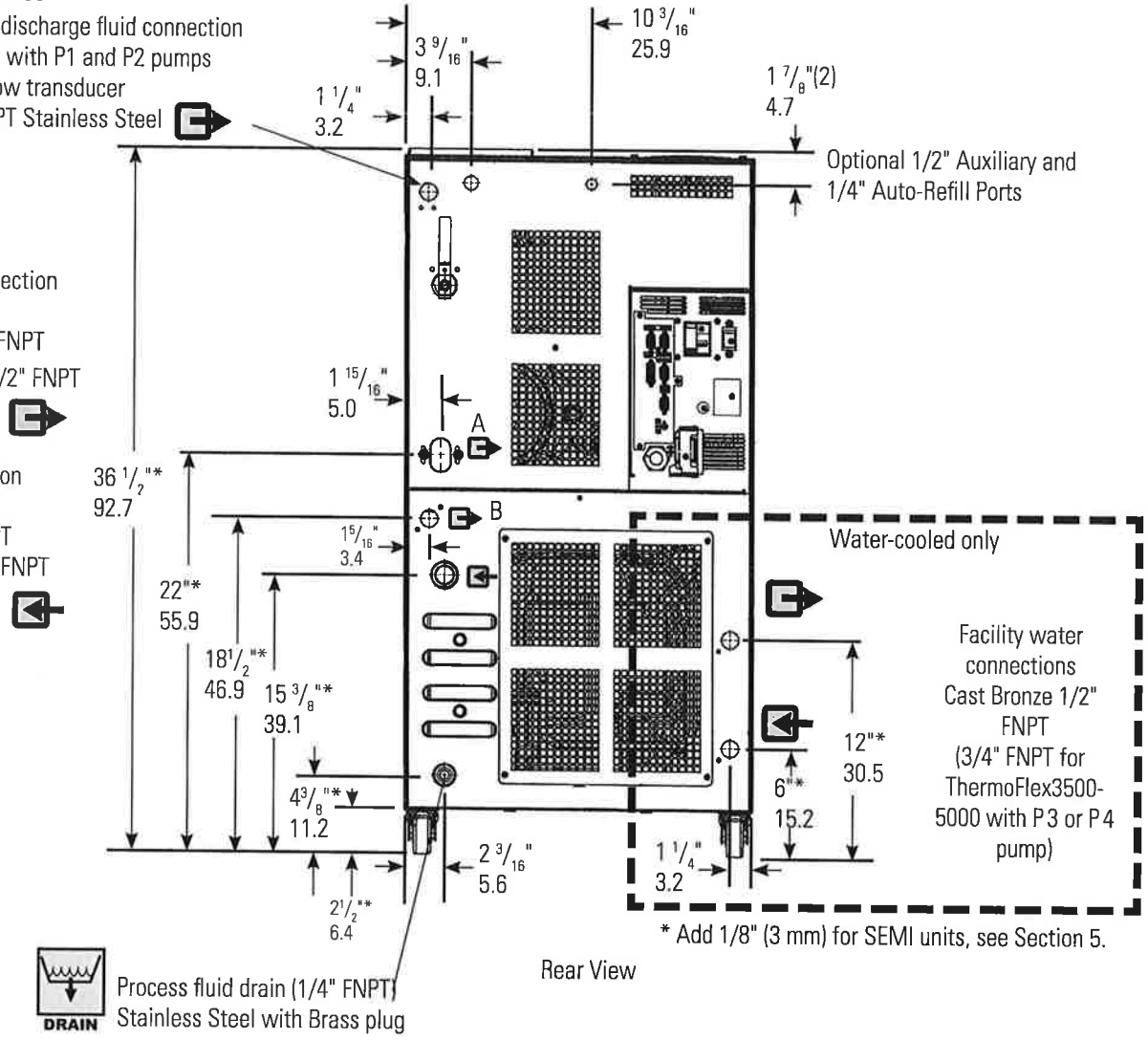


**ThermoFlex3500/5000**

Process discharge fluid connection  
for units with P1 and P2 pumps  
and a flow transducer  
1/2" FNPT Stainless Steel

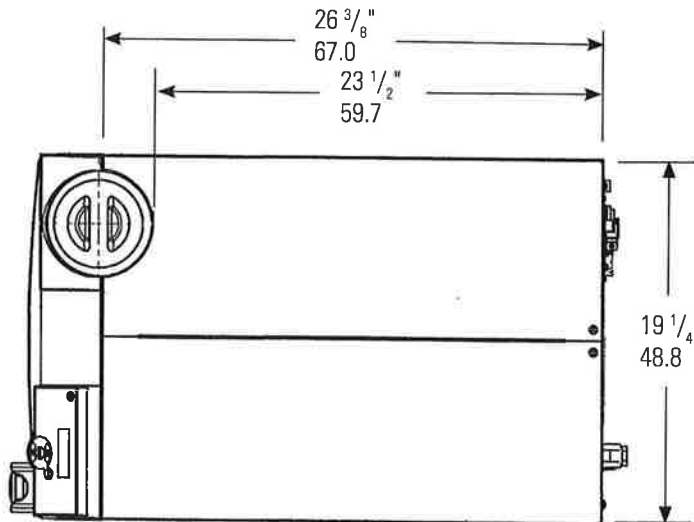
Process discharge connection  
Cast Bronze  
A P3, P4 pumps 3/4" FNPT  
B P1, P2, T1 pumps 1/2" FNPT

Process return connection  
Stainless Steel  
P3, P4 pumps 3/4" FNPT  
P1, P2, T1 pumps 1/2" FNPT



Rear View

Top View

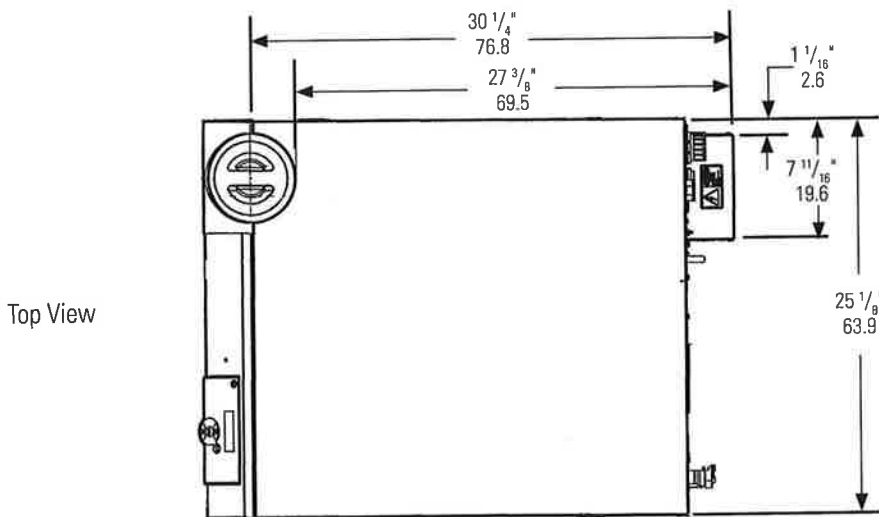
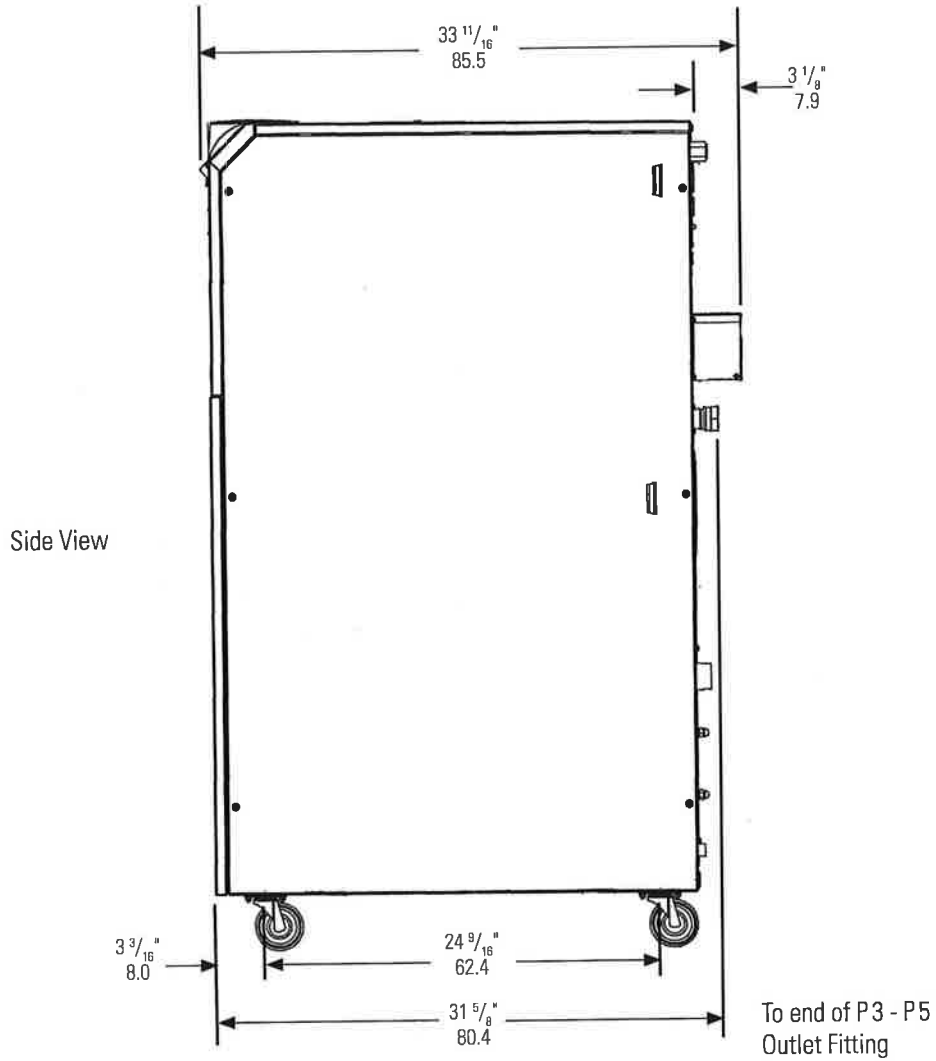


Shipping crate dimensions (approximate):

- 26" (66 cm) wide
- 48" (122 cm) tall
- 47" (119 cm) deep

• Thermo Fisher Scientific reserves the right to change specifications without notice.

**ThermoFlex7500/10000**  
**Dimensions**  
 (inches/centimeters)



Air-cooled shipping crate  
 dimensions (approximate):

35 3/4" (91 cm) wide

61 1/2" (156 cm) tall

46 3/8" (118 cm) deep

Water-cooled shipping crate  
 dimensions (approximate):

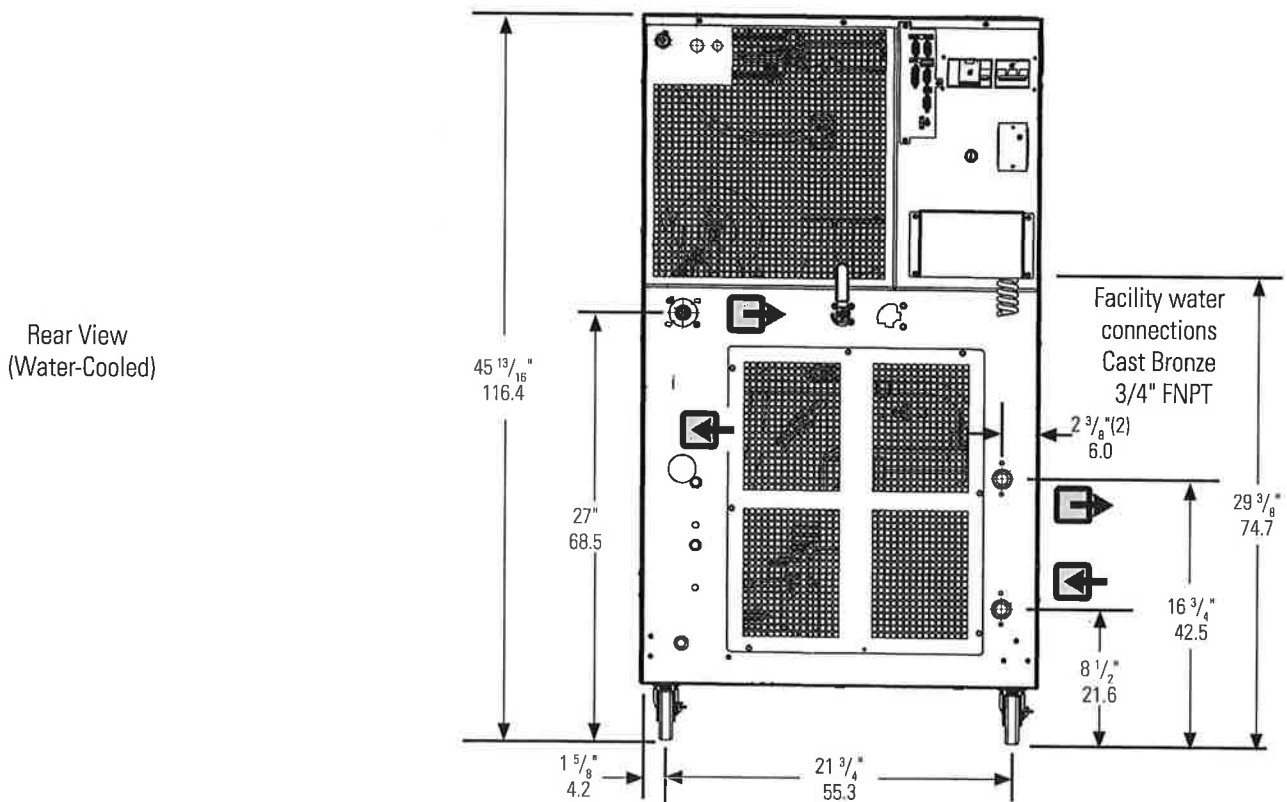
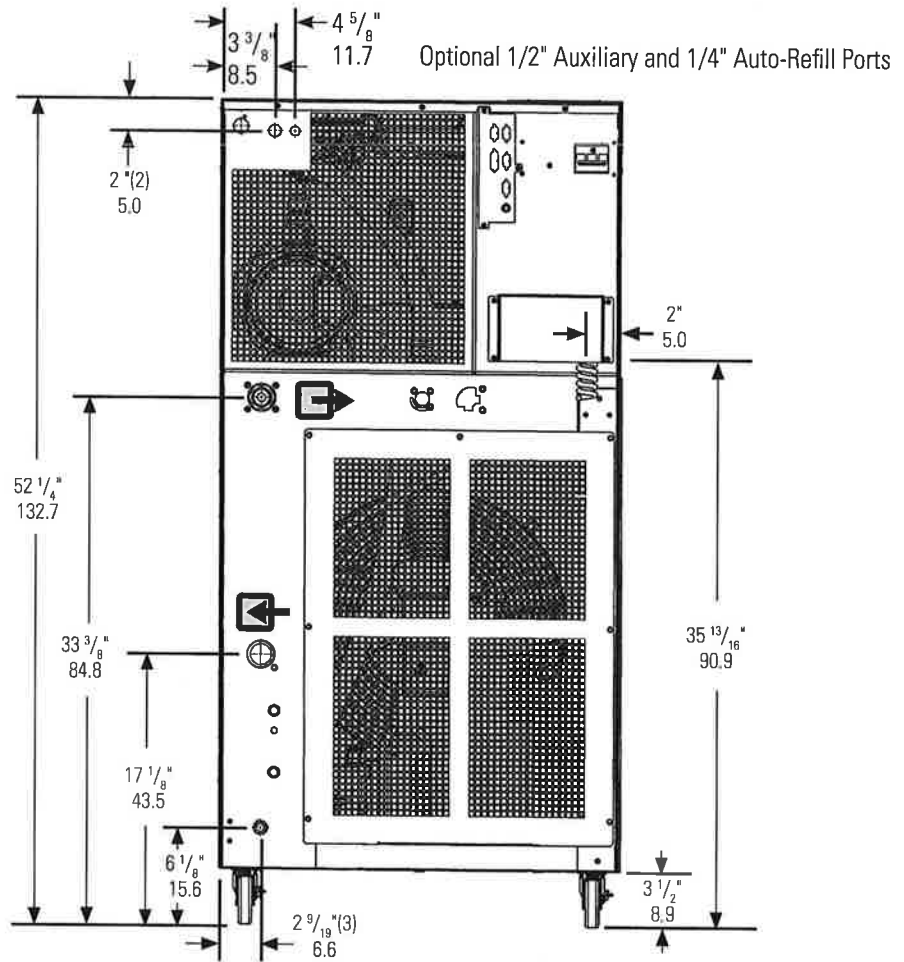
35 3/4" (91 cm) wide

55 1/2" (141 cm) tall

46 3/8" (118 cm) deep

- Thermo Fisher Scientific reserves the right to change specifications without notice.

**ThermoFlex7500/10000**





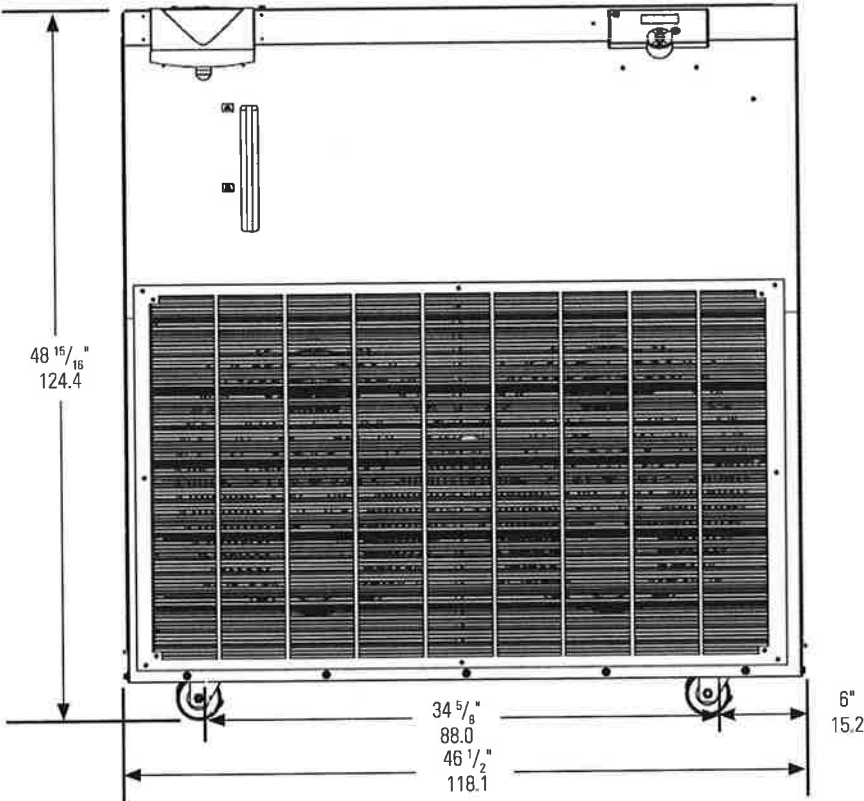
**ThermoFlex15000/20000/24000**

**Dimensions**

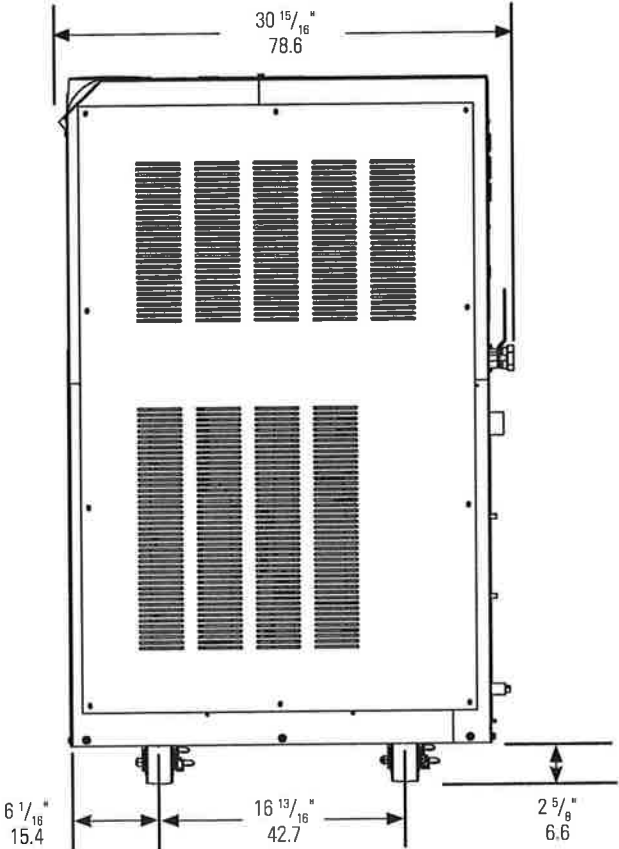
(inches/centimeters)

Front View

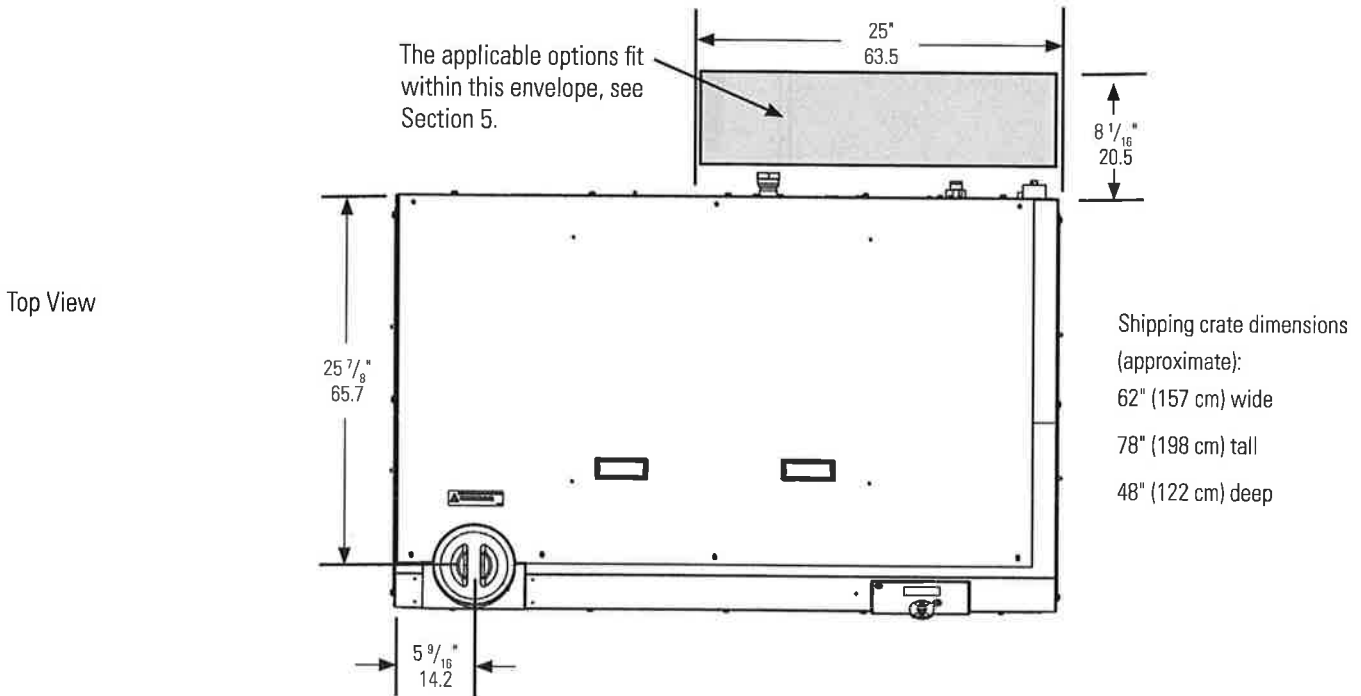
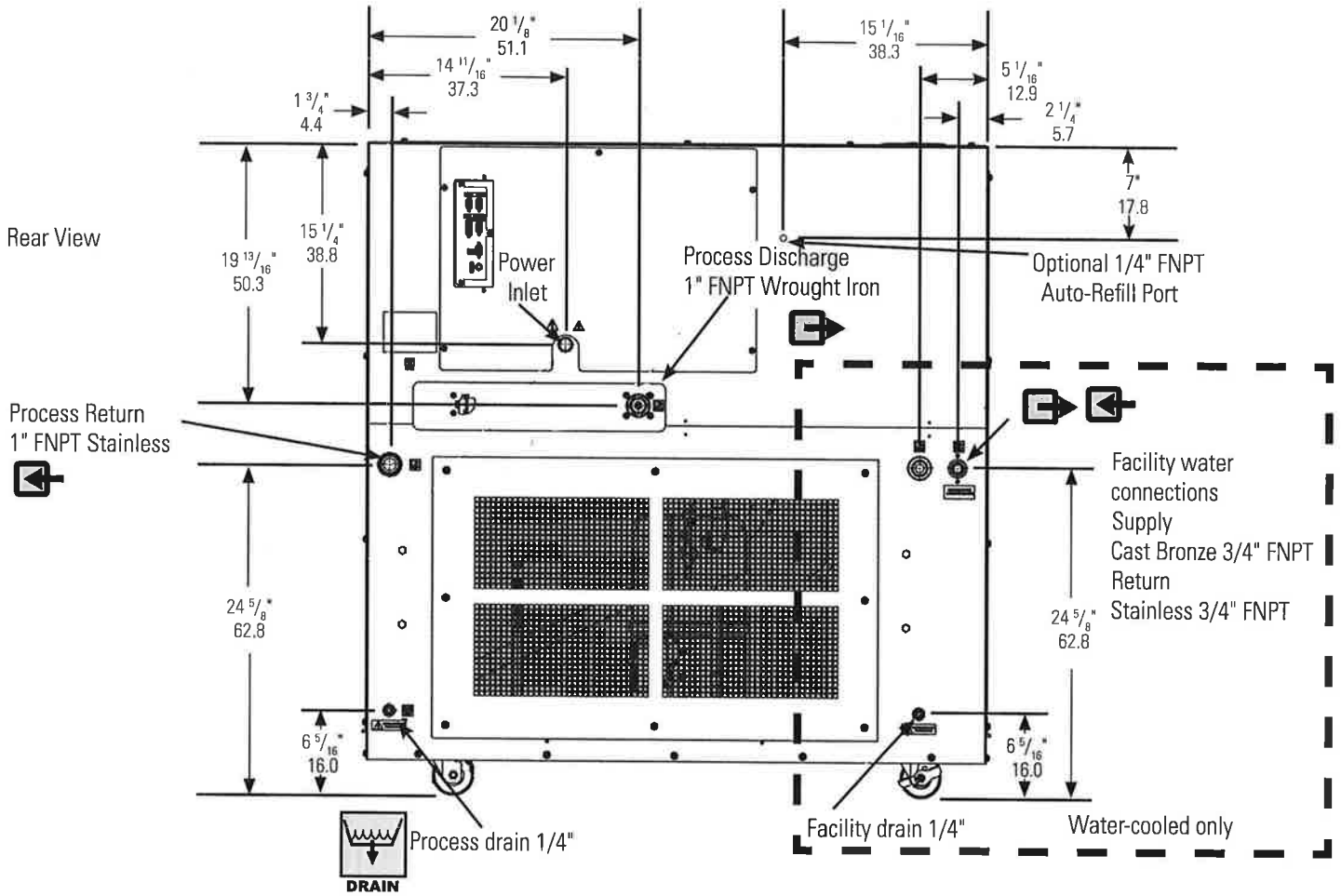
For ThermoFlex24000  
Air-Cooled Units  
58 <sup>5</sup>/<sub>8</sub>"  
148.9



Side View



**ThermoFlex15000/20000/24000**



## Section 3 Installation

### Site Requirements

Ambient Temperature Range*	10°C to 40°C (50°F to 104°F)
Relative Humidity Range	10% to 80% (non-condensing)
Operating Altitude*	Sea Level to 8000 feet (2438 meters)
Overvoltage Category	II
Pollution Degree	2
Degree of Protection	IP 20

\*Because of the decrease in air density, maximum temperature for the air entering an air-cooled ThermoFlex is reduced by 1°C per 1,000 feet above sea level. In addition, cooling capacity is reduced 1.2% per 1,000 feet above sea level.



**Never place the unit in a location where excessive heat, moisture, inadequate ventilation, or corrosive materials are present. ▲**

**NOTE** Refer to the nameplate information on the rear of the unit. ▲

Air-cooled units retain their full rated capacity at 20°C setpoint in ambient temperatures up to 25°C (77°F). For ambient temperatures above 25°C please de-rate the cooling capacity 3% for every 1°C above 25°C (77°F), up to a maximum ambient temperature of 40°C (104°F). Please note that when operating at a process temperature lower than 20°C the de-rate percentage may increase due to additional gains from losses to ambient.

**NOTE** Depending on the setpoint and ambient temperatures, there may be a heat gain or loss through the plumbing resulting in a variation from setpoint temperature at the application inlet. Applications with large temperature variations between ambient and setpoint temperatures, and/or long plumbing lengths, may require additional insulation. ▲

ThermoFlex2500 air-cooled units are equipped with a two-speed fan. Should the unit's internal ambient temperature reach 50°C for 30 seconds, or reach 53°C, the fan speed will switch from slow speed to high speed to maintain internal temperatures within acceptable limits. When the temperature reaches 44°C or below for at least 15 minutes the speed will return to low. When in high speed the unit's decibel level increases significantly.

**NOTE** High speed is required for the unit to achieve its 2500 watt cooling capacity. At high-end operating conditions the fan can be set to run at high speed all the time using the controller's Setup Loop, see Section 4. ▲

Units installed below the end-user application may enable system fluid to drain back into the chiller and cause spillage. Thermo Fisher offers an anti-drainback kit to prevent any spillage, see Section 5.

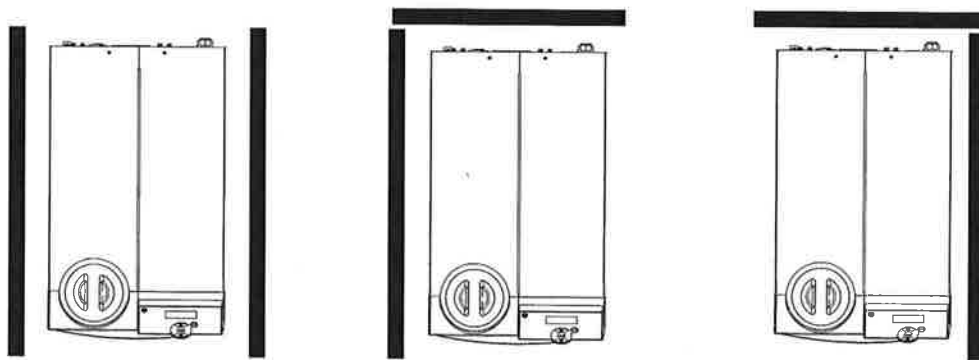
Air-cooled units can be installed with both sides blocked, or one side and the rear. See Figure 3-1. The front of the unit needs a minimum clearance of 24". Air will enter the front of the system and exit through the sides and rear.

Having two sides blocked can impact the unit's performance due to changes in air flow. If your installation requires two blocked sides please ensure that the following requirements are met:

Process Setpoint Temperature: Below 30°C (86°F)

Ambient: Below 40°C (104°F)

Before operating the unit in conditions outside any of those listed on this page please contact Thermo Fisher Scientific's Sales, Service and Customer Support to review your installation.



**Figure 3-1** Minimum Clearance

# Electrical Requirements



The unit construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided. ▲

The unit must be installed in accordance with the National Electrical Code and the with reference to the information on the unit's nameplate located on the rear of the unit.

Locate the unit so it is near, and has easy access to, its disconnecting device.

The user is responsible to ensure that the line cord provided meets local electrical codes. If not, contact qualified installation personnel.

The unit is intended for use on a dedicated outlet. The ThermoFlex has an internal circuit protection that is equivalent (approximately) to the branch circuit rating. This is to protect the ThermoFlex, and is not intended as a substitute for branch circuit protection.

## Electrical Service Requirements (Standard units):

ThermoFlex900	Voltage ±10%	Frequency	Phase	Branch Circuit Requirements	Line Cord Plug
	100 VAC	50 Hz	1Ø	15A	5-15P
	115 VAC	60 Hz	1Ø	15A	5-15P
	200 VAC	50 Hz	1Ø	15A	6-15P
	208-230 VAC	60 Hz	1Ø	15A	6-15P
	230 VAC	50 Hz	1Ø	*16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>	-

ThermoFlex1400	Voltage ±10%	Frequency	Phase	Branch Circuit Requirements	Line Cord Plug
	100 VAC	50 Hz	1Ø	20A	5-20P
	115 VAC	60 Hz	1Ø	20A	5-20P
	200 VAC	50 Hz	1Ø	15A	6-15P
	208-230 VAC	60 Hz	1Ø	15A	6-15P
	230 VAC	50 Hz	1Ø	*16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>	-

ThermoFlex2500	Voltage ±10%	Frequency	Phase	Branch Circuit Requirements	Line Cord Plug
	200 VAC P1, P2 Pump	50 Hz	1Ø	15A	6-15P
	208-230 VAC P1, P2 Pump	60 Hz	1Ø	15A	6-15P
	200 VAC T1 Pump	50 Hz	1Ø	20A	6-20P
	208-230 VAC T1 Pump	60 Hz	1Ø	20A	6-20P
	230 VAC	50 Hz	1Ø	*16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>	-

\* Refer to Appendix A for country specific ratings.

Continued on next page.

## Electrical Service Requirements (Standard units):

<b>ThermoFlex3500/5000</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>Branch Circuit Requirements</b>	<b>Line Cord Plug</b>
	200 VAC P1, P2 Pump	50 Hz	1Ø	15A	6-15P
	200 VAC T1, P3 Pump	50 Hz	1Ø	20A	6-20P
	200 VAC P4 Pump	50 Hz	1Ø	30A	6-30P
	208-230 VAC P1, P2 Pump	60 Hz	1Ø	15A	6-15P
	208-230 VAC T1, P3 Pump	60 Hz	1Ø	20A	6-20P
	208-230 VAC P4 Pump	60 Hz	1Ø	30A	6-30P
	230 VAC P1 - P4 Pump	50 Hz	1Ø	*16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>	-

<b>ThermoFlex7500/10000 (Air-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	200 VAC P2 Pump	50 Hz	3Ø	16.5	20	L15-20P
	200 VAC P3 Pump	50 Hz	3Ø	18.7	20	L15-20P
	200 VAC P5 Pump	50 Hz	3Ø	22.3	30	L15-30P
	208-230 VAC P2 Pump	60 Hz	3Ø	16.5	20	L15-20P
	208-230 VAC P3 Pump	60 Hz	3Ø	18.7	20	L15-20P
	208-230 VAC P5 Pump	60 Hz	3Ø	22.3	30	L15-30P
	400 VAC P2 Pump	50 Hz	3Ø	10.9	20	IEC309
	400 VAC P3 Pump	50 Hz	3Ø	9.6	15	IEC309
	400 VAC P5 Pump	50 Hz	3Ø	11.8	20	IEC309

<b>ThermoFlex7500/10000 (Water-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	200 VAC P2 Pump	50 Hz	3Ø	16.2	20	L15-20P
	200 VAC P3 Pump	50 Hz	3Ø	18.4	20	L15-20P
	200 VAC P5 Pump	50 Hz	3Ø	22.0	30	L15-30P
	208-230 VAC P2 Pump	60 Hz	3Ø	16.2	20	L15-20P
	208-230 VAC P3 Pump	60 Hz	3Ø	18.4	20	L15-20P
	208-230 VAC P5 Pump	60 Hz	3Ø	22.0	30	L15-30P
	400 VAC P2 Pump	50 Hz	3Ø	10.6	20	IEC309
	400 VAC P3 Pump	50 Hz	3Ø	9.3	15	IEC309
	400 VAC P5 Pump	50 Hz	3Ø	11.5	20	IEC309

**MCA** = Minimum Current Ampacity

**MOPD** = Maximum Overcurrent Protective Device

Values reflect those on the nameplate located on the rear of the unit.

Continued on next page.

<b>ThermoFlex15000/20000 (Air-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	208-230 VAC P3 Pump	60 Hz	3Ø	32.2	60	Hard wire
	208-230 VAC P5 Pump	60 Hz	3Ø	35.8	60	Hard wire
	400 VAC P3 Pump	50 Hz	3Ø	15.9	30	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	18.1	30	Hard wire

<b>ThermoFlex15000/20000 (Water-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	208-230 VAC P3 Pump	60 Hz	3Ø	28.7	50	Hard wire
	208-230 VAC P5 Pump	60 Hz	3Ø	32.3	60	Hard wire
	400 VAC P3 Pump	50 Hz	3Ø	14.5	25	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	16.7	30	Hard wire

<b>ThermoFlex24000 (Air-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	208-230 VAC P3 Pump	60 Hz	3Ø	43.9	70	Hard wire
	208-230 VAC P5 Pump	60 Hz	3Ø	47.5	80	Hard wire
	400 VAC P3 Pump	50 Hz	3Ø	20.1	35	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	22.3	40	Hard wire

<b>ThermoFlex24000 (Water-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	208-230 VAC P3 Pump	60 Hz	3Ø	37.1	70	Hard wire
	208-230 VAC P5 Pump	60 Hz	3Ø	40.7	70	Hard wire
	400 VAC P3 Pump	50 Hz	3Ø	18.8	35	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	21.0	35	Hard wire

Electrical Service Requirements (Variable voltage units):

<b>ThermoFlex900</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>Branch Circuit Requirements</b>	<b>Line Cord Plug</b>
	115 VAC	60 Hz	1Ø	15A	5-15P*
	100 VAC	50/60 Hz	1Ø	15A	5-15P*

<b>ThermoFlex1400</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>Branch Circuit Requirements</b>	<b>Line Cord Plug</b>
	115 VAC	60 Hz	1Ø	20A	-
	100 VAC	50/60 Hz	1Ø	20A	-

\* United States and Japan only. All other plugs are country specific.

For installation information on Variable Voltage units refer to Appendix B. Refer to the nameplate label located on the rear of the unit for specific electrical requirements.

## Electrical Service Requirements (Global Voltage units):

ThermoFlex900	Voltage $\pm 10\%$	Frequency	Phase	Branch Circuit Requirements		Line Cord Plug
	200/208/230 VAC	60 Hz	1 $\emptyset$	15A		-
200/230 VAC	50 Hz	1 $\emptyset$	**16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>		-	
ThermoFlex1400	Voltage $\pm 10\%$	Frequency	Phase	Branch Circuit Requirements		Line Cord Plug
	200/208/230 VAC	60 Hz	1 $\emptyset$	15A		-
200/230 VAC	50 Hz	1 $\emptyset$	**16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>		-	
ThermoFlex2500	Voltage $\pm 10\%$	Frequency	Phase	Branch Circuit Requirements		Line Cord Plug
	200 VAC T 1 Pump	60 Hz	1 $\emptyset$	15A		-
	208-230 VAC T 1 Pump	60 Hz	1 $\emptyset$	20A		-
230 VAC	50 Hz	1 $\emptyset$	*16A <sup>1</sup> , 15A <sup>2</sup> , 13A <sup>3</sup>		-	
ThermoFlex3500/5000	Voltage $\pm 10\%$	Frequency	Phase	Branch Circuit Requirements		Line Cord Plug
	200/208-230 VAC P 1 P 3 Pump	50/60 Hz	1 $\emptyset$	15A		-
	200/208-230 VAC T 1 P 3 Pump	50/60 Hz	1 $\emptyset$	20A		-
200/208-230 VAC P 4 Pump	50/60 Hz	1 $\emptyset$	30A		Hard wired	
ThermoFlex7500/10000 (Air-cooled)	Voltage $\pm 10\%$	Frequency	Phase	MCA	MOPD	Line Cord Plug
	400 VAC P 2 Pump	50 Hz	3 $\emptyset$	10.9	20	Hard wire
	400 VAC P 3 Pump	50 Hz	3 $\emptyset$	9.6	15	Hard wire
	400 VAC P 5 Pump	50 Hz	3 $\emptyset$	11.8	20	Hard wire
	460 VAC P 2 Pump	60 Hz	3 $\emptyset$	10.9	20	Hard wire
	460 VAC P 3 Pump	60 Hz	3 $\emptyset$	9.6	15	Hard wire
460 VAC P 5 Pump	60 Hz	3 $\emptyset$	11.8	20	Hard wire	
ThermoFlex7500/10000 (Water-cooled)	Voltage $\pm 10\%$	Frequency	Phase	MCA	MOPD	Line Cord Plug
	400 VAC P 2 Pump	50 Hz	3 $\emptyset$	10.6	20	Hard wire
	400 VAC P 3 Pump	50 Hz	3 $\emptyset$	9.3	15	Hard wire
	400 VAC P 5 Pump	50 Hz	3 $\emptyset$	11.5	20	Hard wire
	460 VAC P 2 Pump	60 Hz	3 $\emptyset$	10.6	20	Hard wire
	460 VAC P 3 Pump	60 Hz	3 $\emptyset$	9.3	15	Hard wire
460 VAC P 5 Pump	60 Hz	3 $\emptyset$	11.5	20	Hard wire	

Continued on next page.



<b>ThermoFlex15000/20000 (Air-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	400 VAC P3 Pump	50 Hz	3Ø	16.2	30	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	18.4	30	Hard wire
	460 VAC P3 Pump	60 Hz	3Ø	16.2	30	Hard wire
	460 VAC P5 Pump	60 Hz	3Ø	18.4	30	Hard wire

<b>ThermoFlex15000/20000 (Water-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	400 VAC P3 Pump	50 Hz	3Ø	14.5	25	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	16.7	30	Hard wire
	460 VAC P3 Pump	60 Hz	3Ø	14.5	25	Hard wire
	460 VAC P5 Pump	60 Hz	3Ø	16.7	30	Hard wire

<b>ThermoFlex24000 (Air-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	400 VAC P3 Pump	50 Hz	3Ø	20.1	35	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	22.3	40	Hard wire
	460 VAC P3 Pump	60 Hz	3Ø	20.1	35	Hard wire
	460 VAC P5 Pump	60 Hz	3Ø	22.3	40	Hard wire

<b>ThermoFlex24000 (Water-cooled)</b>	<b>Voltage ±10%</b>	<b>Frequency</b>	<b>Phase</b>	<b>MCA</b>	<b>MOPD</b>	<b>Line Cord Plug</b>
	400 VAC P3 Pump	50 Hz	3Ø	18.8	35	Hard wire
	400 VAC P5 Pump	50 Hz	3Ø	21.0	35	Hard wire
	460 VAC P3 Pump	60 Hz	3Ø	18.8	35	Hard wire
	460 VAC P5 Pump	60 Hz	3Ø	21.0	35	Hard wire

\*\* Units selected for 230 VAC operation have a range of -10% to +7%. Refer to Appendix A for country specific ratings.

For installation information on Global Voltage units refer to Appendix B. Refer to the nameplate label located on the rear of the unit for specific electrical requirements.

**MCA** = Minimum Current Ampacity

**MOPD** = Maximum Overcurrent Protective Device

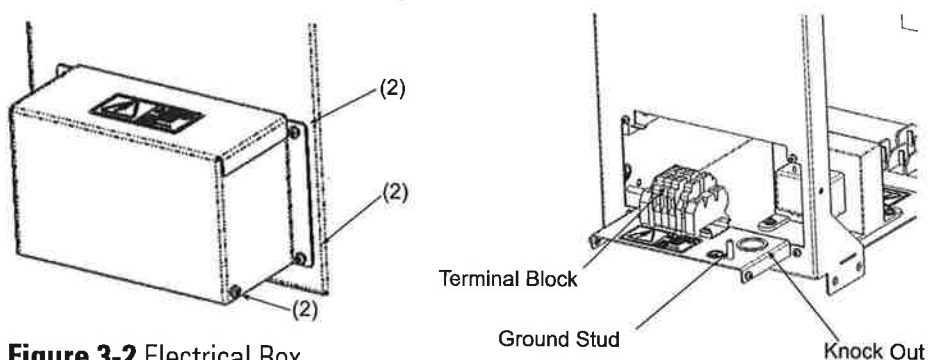
Values reflect those on the nameplate located on the rear of the unit.

## Hard Wire Installation



For personal safety and equipment reliability, only a qualified technician should perform the following procedure. ▲

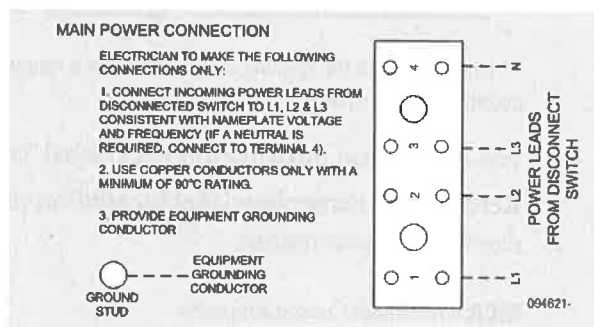
**NOTE** The technician is responsible for installing circuit protection for incoming power. Before wiring consult the nameplate on the rear of the unit. Ensure installation is in accordance with the National Electrical Code and any other applicable country and local codes. ▲



**Figure 3-2** Electrical Box

### For ThermoFlex900 through 10000 units

- Remove the six screws securing the electrical box cover to the rear of the unit.
- Remove the double knock out ( $7/8$ " and  $1\ 3/32$ ").
- Insert the cable through the hole.
- Refer to the label in the electrical box to configure your unit, see Figure 3-3.
- Secure the cable's ground wire to the ground stud.



**Figure 3-3** Sample Label

### For ThermoFlex15000, 20000 and 24000 units

- Remove the five screws securing the electrical panel to the rear of the unit.
- Refer to the label in the electrical box to configure your unit, see Figure 3-3.
- Secure the cable's ground wire to the ground stud.
- Reinstall the panel.

## Plumbing Requirements



Ensure that all shipping plugs are removed before installation.



Never connect the process fluid lines to your facility water supply or any pressurized liquid source. ▲



To prevent damage to the unit's plate exchanger, centrifugal pumps require a 4.0 gpm (15.1 lpm) minimum flow rate. ▲

P1 and P2 pumps are capable of producing 185 psig. Ensure your plumbing is rated to withstand this pressure at your operating temperature. An external pressure relief valve is available, see Section 5. ▲

**NOTE** Ensure your plumbing installation will develop a back pressure to the ThermoFlex greater than 3 PSIG. Lower pressure will shut down the unit. ▲

The process fluid connections are located on the rear of the unit and are labeled (PROCESS OUTLET) and (PROCESS INLET).

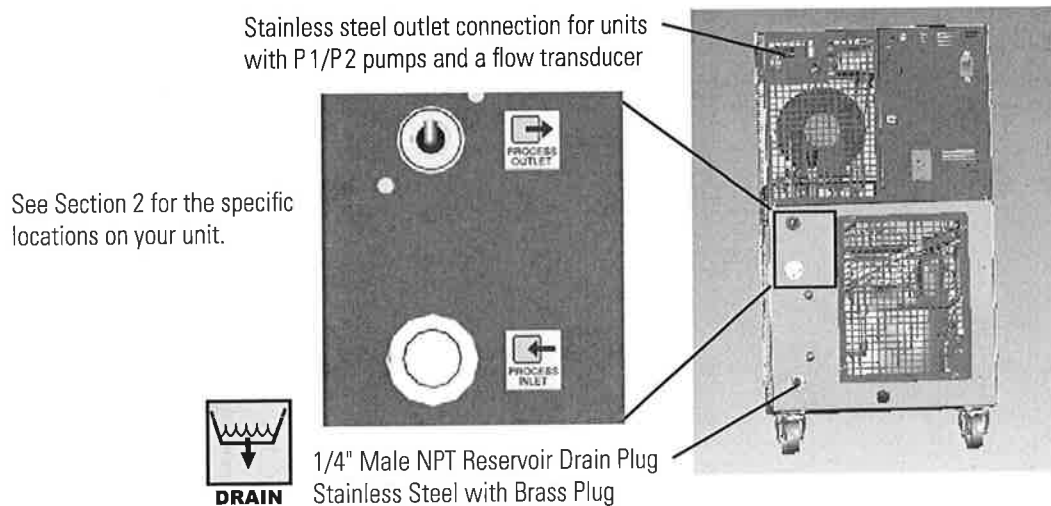
### Process Fluid Connections (FNPT)

#### Outlet

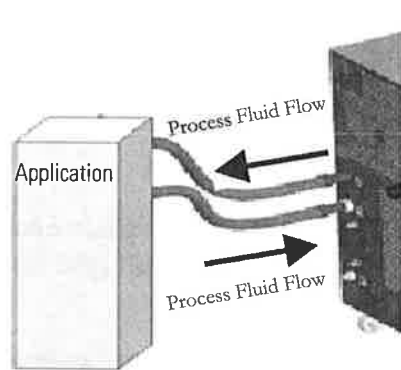
ThermoFlex900 - 10000	P 1 P 2 T 1	1/2" cast bronze
ThermoFlex3500 - 5000	P 3 P 4	3/4" cast bronze
ThermoFlex7500 - 24000	P 3 P 5	1" wrought copper
Inlet - Same size as outlet		all units stainless steel

### Supplied Adapters



P 1 P 2 T 1	1/2" x 3/8" Polyethylene and 1/2" x 1/2" Nylon
P 3 P 4	3/4 MPT x 1/2 barb PVC
P 3 P 5	1" MPT x 1" Barb PVC and 1" MPT x 3/4" Barb PVC





**Figure 3-4** Typical Plumbing Connections (1 of 2)





**Figure 3-4** Typical Plumbing Connections (2 of 2)

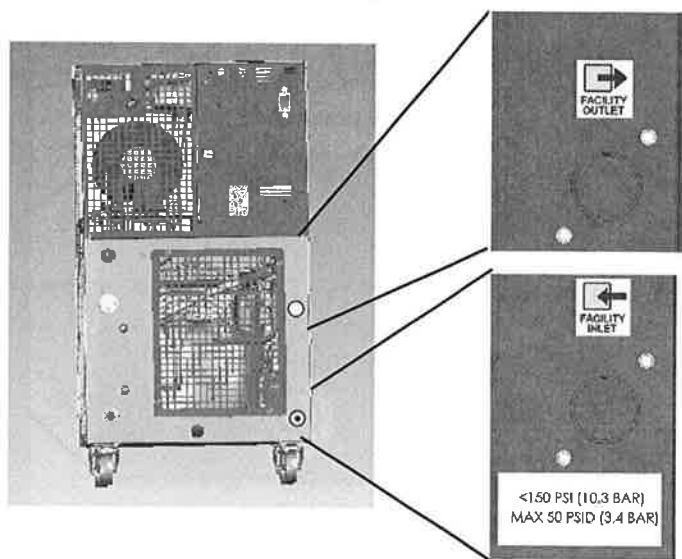
Connect the PROCESS OUTLET  to the fluid inlet on your application. Connect the PROCESS INLET  to the fluid outlet on your application. Ensure all connections are secure and that the proper sealant/lubricant for the fitting material is used. (If Teflon<sup>®</sup> tape is used, ensure the tape does not overhang the first thread as it could shred and get into the fluid.) Keep the distance between the unit and the instrument being cooled as short as possible. Ensure tubing is straight and without bends. If diameter reductions are required, make them at the inlet and outlet of your application, not at the ThermoFlex.

### Water-cooled Units

For water-cooled units the facility water plumbing connections are also located on the rear of the unit and are labeled  FACILITY INLET and  FACILITY OUTLET. The connections are 1/2" Female NPT for ThermoFlex900 - 5000, 3/4" Female NPT for ThermoFlex7500 - 24000.

Both connections for ThermoFlex900 to 10000 are cast bronze. The supply connections for ThermoFlex15000 to 24000 are cast bronze, the return connections are stainless steel.

Connect the  FACILITY INLET to your facility water supply. Connect the  FACILITY OUTLET to your facility water return or drain. Ensure all connections are secure and that the proper sealant/lubricant for the fitting material is used. (If Teflon<sup>®</sup> tape is used, ensure the tape does not overhang the first thread as it could shred and get into the fluid.)



See Section 2 for the specific locations on your unit.

**Figure 3-5** Typical Plumbing Connections, Water-cooled Units

## Process Fluid Requirements



**NEVER** use flammable or corrosive fluids with this unit. Do not use automotive antifreeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of any fluid not listed below will void the manufacturer's warranty. ▲

Acceptable fluids are:

- Filtered/Single Distilled water
- 0 - 75% Ethylene Glycol/Water
- 0 - 75% Propylene Glycol/Water
- Deionized water (1 - 3 MΩ-cm, compensated)



Ethylene glycol (EG) is poisonous and flammable. Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's most current MSDS for handling precautions. ▲



EG is also hygroscopic, it will absorb water from its environment. This can affect the freezing point and boiling point of the fluid over time and may result in system failure. ▲



To prevent freezing/glazing of the plate exchanger, ThermoFlex7500 through 24000 units require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature. ▲



When using a process fluid mixture of ethylene glycol and water or propylene glycol and water, check the fluid concentration and pH on a regular basis. Changes in concentration and pH can impact system performance. ▲



When using EG/water or PG/water, top-off with plain water. After top-off check the fluid concentration. ▲



Do not use a Deionization (DI) filter cartridge with Inhibited EG or Inhibited PG. A DI filter will remove inhibitors from the solution rendering the fluid ineffective against corrosion protection. Also, inhibitors increase fluid conductivity. ▲

## Compatibility with Acceptable Fluids

### Filtered Tap Water/Single Distilled Water

Filtered drinking water and single distilled water are good choices for use in a recirculating chiller because the filtering/distilling process used removes microorganisms that could create biological fouling as well as harmful particulates and excessive minerals that could cause harmful deposits and scaling.

### Deionized Water

Deionized water is water that has had its mineral ions removed using ion exchange resins. The purpose of this process is to remove the ions that allow electrical current to flow more easily through water. This helps to prevent electrical leaks to ground through the recirculating fluid. Deionized water is classified by the electrical resistance of the water, usually measured in  $M\Omega/cm$ , with pure water having a resistance of  $18 M\Omega/cm$ .

Water that has been deionized is in an unbalanced state and will leach the missing ions from the materials it comes in contact with. The aggressive nature of this leaching can cause pitting on metal surfaces. It should also be noted that the deionizing process does not remove microorganisms. Because of this, it is recommended that only applications that have a specified requirement for deionized water should use deionized water.

In any case, only deionized water with a resistivity between 1 and  $3 M\Omega/cm$  is approved for use in Thermo Fisher Scientific recirculating chillers.

### Recommended Biocides and Inhibitors

Thermo Fisher Scientific offers a biocide and inhibitor package (NALCO) premixed with 5 gallons of water or as a kit to be added to water (kit is for North America only). We also offer a separate biocide (Chloramine-T) when an inhibitor is not required. No other biocide or inhibitor is recommended for use in Thermo Fisher Scientific recirculating chillers.

### **Biocides are corrosive and can cause irreversible eye damage and skin burns. They are harmful if inhaled, swallowed or absorbed through the skin. Refer to the manufacturer's most current MSDS. ▲ Uninhibited Ethylene Glycol/Water**

Ethylene glycol is used to depress the freezing point of water and should only be used at temperatures where freeze point suppression is required. Ethylene glycol does not improve heat transfer and is not recommended for use as a biocide. Because glycols lower the surface tension of water and do not evaporate as readily as water, they may cause visible weepage past the pump seals. If weepage cannot be tolerated, seal-less, magnetically driven pumps should be used where available.

Uninhibited simply means that the glycol does not contain any additives to prevent corrosion.

While uninhibited ethylene glycol is acceptable for use, the pH level must be closely monitored and the fluid may need to be replaced more often.

All glycols produce acids in the presence of air and the fluid should be changed if the pH falls below 8. Note that litmus paper will not work to test the pH of ethylene glycol/water.

#### **Inhibited Ethylene Glycol/Water**

Inhibited glycol can help protect the wetted metals within the cooling circuit from corrosion caused by poor water quality, ethylene glycol oxidation (low pH) and mixed metals (electrolysis). The inhibitor works by either leaving a barrier coating on metal surfaces to buffer them from the corrosive fluid or by creating an oxidized layer that protects the underlying metal (passivating).

Inhibited automotive glycols are never acceptable. They use either silicates or Organic Acid Technology (OAT) as the inhibitor and these components are not compatible with the polymers used in recirculating chillers including the pump seals and internal hoses.

Inhibitors may also accelerate pump seal wear and seal-less, magnetically driven pumps should be used where available.

#### **Uninhibited Propylene Glycol/Water**

Propylene glycol does not transfer heat as well as ethylene glycol, but can be used when freeze point suppression is required as well as lower toxicity.

Propylene glycol does not function as a biocide and the pH needs to be maintained the same as with ethylene glycol as it also produces acid when oxidized.

#### **Inhibited Propylene Glycol/Water**

Inhibited propylene glycol has the same properties as uninhibited propylene glycol and the same concerns as inhibited ethylene glycol.

## **Additional Fluid Information**

\*For fluids other than those listed above, please contact the fluid manufacturer to ensure compatibility with the chiller's wetted materials (Section 7) and application wetted materials.

\*\*When using the ThermoFlex chiller to circulate through aluminum, a compatible corrosion inhibitor should be utilized to prevent galvanic corrosion.

\*\*Fluid viscosity should be 50 cSt or less at the lowest temperature used.

\*\*\*Visible pump weepage may occur when compatible glycols, oils or other additives are used. Pump weepage is considered as a normal operating condition of mechanical seal pumps.

## Process Water Quality and Standards

Process Fluid	Permissible (PPM)	Desirable (PPM)
<b>Microbiologicals</b>		
(algae, bacteria, fungi)	0	0
<b>Inorganic Chemicals</b>		
Calcium	<25	<0.6
Chloride	<25	<10
Copper	<1.3	<1.0
0.020 ppm if fluid in contact with aluminum		
Iron	<0.3	<0.1
Lead	<0.015	0
Magnesium	<12	<0.1
Manganese	<0.05	<0.03
Nitrates\Nitrites	<10 as N	0
Potassium	<20	<0.3
Silicate	<25	<1.0
Sodium	<20	<0.3
Sulfate	<25	<1
Hardness	<17	<0.05
Total Dissolved Solids	<50	<10
<b>Other Parameters</b>		
pH	6.5-8.5	7-8
Resistivity	0.01*	0.05-0.1*

\* MΩ-cm (compensated to 25°C)

Unfavorably high total ionized solids (TIS) can accelerate the rate of galvanic corrosion. These contaminants can function as electrolytes which increase the potential for galvanic cell corrosion and lead to localized corrosion such as pitting. Eventually, the pitting will become so extensive that refrigerant will leak into the water reservoir.

As an example, raw water in the United States averages 171 ppm (of NaCl). The recommended level for use in a water system is between 0.5 to 5.0 ppm (of NaCl).

**Recommendation:** Initially fill the tank with distilled or deionized water within a range of 1-3 MΩ-cm. (It is acceptable to have the fluid drop to the other levels over-time.) Do not use untreated tap water as the total ionized solids level may be too high. This will reduce the electrolytic potential of the water and prevent or reduce the galvanic corrosion observed.

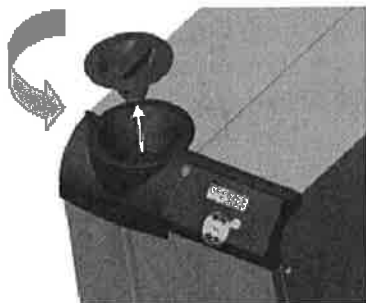


## Initial Filling

Ensure the reservoir drain plug on the back of the unit is in place and that all plumbing connections are secure.



**Before using any fluid refer to the manufacturer's MSDS for handling precautions. ▲**



Locate and remove the reservoir cap by unscrewing it counterclockwise.

To prevent the introduction of particulates into the system, fill the unit with the reservoir bag filter in place. Units are shipped with a bag filter in place. For information on changing the bag filter, see Section 6.

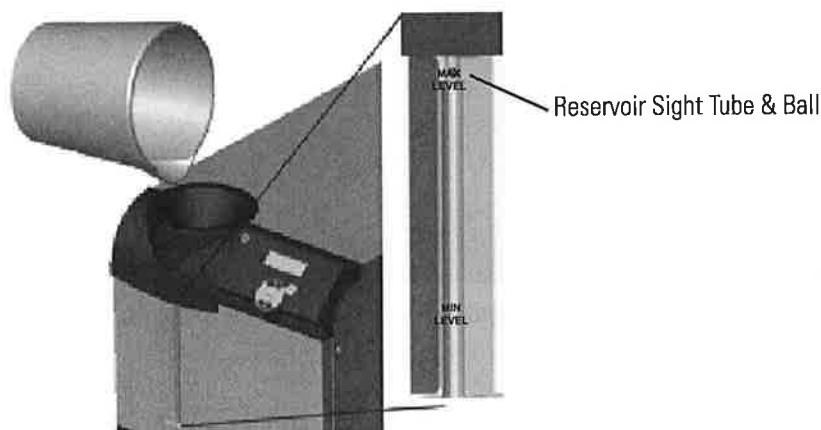
**Figure 3-6** Reservoir Cap

The reservoir has a sight tube and ball for easy

fluid level monitoring. *Slowly* fill the reservoir with clean process fluid through the funnel only, failure to comply may result in internal spillage.

**NOTE** Filling the reservoir above MAX LEVEL fill line will result in a unit over flow error (**O FLO**) causing the unit to shut down. ▲

Since the reservoir capacity may be small compared to your application and air may need to be purged from the lines, have extra cooling fluid on hand to keep the system topped off when external circulation is started.



**Figure 3-7** Reservoir Sight Tube & Ball



**Before replacing the reservoir cap ensure the reservoir sight tube ball stopper is securely in place, see next page. ▲**

Replace the reservoir cap by screwing it clockwise. Cap should be hand tight.

## Fluid Top Off

Remove the reservoir cap by unscrewing it counterclockwise.

To prevent the introduction of particulates into the system, fill the unit with the reservoir bag filter in place. Units are shipped with a bag filter in place. For information on changing the bag filter, see Section 6.

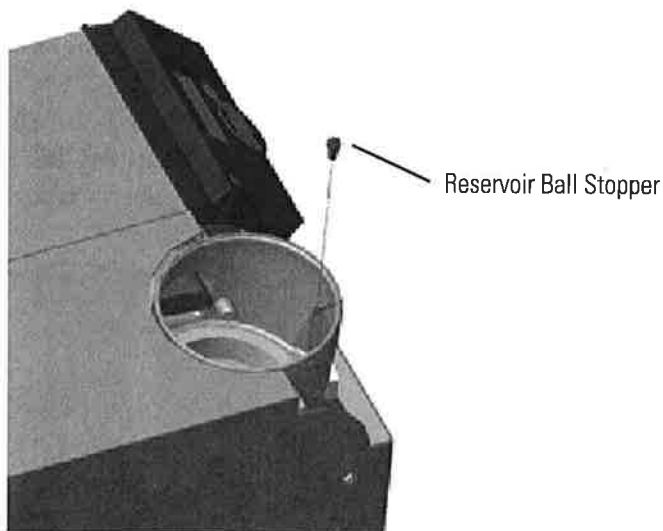
The reservoir has a sight tube and ball for easy fluid level monitoring. *Slowly* fill the reservoir with clean process fluid through the funnel only, failure to comply may result in internal spillage.

**NOTE** Filling the reservoir above MAX LEVEL fill line will result in a unit over flow error (**O FLO**) causing the unit to shut down. Also, fluids expand when heated. ▲

**NOTE** Adding fluid that has a temperature differential with the fluid already in the reservoir will temporarily affect the unit's stability performance. ▲



**Before replacing the reservoir cap ensure the reservoir sight tube ball stopper is securely in place. ▲**



**Figure 3-8** Reservoir Ball Stopper

# Facility Water Requirements (water-cooled units)



Facility Water Maximum Inlet Pressure must not exceed 150 PSIG.

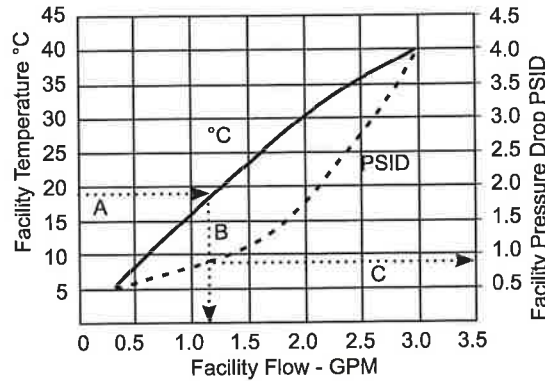
Facility Water Maximum Pressure Differential must not exceed 50 PSID.

(Pressure Differential = Inlet Pressure - Outlet Pressure)

**NOTE** Before using facility water that is above 35°C contact Thermo Fisher Scientific.

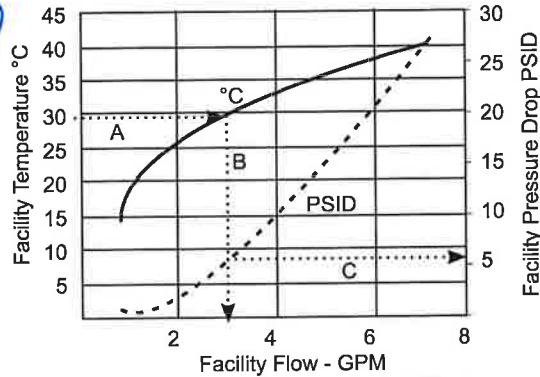
The facility water must meet the following conditions for the units to maintain their full rated capacity.

## ThermoFlex1400



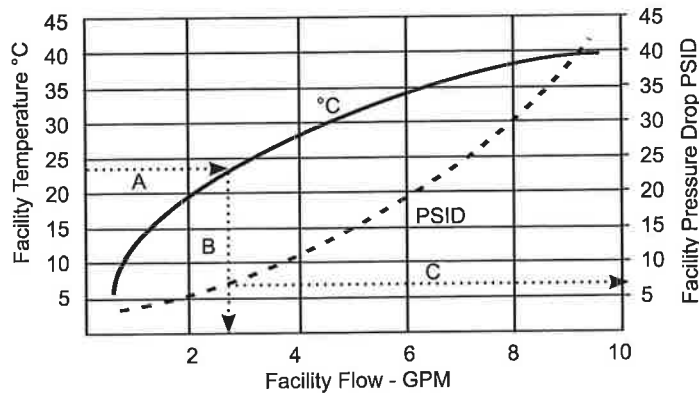
Example:  
Follow the .....► lines.  
Start with a known, e.g., facility water temperature.  
A - go across to temperature curve  
B - drop down to determine the minimum required facility flow.  
C - Where B crosses the PSID curve, go across to determine the minimum required PSID.

## ThermoFlex2500



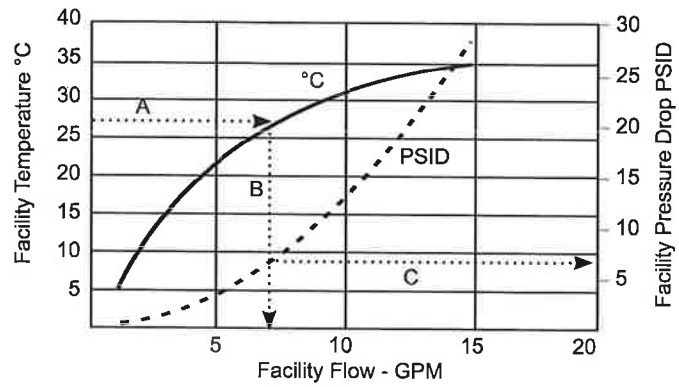
Example: See above.

## ThermoFlex3500/5000



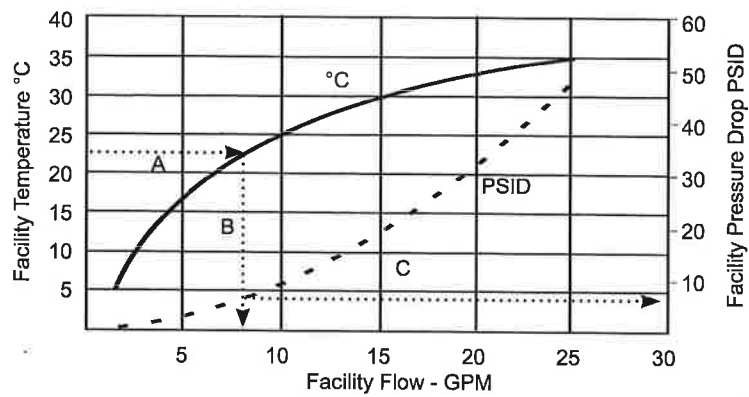
Example: See above.

**ThermoFlex7500/10000**



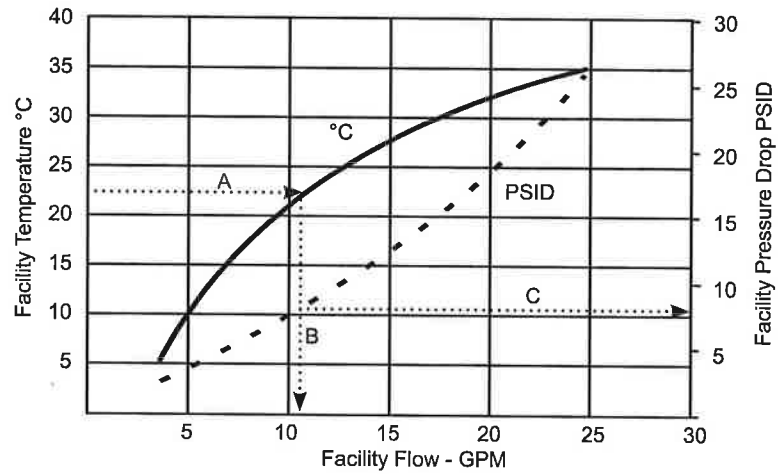
Example: See below.

**ThermoFlex15000/20000**



Example: See below.

**ThermoFlex24000**



Example:  
 Follow the ..... lines.  
 Start with a known, e.g., facility water temperature.  
 A - go across to temperature curve  
 B - go down or up to determine the minimum required facility flow.  
 C - Where B crosses the PSID curve, go across to determine the minimum required PSID.

## Facility Water Quality and Standards (water-cooled units)

Facility Water	Permissible (PPM)	Desirable (PPM)
<b>Microbiologicals</b> (algae, bacteria, fungi)	0	0
<b>Inorganic Chemicals</b>		
Calcium	<40	<0.6
Chloride	<250	<25
Copper	<1.3	<1.0
0.020 ppm if fluid in contact with aluminum		
Iron	<0.3	<0.1
Lead	<0.015	0
Magnesium	<12	<0.1
Manganese	<0.05	<0.03
Nitrates\Nitrites	<10 as N	0
Potassium	<20	<0.3
Silicate	<25	<1.0
Sodium	<20	<0.3
Sulfate	<250	<50
Hardness	<17	<0.05
Total Dissolved Solids	<50	<10

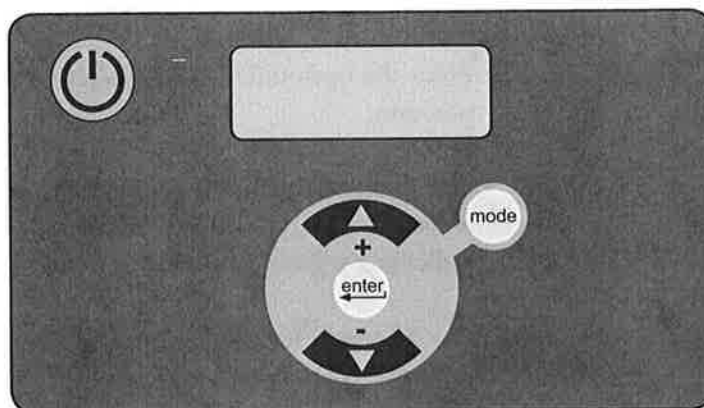
**NOTE** A corrosion inhibitor is recommended if mixed metals are in the facility water loop. ▲



## Section 4 Operation

### Basic Controller

The controller controls temperature using a Proportional-Integral-Derivative (PID) algorithm. It is designed with an easy to use operator interface.



**Figure 4-1** Basic Controller



This key is used to start and stop the unit.



This key is used to navigate through the controller displays, to make changes and to save changes once they are made. It is also used to clear error codes.

mode

This key is also used to navigate through controller displays.



The up arrow key is used to navigate through the controller displays and to increase adjustable values.



The down arrow key is used to navigate through the controller displays and to decrease adjustable values.







### Setup

**NOTE** For first time use, please refer to the quick start instructions included with your unit or the copy in this manual. The manual's version follows the Table of Contents. ▲

Before starting the unit, double check all electrical and plumbing connections. Have extra recirculating fluid on hand. If the unit will not start refer to Section 7 Troubleshooting.

If the unit is equipped with a deionization filter cartridge refer to Section 5 for installation.


### Start Up


- Place the optional GFCI breaker located on the rear of the unit to the up position.
- For ThermoFlex900 through 10000 units, place the circuit protector located on the rear of the unit to the on (I) position. The display will indicate a series of upward scrolling bars (   ).
- For ThermoFlex15000 and 24000 units, the display will indicate a series of upward scrolling bars (   ) as soon as power is supplied to the unit.
- The bars will scroll upward indicating the controller is initializing the unit. The initialization takes approximately 15 seconds.
- When the bars disappear the controller display will go blank.
- Press the  key on the controller. The controller will show the process fluid temperature. The pump and refrigeration system will also start. **NOTE** You can press the  key anytime after placing the circuit protector to the on position. ▲




If the auto restart is enabled and the unit shuts down as a result of a power failure, when power is restored the unit will automatically restart. Auto restart is enabled using the Setup Loop, see Setup Loop in this Section. ▲

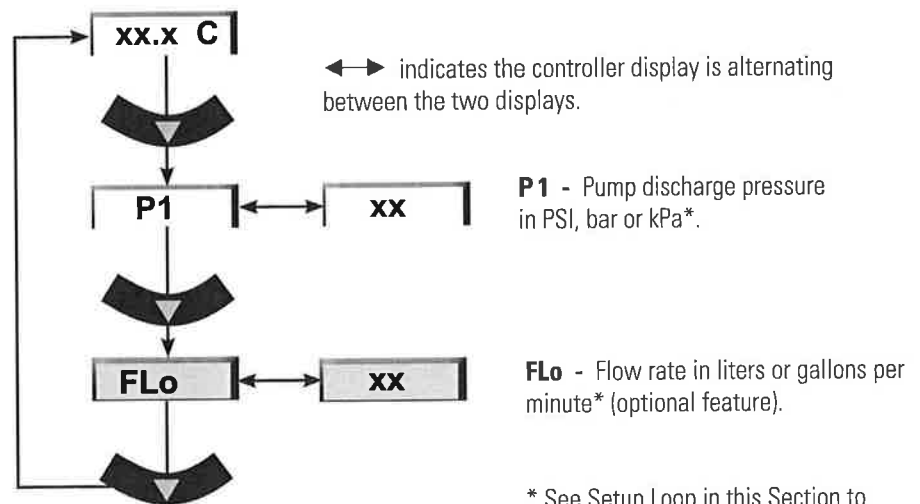


If desired, press the  key to display the pump's discharge pressure - **P1**. The display will alternate between **P1** and the pump's discharge pressure value.

If the unit is equipped with an optional flow transducer, pressing  again will display the flow rate - **FLo**. The display will alternate between **FLo** and the flow rate value.

After displaying **P1** or **FLo** for 60 seconds, if the  key is not depressed the display will automatically revert to the process fluid temperature.

Press  again to display the process fluid temperature.



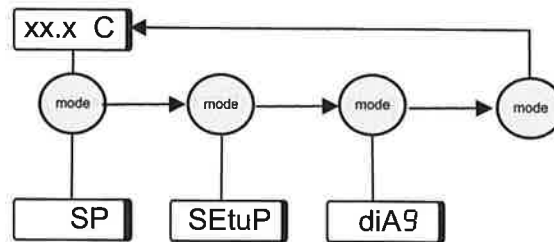
**Figure 4-2** Main Loop

\* See Setup Loop in this Section to change displayed scales.

## Controller Loops

The controller has the capability to display various loops which indicate operating conditions and parameters within the unit. The loops are selected and changed by pressing the appropriate keys.

When the controller is first powered up the unit goes through a short initialization (~15 seconds) and then displays the process fluid temperature. Use the key combination shown below to scroll through the loops.



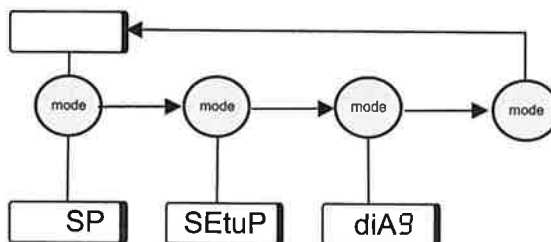
**Figure 4-3** Controller Loops (Unit running)

**SP** is the Setpoint Loop and is used to display and change the setpoint. The setpoint is the desired process fluid temperature needed for your application. The Setpoint Loop is accessed by pressing the **mode** key, see next page.

**SEtuP** is the Setup Loop. The Setup Loop allows you to display and/or alter different parameters of the controller. The Setup Loop is accessed from the **SP** display by pressing the **mode** key.




**diA9** is the Diagnostic Loop. The Diagnostic Loop allows you to display the operating times for various components within the unit. The Diagnostic Loop is accessed from the **Setup** display by pressing the **mode** key, see Section VI for more details.

**NOTE** The loops can be accessed and changed without the unit running as long as the circuit protector (ThermoFlex900-10000 units) is in the on (I) position. ▲





**Figure 4-4** Controller Loops (Unit not running)

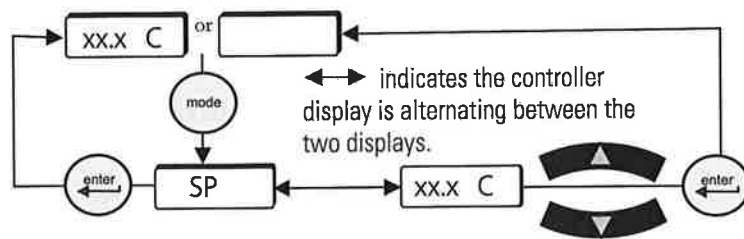
## Setpoint Loop (SP)

- Ensure the controller is either a blank screen or displaying the process fluid temperature.
- Press the  key and the controller display will alternate between **SP** and the setpoint value.
- If no change is required press the  key to return the controller to the previous display.
- If a setpoint change is required, use the  keys.

The setpoint range is +5°C to +40°C (41°F to 104°F).

**NOTE** If the  are not used within one minute the controller will time out and return to the previous display and any changes will not be accepted. ▲

- Once the desired value is displayed press the  key to confirm the change.
- The controller will return to the process fluid temperature display or a blank screen.



**Figure 4-5** Setpoint Loop


# Setup Loop (SETUP)



Use the Setup Loop to adjust/verify the following controller settings.



- Scales: temperature in °C or °F, flow in liters per minute or gallons per minute (only units with an optional flow transducer), and pressure in PSI, bar or kPa
- High and low temperature alarm limits
- High and low pump discharge pressure alarm limits and time delays
- Unit reaction to a temperature, pressure or flow (optional) alarm limit (continue to run or shut down)
- Audible alarm enabled/disabled
- View/change the fan speed (ThermoFlex 2500 air-cooled units only)
- Auto restart feature enabled/disabled
- Preventive care cleaning frequency reminder for air and fluid filters

### Optional Features:




- Global voltage
- Analog I/O
- Auto refill alarm
- DI filter cartridge preventive maintenance interval
- High/low flow alarm limits
- Serial communications
- Anti drainback valve position
- **Save or not save *all* changes**

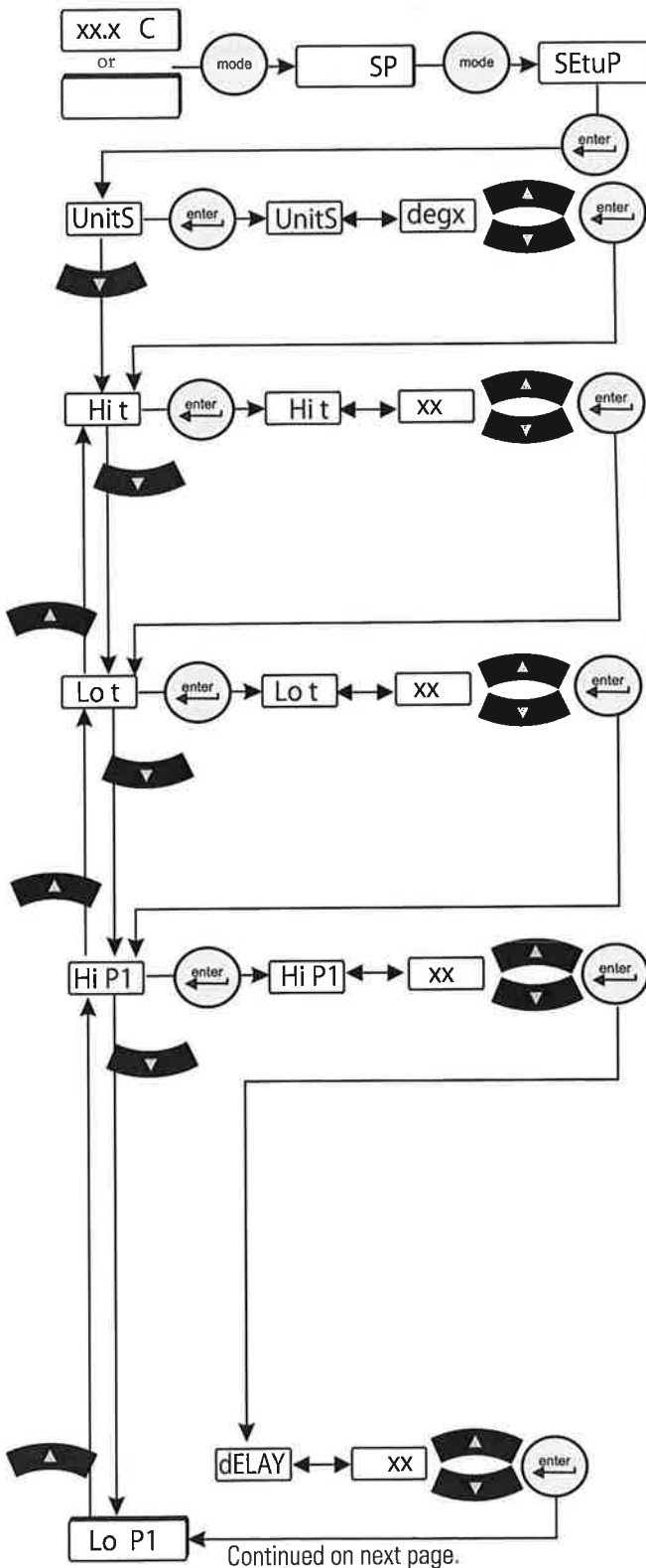
To enter the Setup Loop ensure the controller display is either a blank screen (unit off) or displaying the process fluid temperature. Press the  key and the display will indicate **SP**, press it again to display **SEtUP**.

Press the  key to continue, or press  twice to return to the process fluid temperature or blank display.

Use  to sequence down through the loop. Use  to sequence back through the loop up to the **Hi t** display, see next page.

To change any parameter:

- Press the  key.
- Use the  keys to change a displayed value.
- Press  key to confirm the change and bring up the next display.



• **UnitS** are the temperature, fluid flow (only units with an optional flow transducer) and pressure display scales.

**Scales:** °C or °F                      **Defaults:** °C  
 GPM or LPM                              GPM  
 PSI, Bar or kPa                          PSI

• **Hi t** is the fluid's High Temperature alarm limit.  
**Range:** +3°C to +42°C              **Default:** +42°C  
 Exceeding this limit flashes **Hi t** and, if enabled, sounds the alarm. The unit reaction depends on the alarm configuration (see **ALr** on next page).

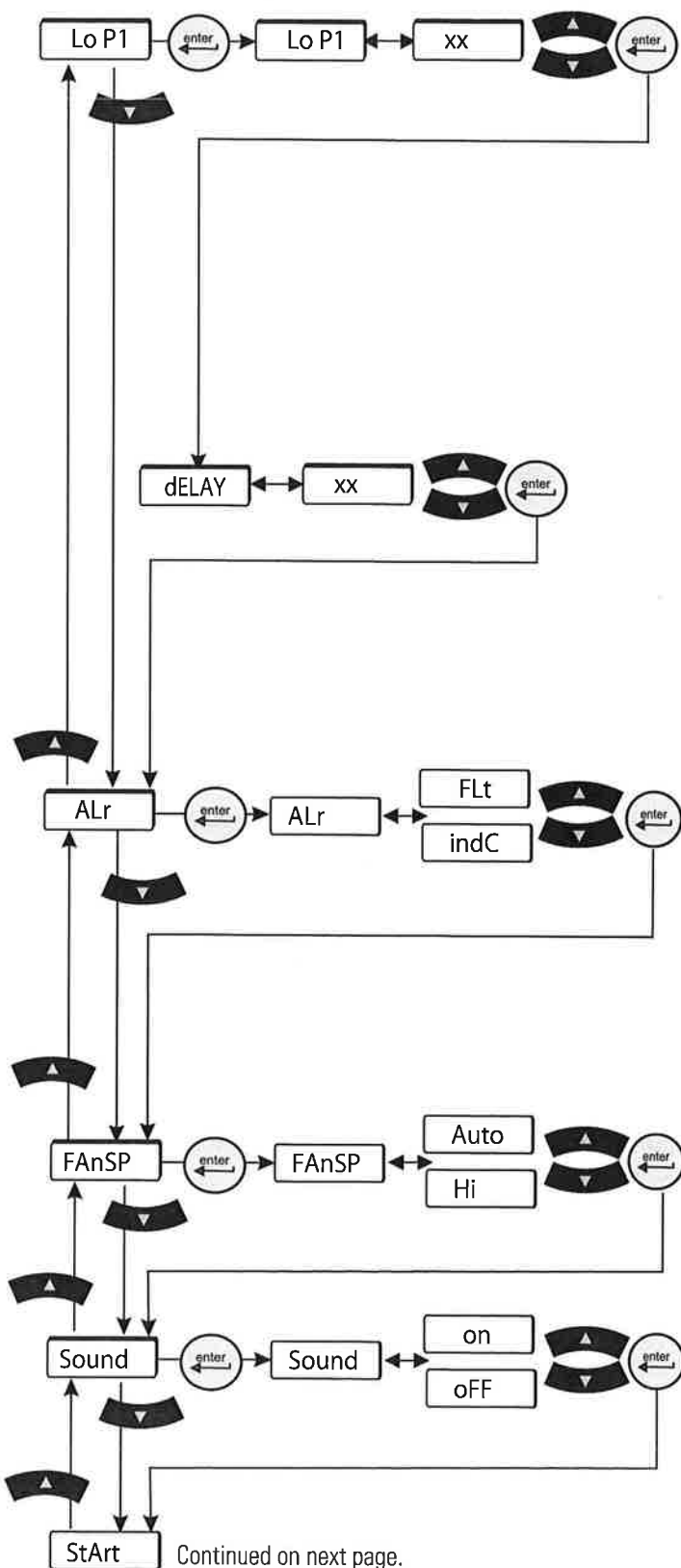
• **Lo t** is the fluid's Low Temperature alarm limit.  
**Range:** +3°C to +42°C              **Default:** +3°C  
 Falling below this limit flashes **Lo t** and, if enabled, sounds the alarm. The unit reaction depends on the alarm configuration (see **ALr** on next page).

• **Hi P1** is the pump's High Pressure discharge alarm limit.  
 P1 P2 T1 Pump **Range:** 3 to 100 PSI    **Default:** 100 PSI  
 P3 Pump 60Hz **Range:** 3 to 46 PSI    **Default:** 46 PSI  
 P3 Pump 50Hz **Range:** 3 to 32 PSI    **Default:** 32 PSI  
 P4 Pump 60Hz **Range:** 3 to 85 PSI    **Default:** 85 PSI  
 P4 Pump 50Hz **Range:** 3 to 60 PSI    **Default:** 60 PSI  
 P5 Pump 60Hz **Range:** 3 to 87 PSI    **Default:** 87 PSI  
 P5 Pump 50Hz **Range:** 3 to 56 PSI    **Default:** 56 PSI  
 Exceeding this limit flashes **Hi P1** and, if enabled, sounds the alarm (see **Sound** on next page).

• **dELAY** is the length of time the pump can exceed the Hi P1 alarm limit. **NOTE** This feature is only active if the unit is configured to shut down with a pressure alarm. ▲  
**P1, P2 and T1 Range:** 0 to 30 seconds    **Default:** 0 seconds  
**P3 - P5 Range:** 0 to 60 seconds        **Default:** 0 seconds  
 Exceeding this limit flashes **Hi P1** and, if enabled, sounds the alarm. The unit reaction depends on the alarm configuration (see **ALr** on next page).

**Figure 4-6** Setup Loop (All Units)

Continued from previous page



Continued on next page.

• **Lo P1** is the pump's Low Pressure discharge alarm limit.

- P1 P2 T1 Pump **Range:** 3 to 100 PSI **Default:** 4 PSI
  - P3 Pump 60Hz **Range:** 3 to 46 PSI **Default:** 4 PSI
  - P3 Pump 50Hz **Range:** 3 to 32 PSI **Default:** 4 PSI
  - P4 Pump 60Hz **Range:** 3 to 85 PSI **Default:** 4 PSI
  - P4 Pump 50Hz **Range:** 3 to 60 PSI **Default:** 4 PSI
  - P5 Pump 60Hz **Range:** 3 to 87 PSI **Default:** 4 PSI
  - P5 Pump 50Hz **Range:** 3 to 56 PSI **Default:** 4 PSI
- Going below this limit flashes **Lo P1** and, if enabled, sounds the alarm.

• **dELAY** is the length of time the pump can exceed the Lo P1 alarm limit. **NOTE** This feature is only active if the unit is configured to shut down with a pressure alarm. ▲

**Range:** 0 to 30 seconds **Default:** 10 seconds  
Exceeding this limit flashes **Lo P1** and, if enabled, sounds the alarm. The unit reaction depends on the **ALr** alarm configuration set below.

• **ALr** is used to configure the unit's reaction for exceeding an alarm limit (temperature, pressure and optional flow). The unit will either shut down (**FLt**) or continue to run (**indC**). In each configuration, the controller will display the error code and sound the audible alarm, if enabled.

**Range:** FLt or indC **Default:** FLt

• **FAnSP** is used to control the fan speed (air-cooled 2500 units only). **Auto** allows the fan to run under the conditions listed in Section 3. Selecting **Hi** allows the fan to run at high speed all the time. **NOTE Hi** is required for units to achieve a 2500 watt cooling capacity. ▲

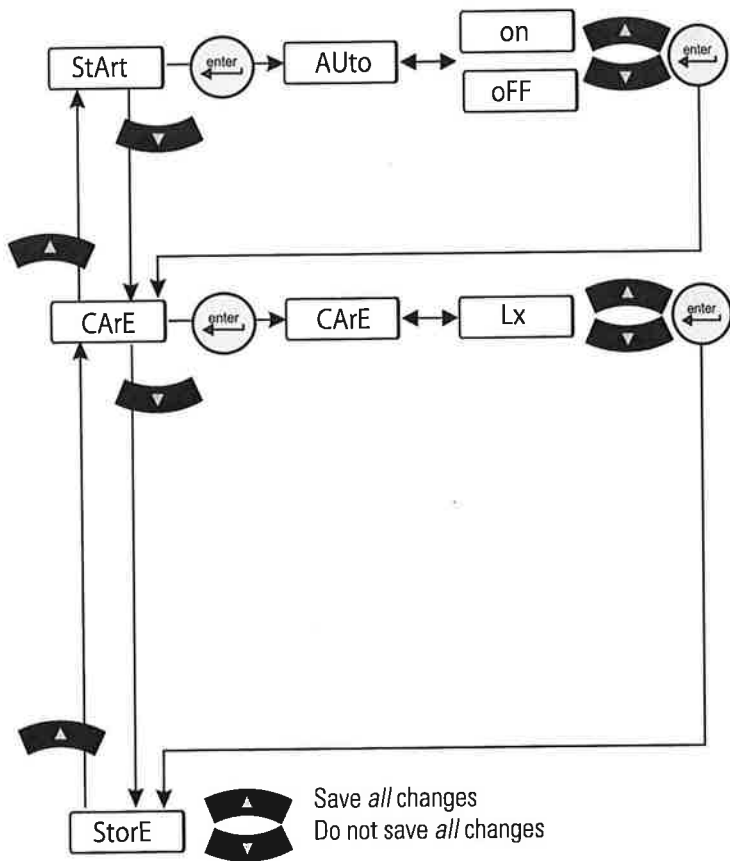
**Range:** Auto or Hi **Default:** Auto

• **Sound** is used to enable/disable the audible alarm.

**Range:** on or oFF **Default:** on

**Figure 4-6** Setup Loop (All Units)

Continued from previous page



**Figure 4-6** Setup Loop (All Units)

• **StArt** is used to enable/disable the auto restart function. When enabled the unit will automatically restart after a power failure or power interruption condition.

**Range:** on or oFF      **Default:** oFF

• **CArE** is used to set the preventive care cleaning frequency reminder for the unit's air and fluid filters, in hours. The time selected is based on your operating environment, see Section 6.

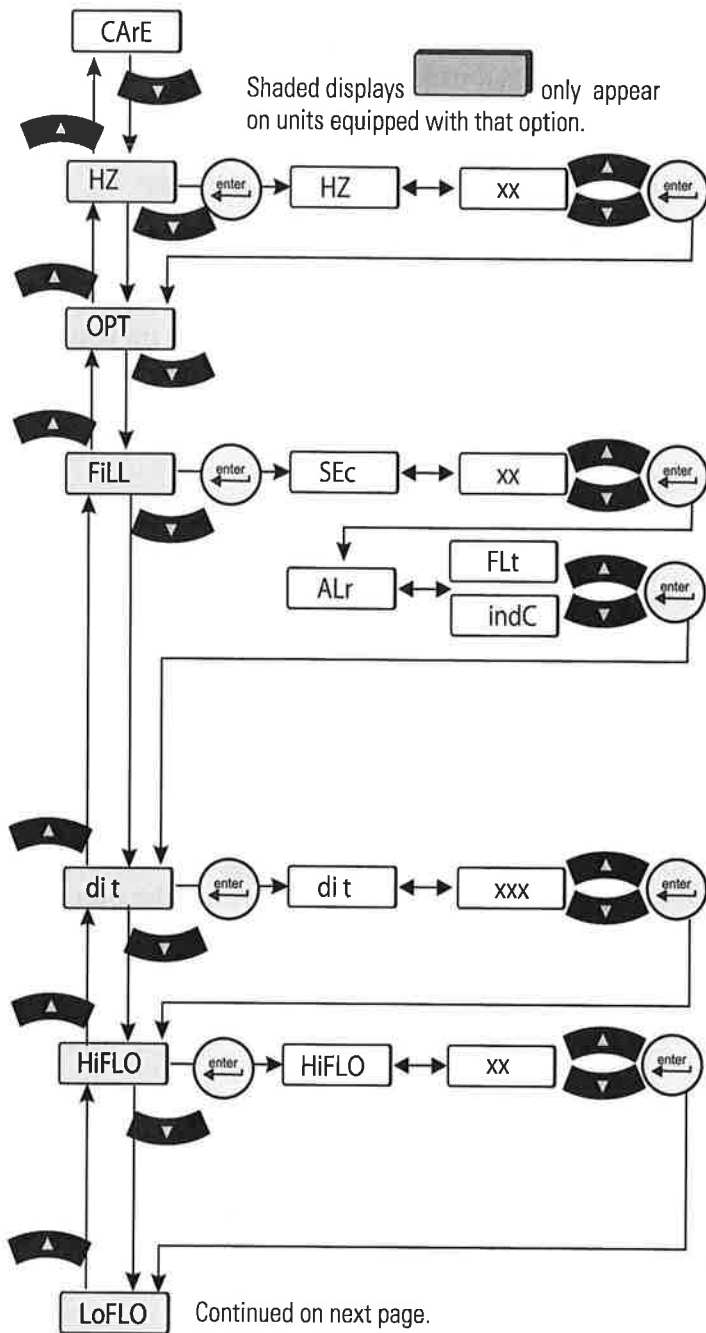
**Range:** off      **Default:** L1

- L1 (1000 hours)
- L2 (2000 hours)
- L3 (3000 hours)

Off disables the reminder. Exceeding this limit flashes **FLtrS**, see Section 6.

**NOTE** If your unit is equipped with any of the **Optional Features** refer to the next page. ▲

When the display indicates **StorE** press ▲ to save *all* changes or press ▼ to not save *all* changes. The display will return either the process fluid temperature or, if the unit was off when you entered the loop, a blank screen.



**Figure 4-7** Setup Loop (Optional Features)

• **HZ** is used to identify the incoming frequency for units with P 3 - P 5 pumps *and* the capability to run on either 50 Hz or 60 Hz. The selected frequency automatically adjusts the firmware's *fixed* high pressure default setting.  
**Range:** 50 Hz or 60 Hz      **Default:** 60 Hz

• **OPT** is used to configure the analog in/out mode of operation. See Appendix C.

• **FiLL** is used to set the time limit the auto refill has for filling the unit's reservoir to the normal operating level.  
**Range:** 0 to 900 seconds  
**Default:** 45 seconds ThermoFlex900 - 5000  
 80 seconds ThermoFlex7500 - 24000

Exceeding the time limit flashes **rEFiL** and the auto refill will shut off. The unit's reaction depends on the alarm **ALr** setting, **FLt** is shut down, **indC** is continue to run.  
**NOTE** Setting the time limit to 0 disables the auto refill option. ▲ See Section 5 for additional information.

• **di t** is used to set the preventive care cleaning frequency reminder for the unit's DI filter cartridge.  
**Range:** 0 to 9999 hours      **Default:** 448 hours  
 Exceeding the limit flashes **di**, see Section 6.

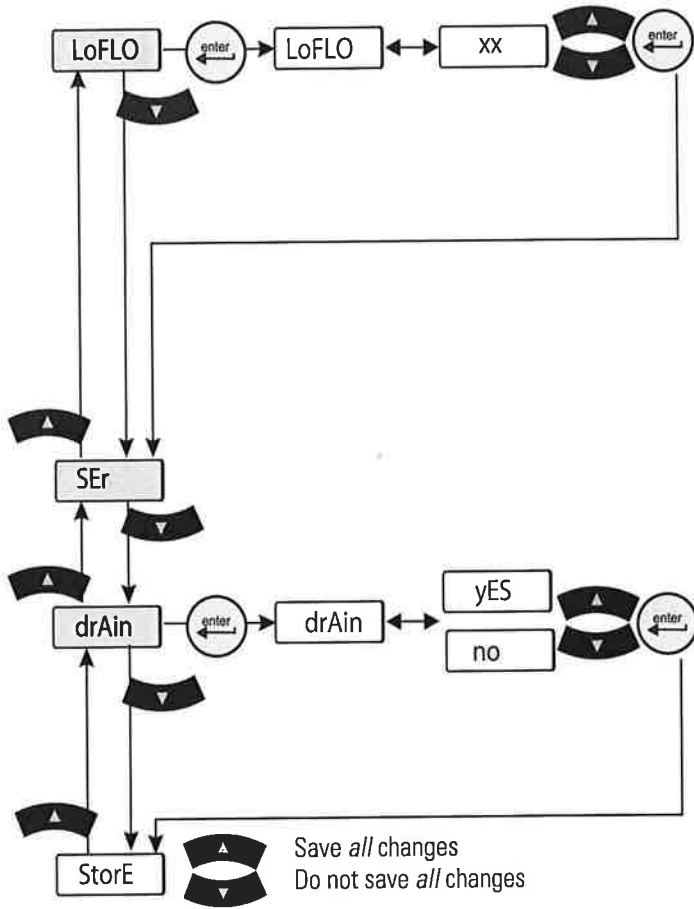
• **HiFLO** is used to set the high flow alarm limit.  
 P1 Pump **Range:** 0.0 to 10.5 GPM      **Default:** 0.0 GPM  
 T1 Pump **Range:** 0.0 to 10.5 GPM      **Default:** 0.0 GPM  
 P2 Pump **Range:** 0.0 to 10.5 GPM      **Default:** 0.0 GPM  
 P3 Pump **Range:** 0.0 to 30.0 GPM      **Default:** 0.0 GPM  
 P4 Pump **Range:** 0.0 to 30.0 GPM      **Default:** 0.0 GPM  
 P5 Pump **Range:** 0.0 to 30.0 GPM      **Default:** 0.0 GPM

Exceeding a high limit flashes **HiFLO** and, if enabled, sounds the alarm. The unit's reaction depends on the alarm (**ALr**) setting.

**NOTE** This feature is not enabled until the value is changed to something other than 0.0. ▲



Continued from previous page



**Figure 4-7** Setup Loop (Optional Features)

• **LoFLO** is used to set the low flow alarm limit.

P 1 Pump	<b>Range:</b> 0.0 to 10.5 GPM	<b>Default:</b> 0.0 GPM
T 1 Pump	<b>Range:</b> 0.0 to 10.5 GPM	<b>Default:</b> 0.0 GPM
P 2 Pump	<b>Range:</b> 0.0 to 10.5 GPM	<b>Default:</b> 0.0 GPM
P 3 Pump	<b>Range:</b> 0.0 to 30.0 GPM	<b>Default:</b> 0.0 GPM
P 4 Pump	<b>Range:</b> 0.0 to 30.0 GPM	<b>Default:</b> 0.0 GPM
P 5 Pump	<b>Range:</b> 0.0 to 30.0 GPM	<b>Default:</b> 0.0 GPM

Going below the low limit flashes **LoFLO** and, if enabled, sounds the alarm. The unit's reaction depends on the alarm (**ALr**) setting.

This feature is not enabled until the value is changed to something other than 0.0. If the feature is not enabled and the flow rate drops below the flow rate listed below the unit will continue to run and the controller will flash between **FLo** and **LoFLo**.


P 1 and T 1 Pump	0.3 GPM
P 2 Pump	1.0 GPM
P 3, P 4 and P 5 Pump	4.0 GPM


• **SEr** is used to configure the serial communications mode of operation. See Appendix D.

• **drAin** is used to open and close the unit's anti drainback valve for draining, see Section 5.  
**Range:** yes or no                      **Default:** no

**NOTE** The unit must be off to drain the valve. The valve automatically closes when you exit the **drAin** display. ▲

## Shut Down

Press the  key on the controller.

**NOTE** To protect the unit's compressor, the unit will enter a 5 to 20 second shut down cycle (colder process fluids take longer) before the refrigeration system and pump shut down. During this time the display will indicate . The bars will scroll downward indicating the controller is in the shut down cycle. ▲

Using any other means to shut the unit down can reduce the life of the compressor.

For ThermoFlex900 - 10000 units, when the display goes blank it is safe to place the circuit protector located on the rear of the unit to the off (0) position.



**Always turn the unit off and disconnect it from its supply voltage before moving the unit. ▲**



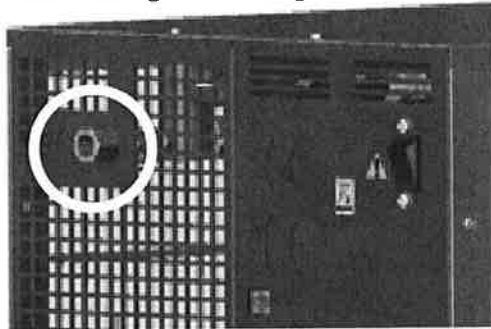
**For ThermoFlex900 - 10000 units, the circuit protector located on the rear of the unit is not intended to act as a disconnecting means. ▲**

## Section 5 Options/Accessories

### Auto Refill

The Auto Refill provides makeup fluid to replace any fluid lost to evaporation, etc. It requires a pressurized fluid source connection to the 1/4" Female Pipe Thread fitting on the rear of the unit. (If Teflon® tape is used, ensure the tape does not cover the connection's starting-end thread.)

**NOTE** ThermoFlex7500 through 24000 units with a P3 or P5 pump have a 1/4" Male brass plug installed in the connection, remove the plug before connecting the makeup fluid. ▲



**Figure 5-1** Auto Refill Fitting

The auto refill fluid must also meet water quality standards or the valve may fail to operate as designed, see Section 3.

The auto refill valve input pressure must be < 80 PSI to ensure the valve functions properly.

The auto refill operates when all of the following conditions are met:

- Fluid is available
- The unit is turned on
- The fluid reaches a low level condition.

The auto refill shuts off when:

- The fluid reaches the correct operating level.
- The delay timer exceeds user fill time entered in the Setup Loop, see Section 4. If **FLt** is selected in the Setup Loop the unit also shuts down. (If **indC** is selected the unit continues to run.) In either case the controller will display **REFIL**.
- The unit shuts down for any reason.

Setting the fill time to 0 disables auto refill. If a low level condition occurs the unit will:

- If **Indc** is selected, continue to run and the controller displays **Add**.
- If **FLt** is selected, shut down and the controller displays **LLF**.

## Internal DI Cartridge

A partial flow DI filter cartridge is designed to maintain water resistivity between 1 and 3 MΩ-cm.

**NOTE** The DI option results in a 0.5 gpm reduction of available flow. ▲

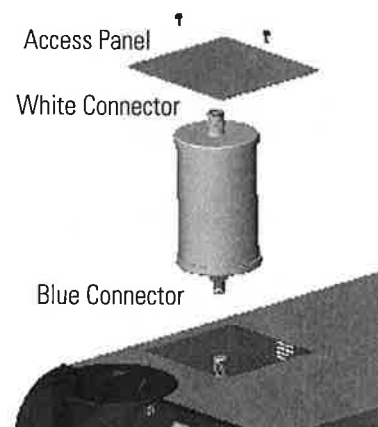


**Do not use a Deionization (DI) filter cartridge with Inhibited EG or Inhibited PG. A DI filter will remove inhibitors from the solution rendering the fluid ineffective against corrosion protection. Also, inhibitors increase fluid conductivity. ▲**

The Puralite sensor on the back of the unit turns red when the cartridge needs changing ( $< 1 \text{ M}\Omega\text{-cm}$ ), see Section 6. **NOTE** The Puralite sensor that comes with the DI cartridge requires a separate power source. ▲

Remove the two thumbscrews securing the DI access panel to the top of the unit. Remove the new cartridge from the shipping bag. The cartridge has a blue and a white connector. Lower the cartridge into the unit with the blue connector facing downward. Press down on the cartridge lightly to engage and then rotate it  $\frac{1}{4}$  turn clockwise (do not over rotate) or until you feel the filter click into place.

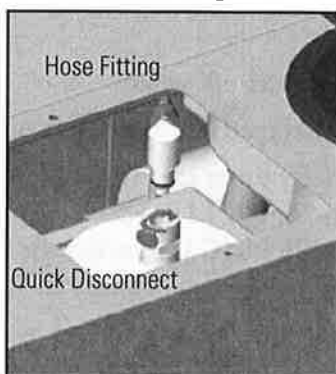
If there is a cartridge in place, first undo the hose fitting by pressing on the quick disconnect located on the top white connection.



**Figure 5-2** Internal DI Cartridge



**The DI Cartridge will overpressurize if it is removed from the unit before removing the hose fitting. ▲**



**Figure 5-3** DI Fittings

Next rotate the cartridge  $\frac{1}{4}$  turn counter-clockwise and then pull the cartridge straight up to remove it.

Push the hose fitting into the quick disconnect located on the white end of the cartridge.

Replace the access panel and thumbscrews.

**NOTE** The cartridge can be changed with the unit running, however, since the cartridge runs in a parallel arrangement, disconnecting the cartridge adds 0.5 gpm to the main flow. The additional flow will cause an increase in system pressure which may cause a high fluid pressure fault. ▲


## P1 P2 T1 Pump Pressure Relief Valve (Internal Configuration)

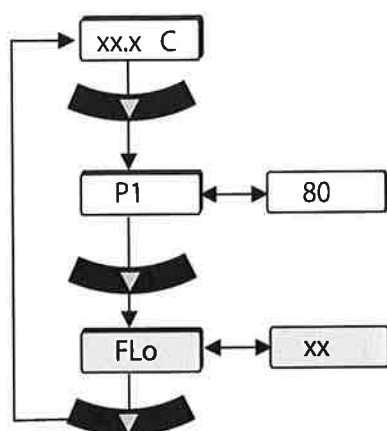
Use the pressure relief valve, located on the top left rear of the unit, to set the desired system back pressure to your application. The valve is factory preset to  $80 \pm 5$  psi ( $5.5 \pm 0.4$  bar).

*If the unit is not plumbed to an application, set the pressure by installing a loop of hose equipped with a shut-off valve between the supply and return fittings. Start the unit and allow it to prime, then close the valve.*



**Figure 5-4** Nut and Screw

Use the controller's  to display P1, it should display  $80 \pm 5$  psi.



**Figure 5-5** Main Loop

Use a screwdriver to turn the adjusting screw (counterclockwise to reduce pressure) until the controller displays the desired setting.



**NOTE** Due to internal back pressure, the minimum pressure setting for a deadheaded P2 pump is 32 psi (2.2 bar), and 8 psi (0.6 bar) for a P1 (these settings prohibit external flow from the unit). ▲

*If the unit is plumbed to an application, ensure the unit is off. Then back out the adjusting screw counterclockwise to reduce pressure. Turn the unit on. Ensure that there is back pressure in the system. Turn the adjusting screw until the controller displays the desired setting.*



**Do not exceed 100 psi (6.9 bar). ▲**

When complete, inspect the area around the  $\frac{5}{8}$ " packing nut for fluid leaks. If fluid is present, slightly tighten the nut and reinspect.

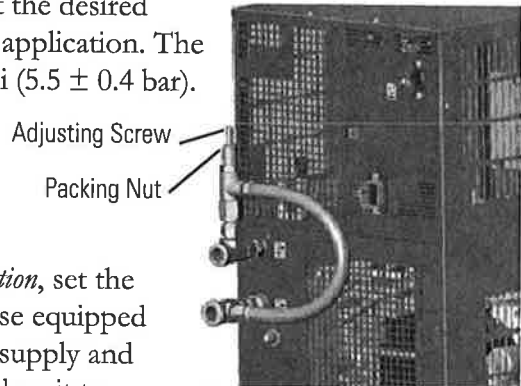
**NOTE** Should the unit start to vibrate the valve setting may be the cause. Changing the pressure setting  $\pm 5$  psi (0.3 bar) will eliminate the vibration. ▲

# P1 P2 T1 Pump Pressure Relief Valve (External Configuration)

Use the pressure relief valve to set the desired system back pressure (P1) to your application. The valve is factory preset to  $80 \pm 5$  psi ( $5.5 \pm 0.4$  bar).

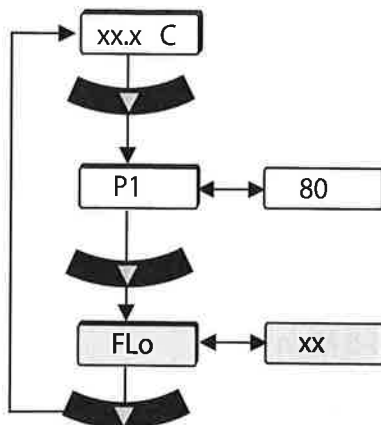
The valve's inlet/outlet connections are  $\frac{1}{2}$ " FNPT.

*If the unit is not plumbed to an application, set the pressure by installing a loop of hose equipped with a shut-off valve between the supply and return fittings. Start the unit and allow it to prime, then close the valve.*



**Figure 5-6** Nut and Screw

Use the controller's  to display P 1, it should display  $80 \pm 5$  psi.



**Figure 5-7** Main Loop

Use a screwdriver to turn the adjusting screw (counterclockwise to reduce pressure) until the controller displays the desired setting.



**NOTE** Due to internal back pressure, the minimum pressure setting for a deadheaded P2 pump is 40 psi (2.8 bar), and 22 psi (1.5 bar) for a P1 (these settings prohibit external flow from the unit). ▲

*If the unit is plumbed to an application, ensure the unit is off. Then back out the adjusting screw counterclockwise to reduce pressure. Turn the unit on. Ensure that there is back pressure in the system. Turn the adjusting screw until the controller displays the desired setting.*

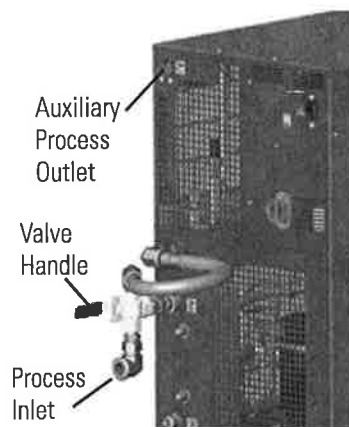


**Do not exceed 100 psi (6.9 bar). ▲**

When complete, inspect the area around the  $\frac{5}{8}$ " packing nut for fluid leaks. If fluid is present, slightly tighten the nut and reinspect.

## Flow Control with Flow Readout


Flow control for P1, P2 and T1 pumps on ThermoFlex900 - 5000 units is achieved using a 3-way valve plumbed between the standard process outlet and the process inlet on the rear of the unit. Use the auxiliary process outlet at the top left of the rear of the unit as a connection point. The connections are 1/2" FNPT. See Figure 5-8.

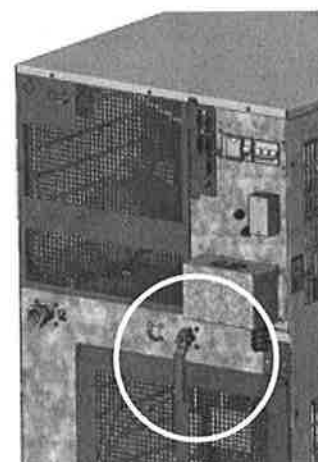


**Figure 5-8** P1 P2 Flow Control

ThermoFlex3500 and 5000 units with P3 and P4 pumps use a 2-way valve located on the rear of the unit. The connections are 3/4" FNPT. See Figure 5-9.

ThermoFlex7500 and 24000 units with P2 - P5 pumps use a valve located on the rear of the unit. The connections are 1/2" FNPT for P2, 1" FNPT for P3 and P5. See Figure 5-9.

Press the controller's down arrow  twice to display the controller's FLO display, see previous page. Turn the valve handle until the desired rate is displayed.



**Figure 5-9** Flow Control Handle (Typical)

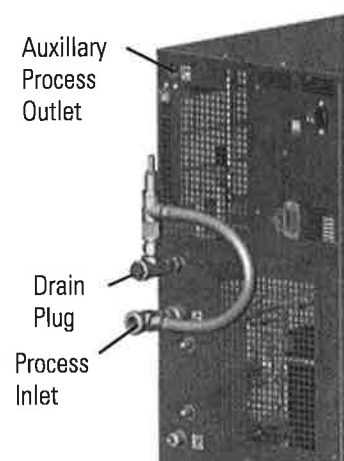
**NOTE** The valve is sensitive to slight adjustments. ▲

## P1 P2 T1 Pump Pressure Relief with Flow Readout

The Pressure Relief with Flow Readout works just like the Pressure Relief Valve discussed on the previous page. It allows you to control the pressure going to your application.

This valve is plumbed between the standard process outlet and the process inlet on the rear of the unit. Use the auxiliary process outlet at the top left of the rear of the unit as a connection point, allowing you to also monitor the flow rate to your application using the controller's FLO display, see previous page.

The valve's outlet connection is 1/2" FNPT. See Figure 5-10.



**Figure 5-10** Pressure Relief

## Anti Drainback

Units installed below the end-user application may allow system fluid to drain back into the chiller and cause spillage. The anti-drainback valve is designed to prevent any such spillage.

The valve opens just before the pump is turned on and it closes just after the pump shuts off.

This option is required if your unit is more than 24 feet below your application, or if there is a possibility of drain back due to the occasional opening of the process lines for either application swaps or unit servicing.

## Semiconductor Equipment and Materials International (SEMI) Units

(ThermoFlex900-10000  
only)

### Compliance

SEMI units are compliant with:

**SEMI S2-0703 Product Safety Assessment**

**SEMI S8-0705 Ergonomic Assessment**

**SEMI S14-0704 Fire Risk Assessment**

**SEMI F47-0706**

### Emergency Off (EMO)

A guarded red mushroom shaped push-button switch with twist-to-reset is provided on the unit's front to turn it off in case of an emergency. The button head is engraved with "EMO" in large white filled letters.

**NOTE** The EMO is controlled by a safety circuit and is not influenced by the unit's firmware/software. ▲

Activation of the EMO button will remove power from the main contactor coil stopping operation of the unit. The controller will display **Er 48**.

Resetting the EMO button will not restart the unit. After all hazards have been removed reset the unit by pushing the enter key on the controller. In the local mode, the unit will restart by pressing the START STOP button again. In the serial communications mode, send the appropriate start command. In the analog I/O mode, the unit starts when the error is cleared.

### Unit Circuit Breaker Interrupt Rating

The main power circuit breaker located on the rear of the unit has an Interrupting Capacity (AIC) of 10,000 amps.



### Lockout/Tagout (LOTO)

Before performing Chiller maintenance, the energy sources associated with the Chiller system must be lockedout and tagged out (LOTO). Hazard control features added to the system (e.g., safety interlocks, EMO) are not a substitute for turning off and locking out electrical or fluid energy.

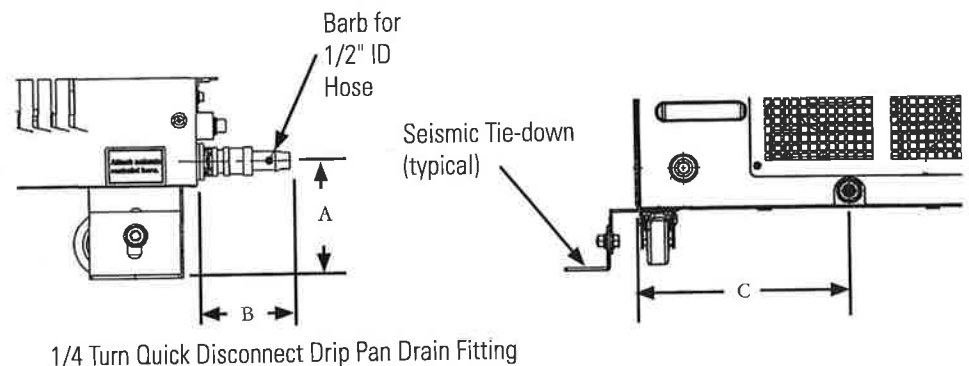
For units rated 20 Amps or less, electrical LOTO is accomplished by removing the power cord on the rear of the unit then closing and locking the power receptacle locking device. For other units, electrical LOTO is the responsibility of the user and can be provided by:

- Using the main disconnect (knife switch at system control cabinet).
- Disconnecting main power at the facility power source prior to the system controller cabinet.
- In addition, follow all OSHA and local facility LOTO directives.

### Drip Pan and Drain

The unit is equipped with a secondary containment (drip pan) in case there is a leak. The drip pan drain is located on the rear of the unit. Install the supplied nylon 1/4 turn quick disconnect (QD) fitting into the drain fitting. The QD is barbed for a 1/2" ID hose.

Since the drip pan will not hold more than 110% of the reservoir volume, connect the drain to guide the fluid to an appropriate spillage location.

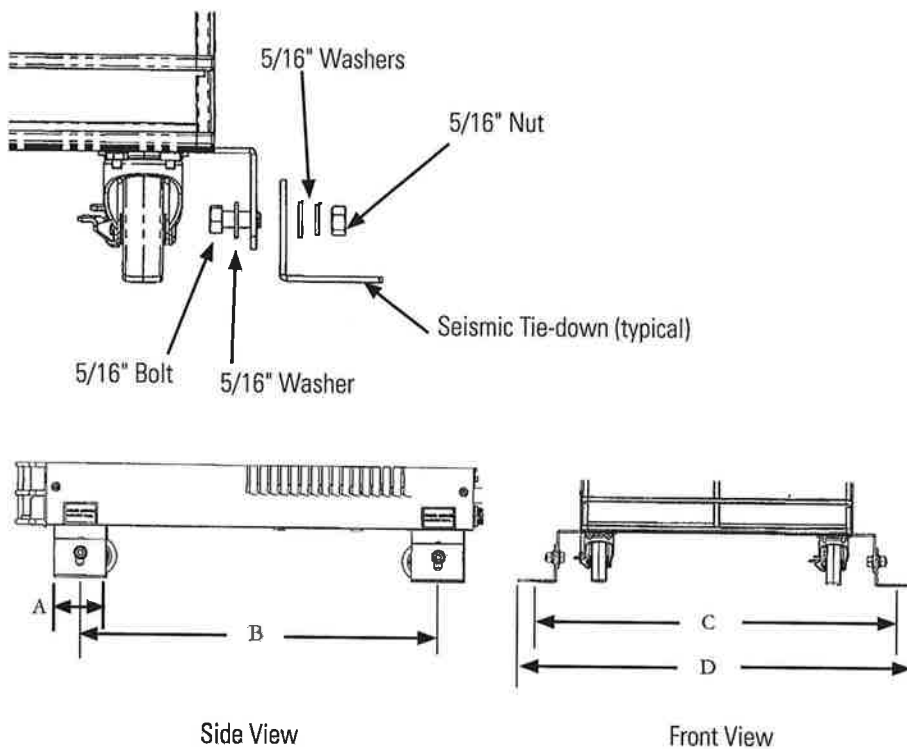


**Figure 5-11** Drip Pan Drain

	900/1400		2500		3500/5000		7500/10000	
A	3 1/2"	8.8 cm	4"	10.1 cm	3 3/8"	11.3 cm	4 1/4"	10.8 cm
B	2 3/4"	7.0 cm	2 11/16"	6.8 cm	2 3/4"	7.1 cm	2 5/8"	6.6 cm
C	6 15/16"	17.7 cm	6 9/16"	16.7 cm	9 9/16"	24.3 cm	7 11/16"	19.5 cm

### Seismic Tie-Downs

Install the seismic tie-downs to the unit as shown below. Then secure the unit to the floor with user-supplied hardware.

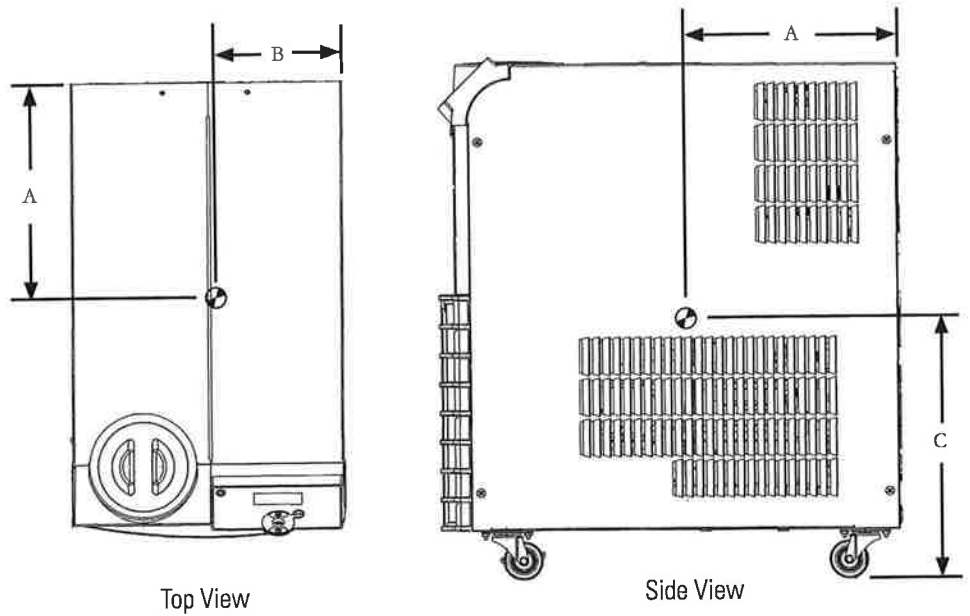


**Figure 5-12** Seismic Tie-Downs

	900/1400		2500		3500/5000		7500/10000	
A	2 1/16"	6.8 cm	2 1/16"	6.8 cm	2 1/16"	6.8 cm	2"	5.1 cm
B*	18 1/2"	47.0 cm	20 1/16"	51.0 cm	24 1/2"	62.2 cm	17"	43.1 cm
C*	19 1/16"	48.4 cm	22 1/16"	56.1 cm	24 1/8"	61.3 cm	27 7/16"	69.6
D	20 9/16"	52.2 cm	23 1/16"	59.9 cm	25 5/8"	65.1 cm	28 15/16"	73.4

\* Distance between Ø.53 Seismic mounting holes

**Center of Gravity**  $\pm \frac{1}{2}$ ", P2 pump (P3 for 7500/10000), air-cooled unit, no fluid in tank



**Figure 5-13** Center of Gravity

	900/1400		2500		3500/5000		7500/10000	
A	10 <sup>3</sup> / <sub>4</sub> "	27.3 cm	12"	30.5 cm	13 <sup>3</sup> / <sub>8</sub> "	34.0 cm	14 <sup>7</sup> / <sub>8</sub> "	37.8 cm
B	6 <sup>3</sup> / <sub>4</sub> "	17.2 cm	8 <sup>3</sup> / <sub>8</sub> "	21.3 cm	9"	22.9 cm	12 <sup>5</sup> / <sub>8</sub> "	32.1 cm
C	13 <sup>1</sup> / <sub>2</sub> "	34.3 cm	13 <sup>1</sup> / <sub>2</sub> "	34.3 cm	16"	40.6 cm	25 <sup>1</sup> / <sub>4</sub> "	64.1 cm

**Weight Distribution**

	900/1400		2500		3500/5000		7500/10000	
Left Front	29.5 lbs	13.4 kg	42.8 lbs	19.5 kg	56.6 lbs	25.7 kg	99.3 lbs	45.0 kg
Left Rear	28.8 lbs	13.1 kg	43.6 lbs	19.8 kg	66.4 lbs	30.1 kg	101.9 lbs	46.2 kg
Right Front	34.3 lbs	15.6 kg	46.9 lbs	21.3 kg	64.9 lbs	29.4 kg	98.2 lbs	44.5 kg
Right Rear	33.4 lbs	15.1 kg	47.7 lbs	21.6 kg	76.1 lbs	34.6 kg	100.7 lbs	45.7 kg

## Other Accessories

Installation kit - includes replacement air and fluid filters

Maintenance kit - includes a set of hoses, adaptor fittings and Teflon<sup>®</sup> tape

Fluids

Fluid treatment kit

Please contact Thermo Fisher Scientific's Sales, Service and Customer Support to assist you with questions that you may have regarding accessories for your ThermoFlex, see inside front cover for contact information.

## Section 6 Preventive Maintenance

Only Thermo Fisher should provide any required replacement parts.


### Preventive Maintenance Timer (CR-E)

The ThermoFlex chiller has an integrated preventive maintenance timer that will alert you when it is time to perform preventive maintenance. This unique feature will remind you to change your air and fluid filters.

Based on the environment in which your chiller is located, you can choose from four levels of preventive maintenance off, L1, L2, and L3:

- off – Disables the alert
- L1 – 1,000 hours - default setting
  - Heavy manufacturing environment
  - Airborne particulate created during manufacturing process
- L2 – 2,000 hours
  - Typical production environment
- L3 – 3,000 hours
  - Clean environment – filtered air
  - Typically laboratory or research environment

Change/set the level using the Setup Loop, see Section 4. When the unit exceeds the chosen limit, the controller will flash **Chn9** **FLt5** and, if enabled, an audible alarm will sound.

To clear this message press . This will automatically restart the preventive maintenance timer for your filters. Each time the unit exceeds the chosen time, the controller will remind you that it is time to change your filters.

If you change your filters before the preventive timer trips, you can clear the timer by using the Diagnostic Loop explained in this section.

**NOTE** For air-cooled units, both the air and fluid filters in the ThermoFlex can be changed while the unit is running. For water-cooled units, only the fluid filter can be changed while the unit is running. ▲

## Fluid Filter Bag

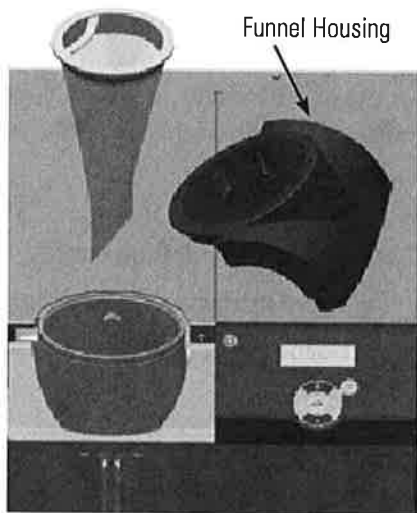
The reservoir has a fluid bag filter designed to prevent the introduction of particulates into the system. Units are shipped with a bag filter in place.

**NOTE** The fluid bag filter can be removed with the unit operating. ▲



**Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's MSDS for handling precautions.** ▲

Fluid Bag Filter



When it is time to replace the bag, gently pull up on the plastic funnel housing to remove it and simply pull the bag out of the unit. Replacement bags are available from Thermo Fisher Scientific.

**Figure 6-1** Fluid Filter Bag



**Before replacing the reservoir housing ensure the reservoir sight tube ball stopper is securely in place, see next page.** ▲

## Fluid Diffuser

On ThermoFlex900-5000 units, when you remove the bag you will notice a wire mesh fluid diffuser inside the reservoir supply line, see Figure 6-2. The diffuser is used to help streamline the flow into the reservoir. After several bag replacements turn the unit off and remove the diffuser to inspect it for debris/damage.



**The fluid velocity into the reservoir will rapidly increase with the diffuser removed and cause splashing. Turn the unit off before removing the diffuser. This is especially critical when using ethylene or propylene glycol.** ▲

**NOTE** To prevent particulates from entering the reservoir, ensure the fluid bag filter is in place before removing the diffuser. ▲



**Do not operate the unit unless the diffuser is installed.** ▲

## Reservoir Cleaning

The user is responsible for maintaining reservoir fluid quality. Check the fluid on a regular interval. Start with frequent checks until a regular interval (based on your application) is established.

If cleaning is necessary, flush the reservoir with a fluid compatible with the process fluid and the unit's wetted parts, see Section 8.



**Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's MSDS for handling precautions. ▲**

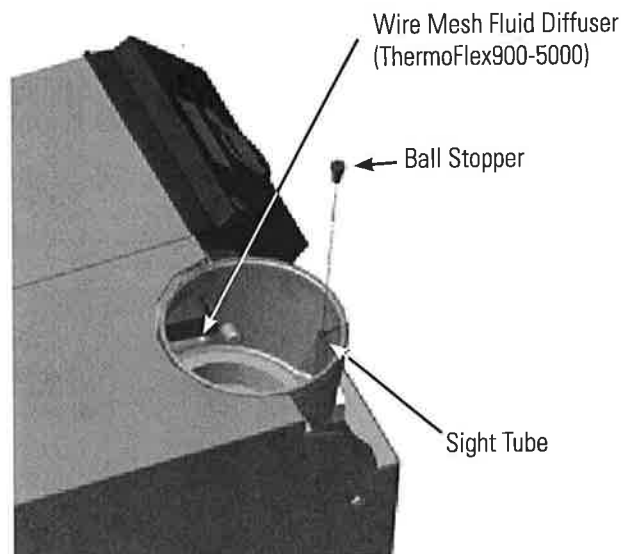
### Reservoir Sight Tube

Clean the sight tube by gently pulling up on the plastic funnel housing to remove it (see illustration on previous page) and then gently pulling out the black sight ball stopper from the tube. Use a long soft-bristle 1/4" brush. Use caution not to scratch the glass.



**Before replacing the reservoir housing ensure the reservoir sight tube ball stopper is securely in place. ▲**

For easier replacement, wet the stopper first and then use a twisting motion to install it in the sight tube.



**Figure 6-2** Reservoir Cleaning and Diffuser

## Fluid Maintenance

An effective recommended maintenance plan would include changing the fluid every six months to optimize chiller reliability, see Section 3 for additional information.

## Condenser Filter



Failure to clean/replace the condenser filter will cause a loss of cooling capacity and lead to premature failure of the cooling system. ▲

### ThermoFlex900 - 5000

Clean the filter through the grill using a vacuum with a soft-bristle brush.

When it is time for a more thorough cleaning, remove the one-piece grill assembly by first pulling the bottom of the assembly away from the unit and then pulling it away from the top.



The condenser framing and fins located behind the grill assembly are very sharp. Use caution when removing the assembly. ▲

**NOTE** ThermoFlex900 - 5000 water-cooled units have an embedded screw(s) located at the top (and bottom) of the grill securing it to the unit. Loosen the screw(s) to remove the grill. ▲



Water-cooled units also have a fan with sharp blades, ensure the unit is off before removing the assembly. ▲

Shake off as much of the excess water as possible before reinstalling. Press the grill back into place.

For water-cooled units, tighten the screw(s) at the top (and bottom) of the grill.

Replacement grill assemblies are available from Thermo Fisher.

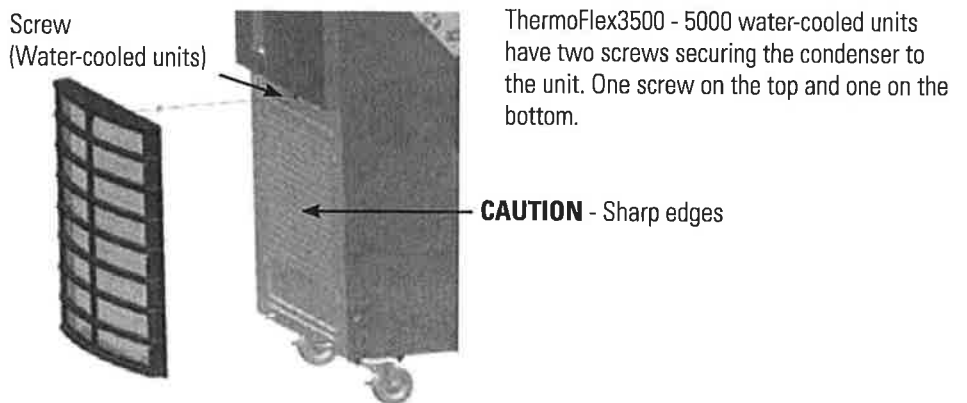


Figure 6-3 ThermoFlex900 - 5000 Condenser Grill Removal



**ThermoFlex7500 - 10000**

For air-cooled units, remove the one-piece grill assembly by pulling the assembly away from the unit.

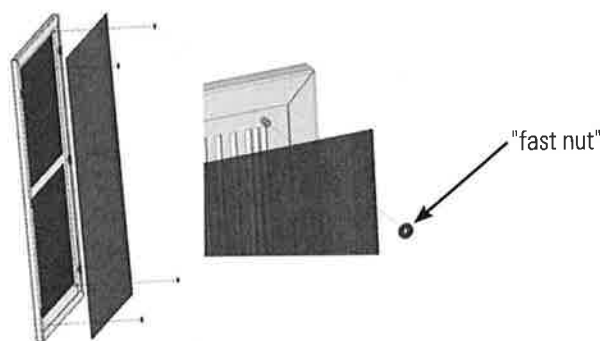
Water-cooled units do not have a filter.

The filter goes over four studs and plastic "fast nuts" hold it in place.

Replace it or vacuum the old filter with a soft-bristle brush, or wash it. Shake off as much of the excess water as possible before reinstalling.

Tuck the filter around the perimeter of the grill and over the four studs, use the plastic "fast nuts" to hold it in place.

Replacement grills are available from Thermo Fisher.



**Figure 6-4** Filter Removal/Replacement ThermoFlex7500 - 10000 Air-Cooled

**ThermoFlex15000 - 24000**

The air-cooled units do not have filters but the condenser fins can be cleaned by removing the eight screws securing the lower-front panel to the unit.

**Unit Surface**

Clean the unit's surface with a soft cloth and warm water only.

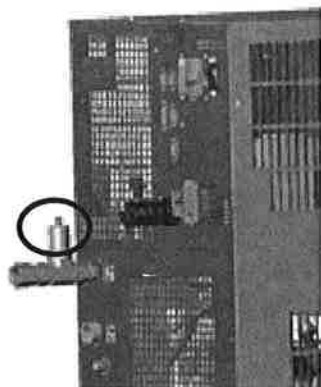
**Hoses**

Inspect the unit's external hoses on a regular basis.

## DI Filter (Optional)

Establish a preventive maintenance schedule for the DI filter cartridge based on your specific application.

The Puralite sensor located on the back of your chiller will illuminate red when it is time to change the DI filter cartridge ( $< 1 \text{ M}\Omega\text{-cm}$ ).




**Figure 6-5** Puralite

**NOTE** When the unit is initially powered, or has been sitting idle for a period of time, the sensor may illuminate. The length of time it will be on varies with your application. ▲

Although the Puralite sensor is the primary indicator that the cartridge needs changing, the unit also has a *separate* integrated alarm that works independently of the Puralite. The alarm is based on unit run hours that will alert you when it is time to change your filter. The **di t** alarm is enabled using the Setup Loop, see Section 4.

If you already know how often your DI filter needs changing, you can input the number of hours into the Setup Loop's **di t** display. When the time is reached, the controller will flash **di** and the audible alarm, if enabled, will sound.

When alerted, check the Puralite sensor on the back of the unit to see if it is illuminated. If it is not illuminated reset the **di t** timer and then check the Puralite periodically.

To clear this message and stop the audible alarm press  .

If the Puralite has turned red and the controller alarm has not gone off, access the Diagnostic Loop **di** display, see next page. Check the system run hours, this will give you an accurate DI replacement time. Adjust the **di t** filter alarm to match the time needed between filter cartridge changes.

This will automatically restart the preventive maintenance timer for your DI filter. If you change the filter before the preventive maintenance timer alerts you, you can clear the timer by again accessing the Diagnostic Loop **di** display, see next page.

**NOTE** It may be necessary to monitor the Puralite three or four times to establish an accurate changing schedule. Also, filter operating time is reduced every time new fluid is added. ▲




## Testing the Safety Features

For units equipped with auto refill switch we recommend slowly draining the unit and ensure the auto refill activates.



## Diagnostic Loop (d, 199)

The Diagnostic Loop is used to view or reset the operating times of various unit components.

To enter the Diagnostic Loop ensure the controller display is either a blank screen (unit off) or displaying the process fluid temperature.

Press the  key and the display will indicate **SP**, press  again to display **SEtuP**, press  again to display **d, 199**.

Press  to enter the loop or press  to return to the process fluid temperature or blank display.

Use the  key to sequence down through the loop. Use the  key to sequence up through the loop.

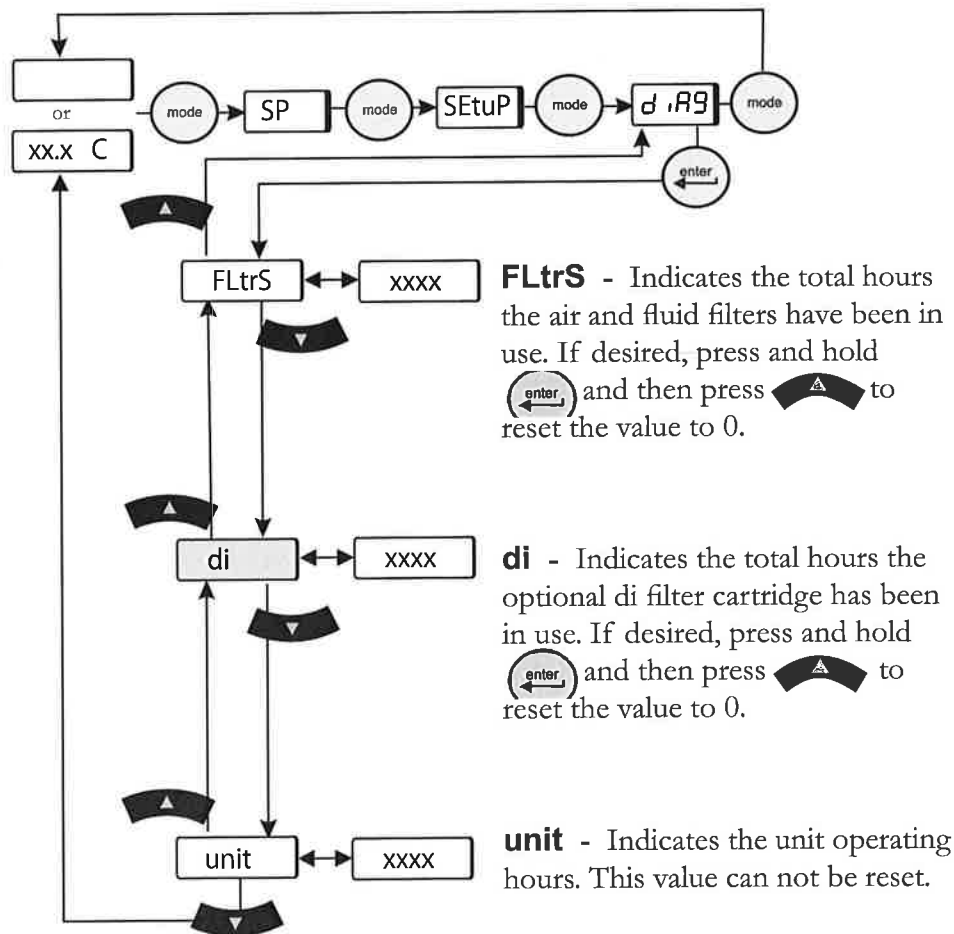


Figure 6-6 Diagnostic Loop



## Section 7 Troubleshooting

### Error Codes

The controller can display Error Codes. If the unit is still running press **enter** to see if the code clears, a limit may have been only temporarily exceeded. If the unit shut down, the controller will continue to flash the error code. Press **enter** to clear the display and silence any alarm. You can silence the alarm without clearing the code by pressing either the up or down arrow key. Once the cause of the shut down is identified and corrected, start the unit. If the cause was not corrected the error code will reappear. Contact our Sales, Service and Customer Support.

Error Code	Reaction	Cause	Actions
<b>8888</b> (or blank-screen)	Unit will not start.	Software communication error.	<ul style="list-style-type: none"> <li>•Cycle circuit protector on the rear of the unit, ThermoFlex900-10000 units.</li> </ul>
<b>Add</b>	Unit continues to run. Auto refill, if installed, shuts off.	The auto refill time chosen for the customer adjustable <i>fill</i> setting in the Setup Loop is set to 0 and the unit is configured to keep running, see Section 4.	<ul style="list-style-type: none"> <li>•Check for leaks.</li> <li>•Check <b>rEFil</b> settings and adjust if necessary, see Section 4.</li> <li>•Add fluid to the tank.</li> </ul>
<b>di</b>	Unit continues to run. (Optional display)	The unit operating time exceeded Setup Loop di t alarm value. The optional DI cartridge <i>may</i> need replacing.	<ul style="list-style-type: none"> <li>•Check the Puralite sensor on the rear of the unit, if the light is red change the cartridge. See Section 6.</li> <li>•If the Puralite sensor is green, see Section 4 to revise <b>di t</b> alarm value.</li> </ul>
<b>driP</b>	Unit will shut down. (Optional display)	Fluid in drip pan (SEMI units only).	<ul style="list-style-type: none"> <li>•Check for leaks.</li> <li>•Remove the fluid from the drip pan and reset the fault.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>FLo-LoFLo</b>	Unit continues to run.	The low flow alarm is set to 0.0 and the pump flow rate is below the minimum required, see Section 4.	<ul style="list-style-type: none"> <li>•See <b>LoFLo</b> error code.</li> </ul>
<b>FLtrS</b>	Unit continues to run.	Air and fluid filters require preventive maintenance/replacement.	<ul style="list-style-type: none"> <li>•Check air and fluid filters. If required, clean/change air and fluid filters, see Section 6.</li> <li>•If your filters do not need cleaning, you may increase the number of hours between preventive care reminders. There are four levels, see Section 6.</li> </ul>

Error Code	Reaction	Cause	Actions
<b>HiFlo</b>	Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4. (Units equipped with a flow transducer.)	The process fluid flow rate has exceeded the adjustable high flow setting's value.	<ul style="list-style-type: none"> <li>•If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.</li> <li>•Verify your <b>HiFlo</b> setting, see Section 4, and adjust setting if necessary.</li> <li>•Check all application and plumbing shut off valves for correct position.</li> <li>•Adjust flow if unit is equipped with a flow control valve (option), see Section 5.</li> <li>•If flow transducer was recently calibrated double check calibration, see Section 8.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Hi P1</b>	Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4.	The pump's high discharge pressure exceeded Setup Loop high alarm value.	<ul style="list-style-type: none"> <li>•If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.</li> <li>•Verify your <b>Hi P1</b> setting, see Section 4.</li> <li>•Check application valves and ensure that they have not changed or been closed. <b>NOTE</b> If routine shut-off of the process flow is required then an external pressure relief valve should be added, see Section 5. ▲</li> <li>•May occur as a result of changing the internal DI cartridge. Disconnecting the cartridge adds an additional 0.5 gpm to the main flow. See Section 5.</li> <li>•Check for debris in the application or external filters.</li> <li>•Double check fluid lines. Excessive bends, long tubing and diameter reductions can affect the pump's discharge pressure. <b>NOTE</b> If diameter reductions must be made, they should be made at the inlet and outlet of your application, not at the chiller. ▲</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>

Error Code	Reaction	Cause	Actions
<b>Hi t</b>	Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4. <b>NOTE</b> If the unit does shut down it can be restarted provided the temperature is still within the factory-set high fixed temperature limit. However, the error will reoccur if the temperature goes below the adjustable setting and then again exceeds it. ▲	The process fluid temperature exceeded Setup Loop alarm value.	<ul style="list-style-type: none"> <li>•If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.</li> <li>•Verify your <b>Hi t</b> setting, see Section 4.</li> <li>•Ensure the unit meets all environmental requirements, see Section 3.</li> <li>•Ensure unit has adequate ventilation, see Section 3.</li> <li>•Clean the air filter. Dirt and debris on the filter can prevent the unit from functioning at full capacity, see Section 6.</li> <li>•Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher for assistance on calculating heat loads.</li> <li>•Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.</li> <li>•Verify/adjust controller PID values, see the end of this section.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>HPC</b>	Unit will shut down.	High refrigeration pressure.	<p><b>Air-cooled units</b></p> <ul style="list-style-type: none"> <li>•Ensure that the ambient temperature is not exceeding the recommended range, see Section 3.</li> <li>•Ensure unit has adequate ventilation, see Section 3.</li> <li>•Clean the air filter. Dirt and debris on the filter can prevent the filter from functioning at full capacity, see Section 6.</li> <li>•Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul> <p><b>Water-cooled units</b></p> <ul style="list-style-type: none"> <li>•Ensure the plastic plugs were removed from the facility connections.</li> <li>•Ensure facility water is on and connected.</li> <li>•Check facility water flow rate and pressure.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>

Error Code	Reaction	Cause	Actions
<b>LLF</b>	Unit will shut down.  Optional auto refill shuts down.	Reservoir fluid level too low for normal operation.  The auto refill time chosen for the customer adjustable <i>fill</i> setting in the Setup Loop is set to 0 and the unit is configured to shut down, see Section 4	<ul style="list-style-type: none"> <li>•Excessive evaporation. Ensure the unit is operating with the funnel and cap in place.</li> <li>•Check for leaks.</li> <li>•Check <b>rEFil</b> settings and adjust if necessary, see Section 4.</li> <li>•Add fluid to the tank.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>LoFlo</b>	Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4.  (Units equipped with a flow transducer.)	The process fluid flow rate has gone below the adjustable setting's value.	<ul style="list-style-type: none"> <li>•If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.</li> <li>•Verify your <b>LoFlo</b> setting, see Section 4.</li> <li>•Adjust flow if unit is equipped with a flow control valve (option), see Section 5.</li> <li>•Check all valves in your application and plumbing lines to ensure that they have not changed or closed.</li> <li>•If flow transducer has recently been calibrated, double check calibration to ensure it was done properly, see Section 8.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Lo P1</b>	Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4.	Pump's low discharge pressure is below Setup Loop low alarm value.	<ul style="list-style-type: none"> <li>•If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.</li> <li>•Ensure that chiller reservoir level is not too low.</li> <li>•Verify your <b>LoP1</b> setting, see Section 4.</li> <li>•Unit requires &gt;3 PSIG application pressure drop. If a bypass valve has been installed, some restriction may need to be added to the bypass line.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>



Error Code	Reaction	Cause	Actions
<b>Lo t</b>	Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4. <b>NOTE</b> If the unit does shut down it can be restarted provided the temperature is still above the factory-set low fixed temperature limit. However, the error will reoccur if the temperature goes above the adjustable setting and then again drops below it. ▲	Process fluid temperature is below Setup Loop alarm value.	<ul style="list-style-type: none"> <li>• If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.</li> <li>• Verify your <b>Lo t</b> setting, see Section 4.</li> <li>• Ensure that the ambient temperature is not below the recommended low-range, see Section 3. If your application load is constant and/or the lower temperature can be temporarily tolerated, then continue operation. (The ThermoFlex will control setpoint when sufficient heat is added.)</li> <li>• Verify/adjust controller PID values.</li> <li>• Add insulation to external plumbing lines to reduce the heat-loss to the environment.</li> <li>• For water-cooled units check facility water temperature.</li> <li>• Contact our Sales, Service and Customer Support.</li> </ul>
<b>o FLo</b>	Unit will shut down.	There is an overflow condition in the reservoir.	<ul style="list-style-type: none"> <li>• Ensure the reservoir was not filled above the MAX LEVEL line.</li> <li>• Check for clogged reservoir filter.</li> <li>• Contact our Sales, Service and Customer Support.</li> </ul>
<b>oL</b>	Unit will shut down. (Units equipped with 3- $\Phi$ pump motor overload.)	Pump motor overload activated. Pump motor exposed to excessive current due to high pressure, flow or ambient temperature.	<ul style="list-style-type: none"> <li>• Allow pump to cool down.</li> <li>• Contact our Sales, Service and Customer Support.</li> </ul>
<b>oL 2</b>	Unit will shut down. (Units equipped with 3- $\Phi$ fan.)	Fan motor overload activated.	<ul style="list-style-type: none"> <li>• Allow unit to cool down.</li> <li>• For air-cooled units, clean the air filter</li> <li>• Contact our Sales, Service and Customer Support.</li> </ul>
<b>PHEr</b>	Unit will shut down. (3- $\Phi$ units only)	Phase rotation is wrong.	<ul style="list-style-type: none"> <li>• Disconnect unit from power source and reverse any two line conductors on the line side of the main circuit breaker.</li> <li>• Contact our Sales, Service and Customer Support.</li> </ul>

Error Code	Reaction	Cause	Actions
<b>rEFiL</b>	<p>Auto refill will shut off. Unit reaction depends on <b>ALr</b> setting chosen in the Setup Loop, see Section 4.</p> <p>Auto refill will shut off. Unit will continue to run. (Optional display.)</p>	<p>The fluid level did not reach the minimum operating level within the time chosen for the customer adjustable <i>fill</i> setting, chosen in the Setup Loop, see Section 4.</p> <p>The auto refill successfully filled within the time frame chosen for the customer adjustable <i>fill</i> setting, but the unit tried to refill 5 times in 40 hours.</p>	<ul style="list-style-type: none"> <li>•Check auto refill connection.</li> <li>•Check for leaks.</li> <li>•Check the supply pressure on the auto refill supply line. With low pressure the auto refill time span setting may be set too low and the reservoir does not have time to fill.</li> <li>•Check <b>rEFil</b> settings and adjust if necessary, see Section 4.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 4</b>	Unit will not start.	Normal if new software installed and all values in the Setup and Tune Loops were reset to factory defaults.	<ul style="list-style-type: none"> <li>•Clear the error code.</li> <li>•If error remains, contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 15</b>	Unit will continue to run. (Units equipped with serial communications.)	Bad, communications connection.	<ul style="list-style-type: none"> <li>•Check the serial communication connection.</li> <li>•See serial communication connections in Appendix D.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 16</b>	Unit continues to run.	Bad sensor calibration detected several seconds after performing a calibration.	<ul style="list-style-type: none"> <li>•Redo calibration, see Section 8.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>

Error Code	Reaction	Cause	Actions
<b>Er 22</b>	<p>This error code has priority over <b>H IT</b>.</p> <p>Unit will shut down.</p> <p><b>NOTE</b> Unit will not restart until process fluid temperature is below +43°C. ▲</p>	Reservoir fluid temperature exceeded the <i>factory preset</i> value of +43°C.	<ul style="list-style-type: none"> <li>•Ensure the unit meets all environmental requirements, see Section 3.</li> <li>•Ensure unit has adequate ventilation, see Section 3.</li> <li>•Clean the air filter. Dirt and debris on the filter can prevent the unit from functioning at full capacity, see Section 6.</li> <li>•Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher for assistance on calculating heat loads.</li> <li>•Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.</li> <li>•Verify/adjust controller PID values, see the end of this section.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 23</b>	Unit will shut down.	Refrigeration temperature sensor shorted.	•Contact our Sales, Service and Customer Support.
<b>Er 24</b>	Unit will shut down.	Refrigeration temperature sensor open.	•Contact our Sales, Service and Customer Support.
<b>Er 25</b>	Unit will shut down.	Internal temperature sensor shorted.	•Contact our Sales, Service and Customer Support.
<b>Er 26</b>	Unit will shut down.	Internal temperature sensor open.	•Contact our Sales, Service and Customer Support.
<b>Er 32</b>	Unit will shut down.	Refrigeration suction gas temperature exceeded 50°C.	<ul style="list-style-type: none"> <li>•Make sure supply voltage matches the unit's nameplate rating <math>\pm 10\%</math>.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>

Error Code	Reaction	Cause	Actions
<b>Er 33</b>	<p>This error code has priority over <b>L oT</b>.</p> <p>Unit will shut down.</p> <p><b>NOTE</b> Unit will not restart until process fluid temperature exceeds +2°C. ▲</p>	<p>Reservoir fluid temperature below the <i>factory preset</i> value of +2°C.</p>	<ul style="list-style-type: none"> <li>•Check ambient temperature. Unit may not be able to reach setpoint at low ambient temperatures.</li> <li>•Ensure that the ambient temperature is not exceeding the recommended range, see Section 3.</li> <li>•Verify/adjust controller PID values, see Section 7.</li> <li>•Add insulation to external plumbing lines to reduce the heat-loss to the environment.</li> <li>•For water-cooled units check facility water temperature.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 35</b>	<p>This error code has priority over <b>Hi P1</b>.</p> <p>Unit will shut down.</p>	<p>Process pressure (P1) exceeded <i>factory preset</i> value for greater than 30 seconds.</p> <p>Preset Values:</p> <p>P1, P2 and T1- 105 psi  P3 60 Hz - 48 psi  P3 50 Hz - 32 psi  P4 60 Hz - 85 psi  P4 50 Hz - 60 psi  P5 60 Hz - 87 psi  P5 50 Hz - 56 psi</p>	<ul style="list-style-type: none"> <li>•Check application valves and ensure that they have not changed or been closed. <b>NOTE</b> If routine shut-off of the process flow is required then an external pressure regulator accessory should be added - contact Thermo Fisher. ▲</li> <li>•May occur as a result of changing the internal DI cartridge. Disconnecting the cartridge adds an additional 0.5 GPM to the main flow, see Section 5.</li> <li>•Check for debris in the application or clogged external filters.</li> <li>•Double check fluid lines. Excessive bends, long tubing and diameter reductions can affect the pump's discharge pressure. <b>NOTE</b> If diameter reductions must be made, they should be made at the inlet and outlet of your application, not the chiller. ▲</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 36</b>	<p>This error code has priority over <b>Lo P1</b>.</p> <p>Unit will shut down.</p>	<p>Process pressure (P1) below <i>factory preset</i> limit of 3 psi (all pumps) for greater than 15 seconds.</p> <p>Possible pump motor overload.</p>	<ul style="list-style-type: none"> <li>•Ensure that the chiller reservoir is not too low.</li> <li>•Unit requires &gt;3 PSIG application pressure drop. If a bypass valve has been installed, some restriction may need to be added to the bypass line.</li> <li>•Allow unit to cool down</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>

<b>Error Code</b>	<b>Reaction</b>	<b>Cause</b>	<b>Actions</b>
<b>Er 41</b>	Unit continues to run.	Communication error between display and main control board.	<ul style="list-style-type: none"> <li>•Cycle circuit protector on rear of unit off and on, ThermoFlex900-10000 units.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 42</b>	Unit continues to run.	Internal communications error.	<ul style="list-style-type: none"> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 48</b>	Unit will shut down. (Optional display.)	Unit's optional EMO button depressed.	<ul style="list-style-type: none"> <li>•When able, reset the EMO.</li> </ul>
<b>Er 59</b>	Unit will shut down.	Invalid level fault. Unit sensed both a high level and low level reservoir fluid level.	<ul style="list-style-type: none"> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 62</b>	Unit will not start. (Units equipped with optional Analog I/O.)	<p>Probe not properly connected.</p> <p>Shorted remote temperature probe.</p>	<ul style="list-style-type: none"> <li>•Check connection.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 63</b>	Unit will not start. (Units equipped with optional Analog I/O.)	<p>Probe not properly connected.</p> <p>Open remote temperature probe.</p>	<ul style="list-style-type: none"> <li>•Check connection.</li> <li>•Contact our Sales, Service and Customer Support.</li> </ul>
<b>Er 64</b>	Unit will continue to run using the last valid setpoint received. (Units equipped with optional Analog I/O.)	Analog remote setpoint is enabled and the unit receives a voltage or current level that is outside the unit's set point range.	<ul style="list-style-type: none"> <li>•The error can be cleared only after a valid set point is received, or the remote analog setpoint is turned off.</li> </ul>

## Checklist

### Unit will not start

For first time use, please refer to the quick start instructions included with your unit or the copy in this manual. The manual's copy follows the Table of Contents.

Check the controller for error codes, see Error Codes in this section.

Ensure the optional GFCI breaker located on the rear of the unit is in the up position.

For ThermoFlex900 - 10000 units ensure the circuit protector is in the on (I) position.

Make sure supply voltage is connected and matches the unit's nameplate rating  $\pm 10\%$

**NOTE** Once RS232 or RS485 is activated, all keypad operations are disabled except for turning the unit off and changing serial communication settings. ▲

### No display on controller or display is 8888


For ThermoFlex900 - 10000 units recycle the circuit protector on the rear of the unit.

### Clearing Error Codes

Note the code in case it clears before you are done troubleshooting.

If desired, silence the audible alarm by pressing the up or down arrow key.

*If the unit shut down*, the controller will continue to flash the error code. Press **enter** to clear the display and silence any alarm. Refer to Error Codes in this section. Once the cause of the shut down is identified and corrected, start the unit. If the cause was not corrected the error code will reappear.

*If the unit is still running*, press **enter** to see if the code clears, a limit may have been only temporarily exceeded. If the error code does not clear press  until the display flashes between the error code and the temperature and then press **enter**. If the code still does not clear refer to Error Codes in this section.

### Unit will not circulate process fluid

Check the reservoir level. Fill, if necessary.

Ensure the reservoir bag filter is not clogged.

Check the application for restrictions in the cooling lines.

Unit requires >3 PSIG application pressure drop. If a bypass valve has been installed add some restriction to the bypass line.

The pump motor overloaded. The pump's internal overtemperature overcurrent device will shut off the pump causing the flow to stop. This can be caused by low fluid, debris in system, operating unit in a high ambient temperature condition or excessively confined space. Allow time for the motor to cool down.

Make sure supply voltage matches the unit's nameplate rating  $\pm 10\%$ .

### Inadequate temperature control

Verify the setpoint.

If the unit is over-cooling, recycle the power.

Make sure the condenser/air filter is free of dust and debris.

Check the fluid concentration, see Section 3.

Ensure unit installation complies with the site requirements in Section 3.

Make sure supply voltage matches unit nameplate rating  $\pm 10\%$ .

For ThermoFlex900 - 5000 Global Voltage units ensure the unit is properly configured, see Appendix B.

If the temperature continues to rise, make sure your application's heat load does not exceed the rated specifications.


Check for high thermal gradients (e.g., the application load is being turned on and off or rapidly changing).

Verify/adjust controller PID values, see next page.

### Unit vibration

The optional pressure relief valve setting may be the cause. Change the pressure setting  $\pm 5$  psi to eliminate the vibration.

### Unit shuts down

Ensure  button wasn't accidentally pressed.

Ensure the optional GFCI breaker located on the rear of the unit is in the up position.

For ThermoFlex900 - 10000 units ensure the circuit protector is in the on (I) position.

Check the controller for error codes, see Error Codes in this section.

Make sure supply voltage is connected and matches the unit's nameplate rating  $\pm 10\%$ .

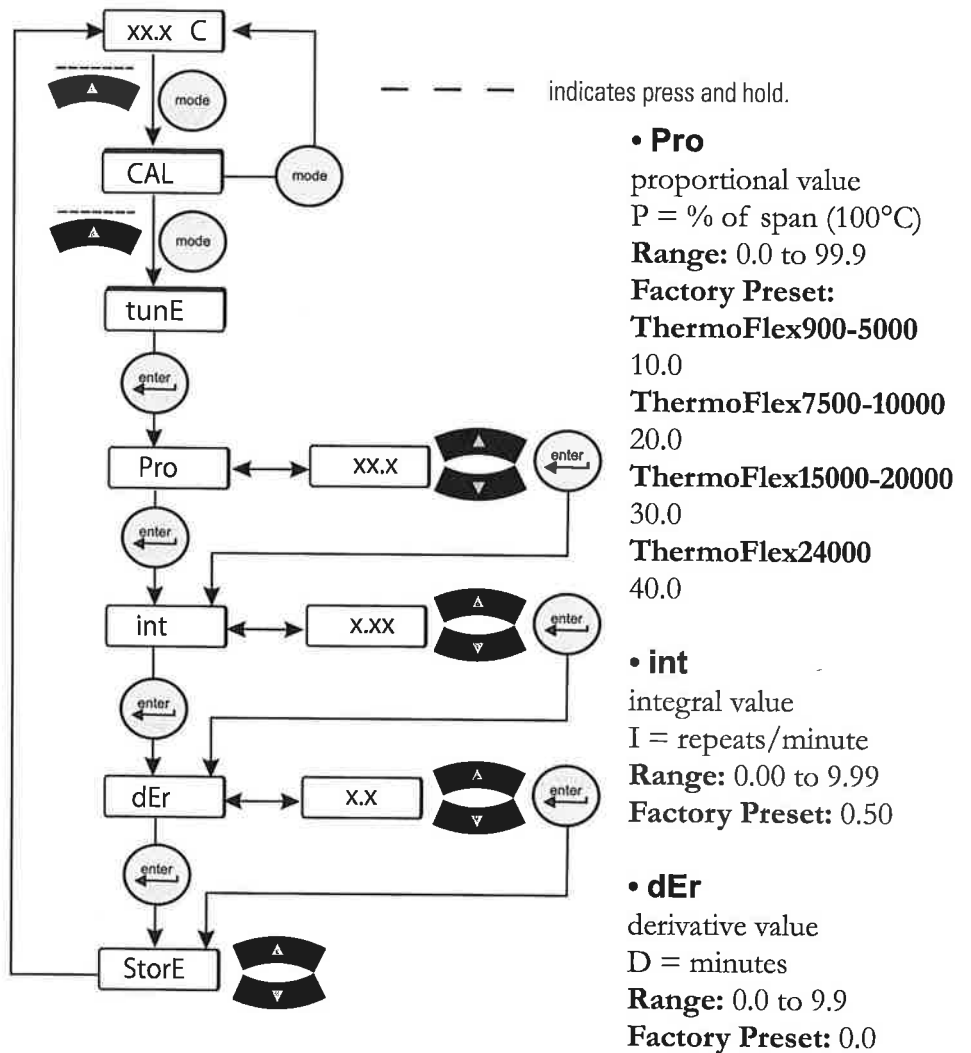
Restart the unit.

Please contact Thermo Fisher Scientific Sales Service and Customer Support if you need any additional information, see inside cover for contact instructions.

# Verifying/ Adjusting the Controller PID Values (Tune Loop)

The controller controls temperature using a Proportional-Integral-Derivative (PID) algorithm. Should your unit experience temperature control issues, verifying/adjusting the controller's PID values may correct the condition.

**NOTE** Thermo Fisher recommends that only a qualified technician adjust the PID values. Incorrect values will hamper unit performance. ▲



**Figure 7-1** Verifying/Adjusting PID Values



## Section 8 Additional Information

### Draining



Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's MSDS for handling precautions. ▲

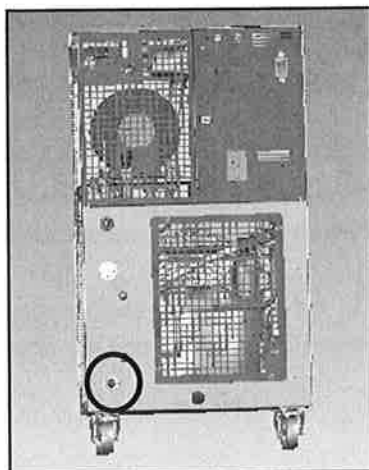
Position a suitable pan beneath the drain port at the rear of the unit. The drain pan must be shallow (under 3½" in height) and have a volume of approximately 3 gallons (6 gallons for ThermoFlex7500 - 24000). Remove ¼" Male NPT pipe plug from drain port. This will drain the return line, reservoir, plate exchanger, and the suction side of the pump.

To drain the discharge side of the pump disconnect the Female NPT outlet connection on the rear of the unit.

**NOTE** Internally the unit does not contain a large quantity of fluid on the discharge side however take care to contain what fluid does drain, a wet-vac can be employed to minimize the potential for spillage. ▲

If the unit is equipped with the flow control or pressure relief with flow control option, open the valve or remove the drain plug in order to drain the discharge line, see Section 5.

If the unit is equipped with the anti drainback option, enter the Setup Loop and utilize the **drAin** display to open the valve, see Section 4. Opening the valve allows the fluid to drain out of the unit.

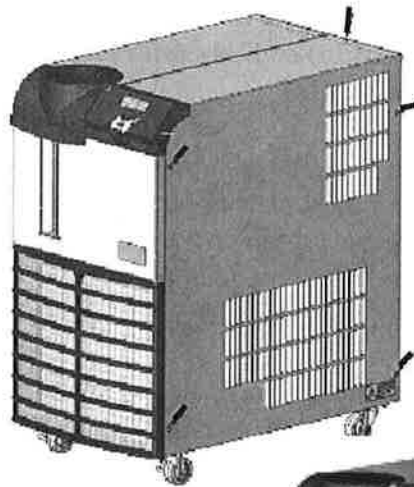


Reinstall ¼" Male NPT pipe plug using a sealant suitable for the wetted materials prior to refilling the unit.

**Figure 8-1** 1/4" Male NPT Reservoir Drain Plug (Typical)

**Water-Cooled**

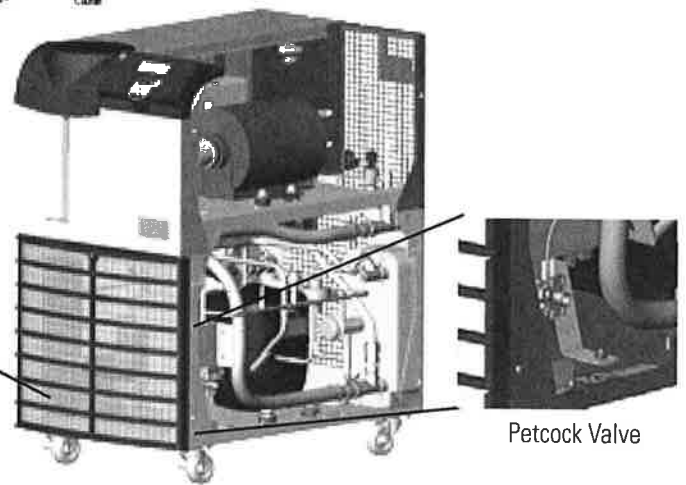
Draining ThermoFlex900 - 2500 water-cooled units is accomplished by removing the right side panel. Use a Phillips head screwdriver to remove the five screws indicated in the illustration below. Slide the panel back approximately one inch, then lift slightly from the rear to disengage the panel's two tabs from their slots.



The drain for ThermoFlex3500 and 5000 units is located behind the condenser filter.

The drain for ThermoFlex7500 and 10000 units is located behind the access panel on the lower left front of the unit. The panel has two ¼ turn fasteners (cross head).

The drain for Thermoflex15000 - 24000 is a ¼" plug located on the rear of the unit.



**Figure 8-2** Water-Cooled

Install a 7/16" ID tube on the drain petcock valve located on the lower end of the exchanger. Open the valve to allow fluid to drain into an external device. When draining is complete close the valve and replace the panel.

A wet-vac is needed on the facility water inlet connection to thoroughly drain any remaining fluid from the lines.

**Wetted Materials****P1 and P2 Pumps**

300 Series Stainless Steel  
 Bronze  
 Carbon Graphite  
 Ceramic  
 Fluorocarbon (Viton®)  
 Polysulfone

**Tank**

Polyethylene  
 Brass  
 EPDM  
 Pyrex®

**Plumbing**

300 Series Stainless Steel  
 Bronze  
 Fluorocarbon (Viton®)  
 Nickel  
 Polypropylene  
 EPDM  
 Brass  
 Copper  
 Teflon®  
 PPS (flow transducer)  
 Nitrile (Buna-n®)

**Filter bag**

Polypropylene  
 Mono-filament nylon

**Cap and Funnel**

Acetal Copolymer

**P3, P4 and P5 Pumps**

316 Series Stainless Steel  
 Carbon  
 Silicon Carbide  
 Fluorocarbon (Viton®)

**T1 Pumps**

Stainless Steel AISI 304  
 Bronze ASTM B62  
 Bronze ASTM B16  
 Buna N  
 Buna/Ceramic  
 Buna/Carbon

## Internal Fluid Temperature Sensor (rtd1) Calibration

The ThermoFlex has been designed to minimize the need for calibration. However, if calibration is desired or recommended by our Sales, Service and Customer Support, please use the following procedure.



This procedure requires a running unit and a calibrated reference thermometer.





**NOTE** Uninsulated applications may cause the internal temperature and an external reference temperature to differ and to fluctuate. If inaccurate calibration is suspected, place the reference thermometer as close to the ThermoFlex process outlet as possible. ▲


**NOTE** If it is more convenient, perform the low-end calibration before doing the high-end. ▲




Do not pick calibration points that are outside the safe operating limits of the fluid in your application. For example with water, 40°C and 5°C are typical high and low calibration points.



Run the unit to a suitable high-end calibration point. Place a calibrated reference thermometer in the reservoir. Ensure the fluid temperature is stabilized.

To enter the Calibration Loop ensure the controller display is displaying the process fluid temperature, see the diagram on next page. Press and hold the  and then press the  key. The display will indicate **CAL**.

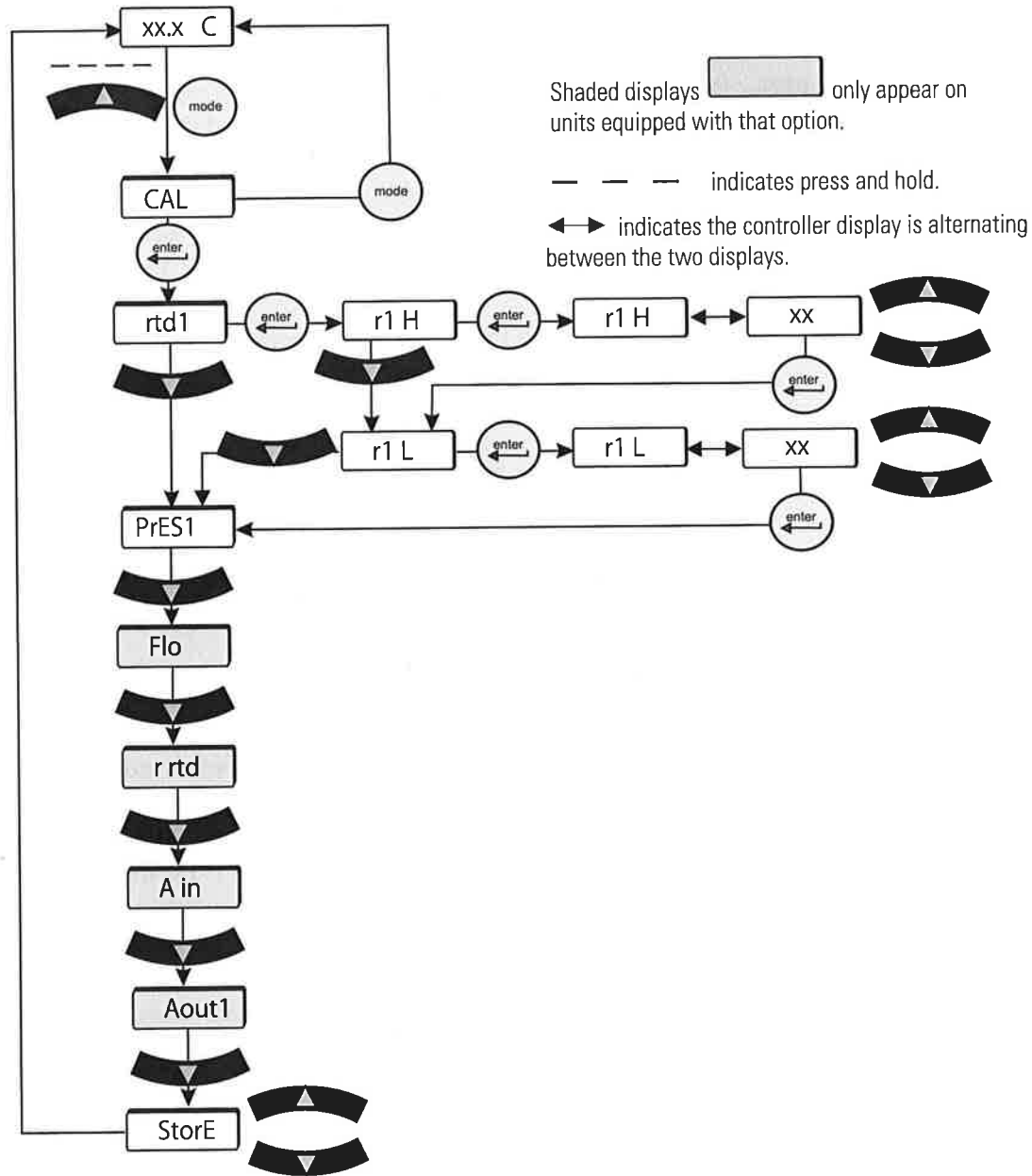
Press the  key and the controller will display **rtd1**. Press  again and the controller will display **r1 H** (high-end calibration). Press  again and the controller will flash between **r1 H** and the temperature. Use  to adjust the temperature to match the reference thermometer.

Press the  key again to accept the value.

Press the  key until **Store** is displayed, press  to save the new value, press  to not save it.

**NOTE** After pressing the  button at the **Store** prompt wait several seconds before proceeding to ensure that a bad calibration message (**Er 16**) does not appear. Premature use of the keypad after pressing  may cancel the bad calibration error message. ▲

Run the unit to a suitable low-end calibration point. At the **r1 L** (low-end calibration) display repeat the procedure.



**Figure 8-3** Internal Temperature Sensor Calibration



If you have any questions please contact Thermo Fisher Scientific's Sales, Service and Customer Support.




## Process Fluid Pressure (P1) Transducer Calibration


The ThermoFlex has been designed to minimize the need for calibration. However, if calibration is desired or recommended by our Sales, Service and Customer Support, please use the following procedure.


This procedure requires a running unit, a calibrated reference pressure gauge and an external flow control valve.

Connect a calibrated reference pressure gauge to the outlet line. Using an external flow control valve, increase the pressure to a suitable high-end calibration point by closing the valve. Ensure the pressure is stabilized.

To enter the Calibration Loop ensure the controller display is displaying the process fluid temperature, see the diagram on the next page. Press and hold the  and then press the  key. The display will indicate **CAL**.




Press the  key and the controller will display **rtd1**. Press  until the controller displays **PrES1**. Press  and the controller will flash between **P1H** and the pressure.



Use  to adjust the rate to match the reference pressure gauge.

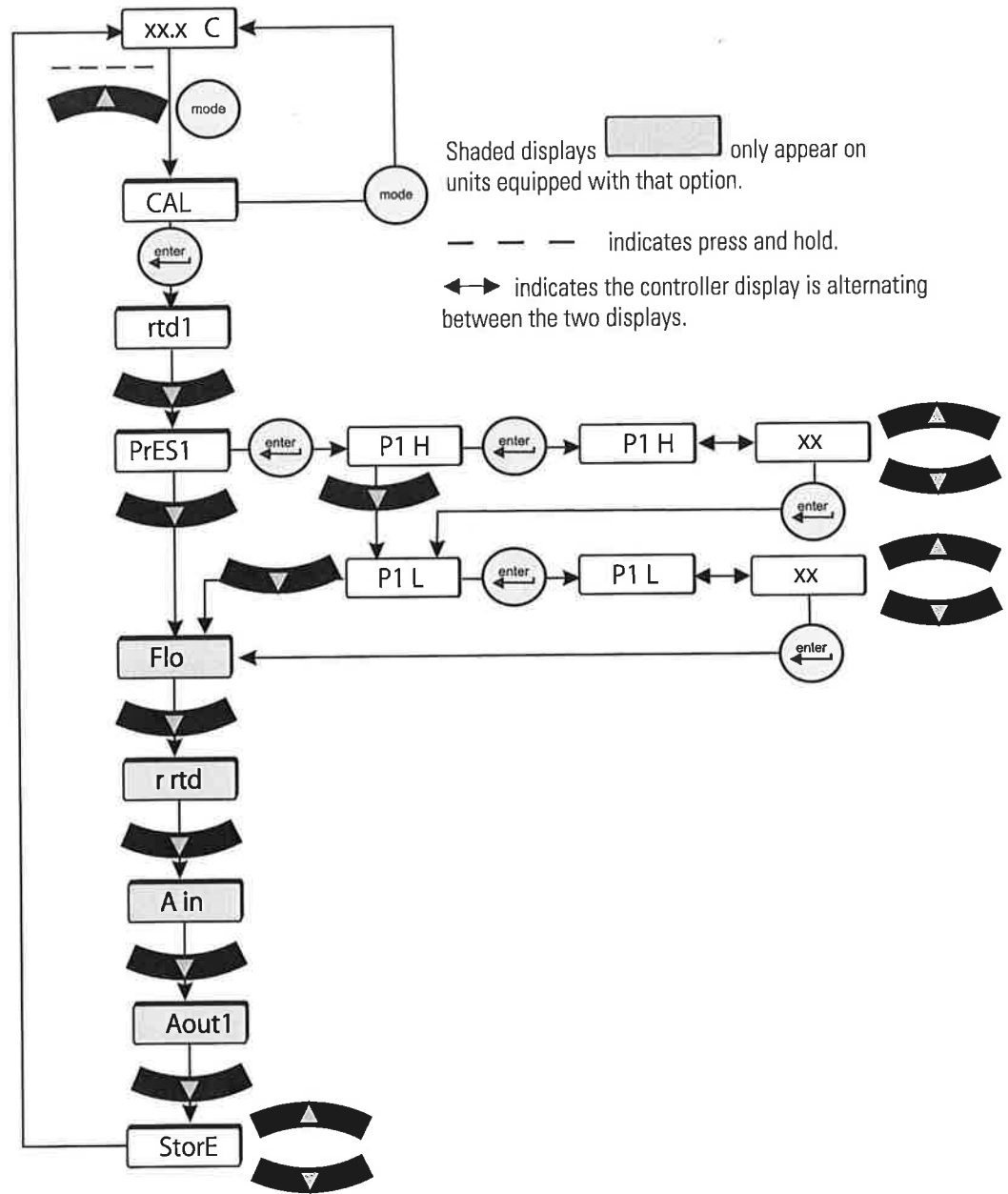
Press the  key to accept the value.

Decrease the pressure to a suitable low-end calibration point (avoid a zero pressure). Ensure the pressure is stable.

The controller will flash between **P1L** and the pressure. Use  to adjust the rate to match the reference pressure gauge.

Press the  key and **StorE** is displayed, press  to save both values, press  to not save them.

**NOTE** After pressing the  button at the **StorE** prompt wait several seconds before proceeding to ensure that a bad calibration message (**Er 16**) does not appear. Premature use of the keypad after pressing  may cancel the bad calibration error message. ▲



**Figure 8-4** Pressure (P1) Calibration



If you have any questions please contact Thermo Fisher Scientific's Sales, Service and Customer Support.




## Optional Process Fluid Flow Transducer (FLo) Calibration


The ThermoFlex has been designed to minimize the need for calibration. However, if calibration is desired or recommended by our Sales, Service and Customer Support, please use the following procedure.


This procedure requires a running unit, a calibrated reference flowmeter and an external flow control valve.

Connect a calibrated reference flowmeter to the outlet line. Using an external flow control valve, increase the flow to a suitable high-end calibration point. Ensure the flow is stabilized.

To enter the Calibration Loop ensure the controller display is displaying the process fluid temperature, see the **diagram** on the next page. Press and hold the  and then press the  key. The display will indicate **CAL**.




Press the  key and the controller will display **rtd1**. Press  until the controller displays **FLo**. Press  and the controller will flash between **HiFLo** and the flow rate.



Use  to adjust the rate to match the reference flowmeter.

Press the  key to accept the value.

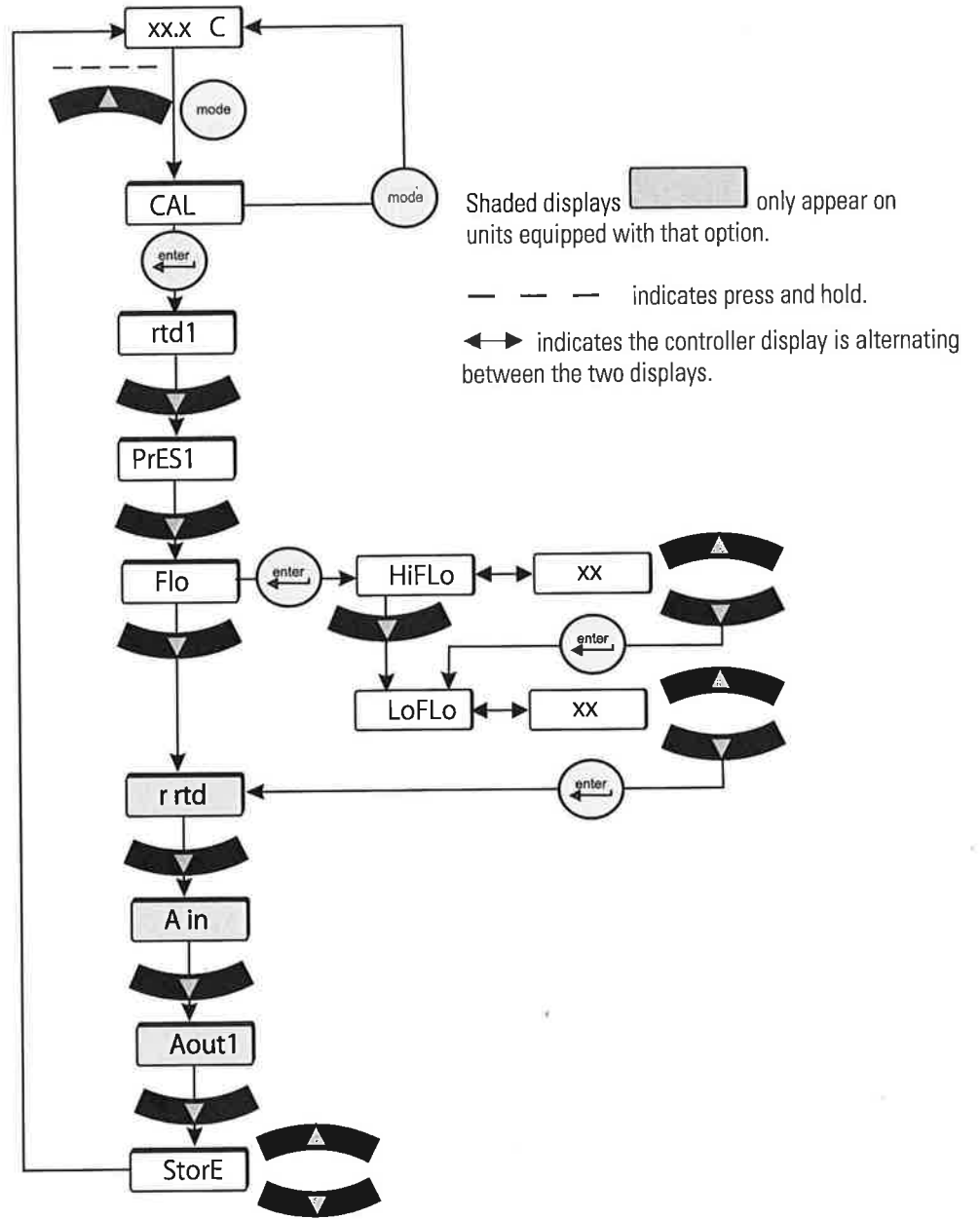
Decrease the flow to a suitable low-end calibration point (avoid a zero flow rate). Ensure the flow is stable.

The controller will flash between **LoFLo** and the flow rate. Use  to adjust the rate to match the reference flowmeter.

Press the  key and **StorE** is displayed, press  to save both values, press  to not save them.

**NOTE** After pressing the  button at the **StorE** prompt wait several seconds before proceeding to ensure that a bad calibration message (**Er 16**) does not appear. Premature use of the keypad after pressing  may cancel the bad calibration error message. ▲





**Figure 8-5** Flow Transducer (FLo) Calibration

If you have any questions please contact Thermo Fisher Scientific's Sales, Service and Customer Support.

## Shipment/Storage



Follow the manufacturer's MSDS instructions if decontamination is required.



Transporting and/or storing the unit in near or below freezing temperatures requires draining, see Draining in this Section. Store the unit in the temperature range of -25°C to 60°C (with packaging), and <80% relative humidity. ▲



Do not store the unit for more than 90 days. ▲

# Appendix A Country Specific 230 VAC, 50 Hz, 1Ø Requirements

Refer to the nameplate label located on the rear of the unit for specific electrical requirements.

1. Units shipped to the following locations require a **16 Amp service**:

Afghanistan, Albania, Algeria, Andorra, Angola, Argentina, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, Comoros, Congo, Croatia, Czech Republic, Denmark, Djibouti, DR Congo, Ecuador, Egypt, Eritrea, Estonia, Ethiopia, Finland, France, French Guiana, Gabon, Georgia, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Iraq, Israel, Italy, Ivory Coast, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lebanon, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Mauritania, Moldova, Monaco, Mongolia, Morocco, Mozambique, Namibia, Nepal, Netherlands, Niger, North Korea, Norway, Paraguay, Peru, Poland, Portugal, Romania, Russia, Rwanda, Saint Vincent and the Grenadines, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia, Somalia, South Africa, South Korea, Spain, Sweden, Switzerland, Syria, Tajikistan, Thailand, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Uruguay, Uzbekistan, Vanuatu, Vatican City, Vietnam.

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2. Units shipped to the following locations require a **15 Amp service**:

Australia, China, Fiji Islands, Nauru, New Zealand, Papua New Guinea, Solomon Island, Tonga, Tuvalu.

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3. Units shipped to the following locations require a **13 Amp service**:

Abu Dhabi, Bahrain, Bangladesh, Botswana, Brunei, Cyprus, Dominica, Gambia, Ghana, Gibraltar, Grenada, Hong Kong, India, Ireland, Kenya, Kiribati, Kuwait, Lesotho, Malawi, Malaysia, Maldives, Malta, Mauritius, Myanmar, Nigeria, Oman, Pakistan, Qatar, Saint Lucia, Seychelles, Sierra Leone, Singapore, Sri Lanka, Sudan, Swaziland, Tanzania, Uganda, United Arab Emirates, United Kingdom, Yemen, Zambia, Zimbabwe.

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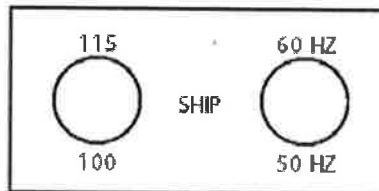
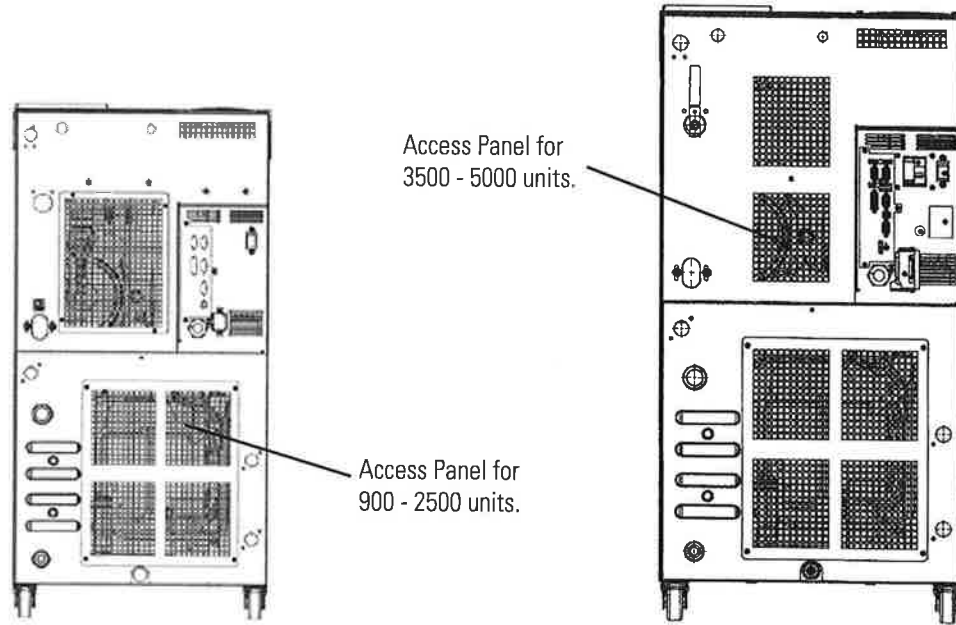
# Appendix B Voltage Configuration Instructions

ThermoFlex900 to 5000 units configured to operate at either 115V 60Hz or 100V 50/60Hz, or units with the Global Voltage option, have a voltage configuration panel located behind the access panel on the rear of the unit.

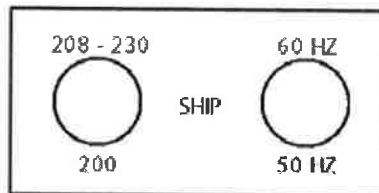
- Use a 1/4" socket to remove the four screws securing the access panel to the unit.
- The configuration panel has two 3-position toggle switches, one for voltage and one for frequency. All units are shipped with the toggle switch in the center **SHIP** position. Place each switch to the settings that match the voltage/frequency supplied to the unit.

**NOTE** For ThermoFlex900-2500 global voltage units, the compressor and fan will not operate when the switch is in the **SHIP** position. ▲

- Reinstall the access panel.



115/100 Variable Voltage units

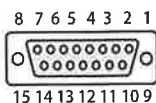


208-230/200 Global Voltage units

**Figure B-1** Variable/Global Voltage Units

# Appendix C Analog I/O and Remote Sensor

## Analog I/O Connector Pinout ♀



Install your analog input/output device to the 15-pin female connector on the rear of the unit. Analog I/O is activated using the Setup Loop, see page C-3.

PIN	NAME	NOTES	DEFINITION
1	DIGITAL GROUND		Common round connection for pins 12, 13 and 14
2	Not Used		
3	LOW LEVEL (Only if option chosen)	Note 1	<u>Dry Relay Contact</u> : Reference to pin 11. Closes if either level switch is in the "low" position for more than 1 second.
4	CONFIGURABLE RELAY 2	Note 1	<u>Dry Relay Contact</u> : Reference to pin 11. Closes when any configured fault or warning occurs, see Table 2.
5	PUMP ON	Note 1	<u>Dry Relay Contact</u> : Reference to pin 11. Closes when pump is turned on. Opens when pump is turned off.
6	ANALOG GROUND		Common for analog signals (pins 2, 7 and 15)
7	RESERVOIR TEMP OUT <b>OR</b> EXTERNAL SENSOR TEMPERATURE IF EXTERNAL SENSOR ENABLED	Note 2	Analog Voltage Output 0-10VDC, 10mV/°C, or 4-20mA: Reference to pin 6. This voltage output is proportional to the reservoir fluid temperature: Default scale= 0–10V (where: 0V = Low Temp Span, 10V = Hi Temp Span) Optional Range = 10mV/ °C. (Ex: 200mV = 20°C) (Max Load @ 10V = 5mA) or 4-20mA, 4mA = low temp span, 20 mA = high temp span (maximum output current = 5mA @10VDC.
8	LOW FLOW (Only if option chosen)	Note 1	<u>Dry Relay Contact</u> : Reference to pin 11. Closes when a low flow occurs while the pump is on. Note: To allow the pump to get up to speed at startup, the pump runs for 3 - 5 seconds before the low flow sensor is read.
9	CONFIGURABLE RELAY 1 (Normally Open)	Note 1	<u>Dry Relay Contact</u> : Reference to pin 11. Closes when any of the configured faults occur, see Table 1.
10	CONFIGURABLE RELAY 1 (Normally Closed)	Note 1	<u>Dry Relay Contact</u> : Reference to pin 11. Complement of pin 9 (open when pin 9 is closed).
11	RELAY COMMON		Common for all relay contacts (pins 3, 4, 5, 8, 9, 10).
12	REMOTE START ENABLE	Note 3	Connect to pin 1 to allow unit to be remotely turned on/off through pin 14 REMOTE START.

Note 1: All relay contacts (except for Pin 10) are normally OPEN when power is off. Pin 10 contacts are normally CLOSED when power is off. Relay contacts are rated: 24V AC/DC, 2A, <= 0.08 Ohm maximum each or 5A total for all relays combined, 1mA minimum, switching capacity: 48VA/48W (Resistive load only).

Note 2: Default = 0-10VDC

Note 3: Connect to digital ground (pin 1) using a low resistance connection (gold contact relay).

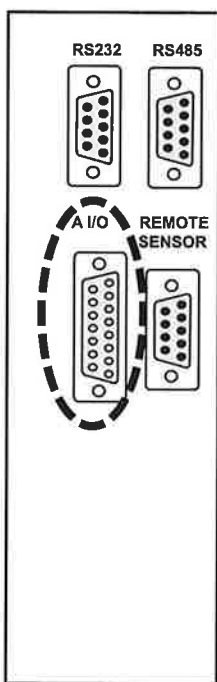
PIN	NAME	NOTES	DEFINITION
13	REMOTE SETPOINT ENABLE	Note 3	Connect to pin 1 to allow the setpoint to be changed remotely through pin 15 REMOTE SETPOINT.
14	REMOTE START	Note 3	Connect to pin 1 to turn unit on. Disconnect to turn unit off. Note: Pins 1 and 12 must be connected to allow operation from this pin.
15	REMOTE SETPOINT	Note 2, 4	Analog Voltage Input 0-10VDC, 10mV/°C, or 4-20mA: Reference to pin 6. Apply a DC voltage to this pin to adjust the unit's setpoint: Default Range = 0 – 10V (where: 0V = Low Temp Span, 10V = Hi Temp Span) (Input Impedance > 600K) Optional Range = 10mV/ °C. (Ex: 200mV = 20°C) (Max Input Voltage = 10VDC, or 4-20mA, 4mA = low temp span, 20 mA = high temp span.

Note 1: All relay contacts (except for Pin 10) are normally OPEN when power is off. Pin 10 contacts are normally CLOSED when power is off. Relay contacts are rated: 24V AC/DC, 2A, <= 0.08 Ohm maximum each or 5A total for all relays combined, 1mA minimum, switching capacity: 48VA/48W (Resistive load only).

Note 2: Default = 0-10VDC

Note 3: Connect to digital ground (pin 1) using a low resistance connection (gold contact relay).

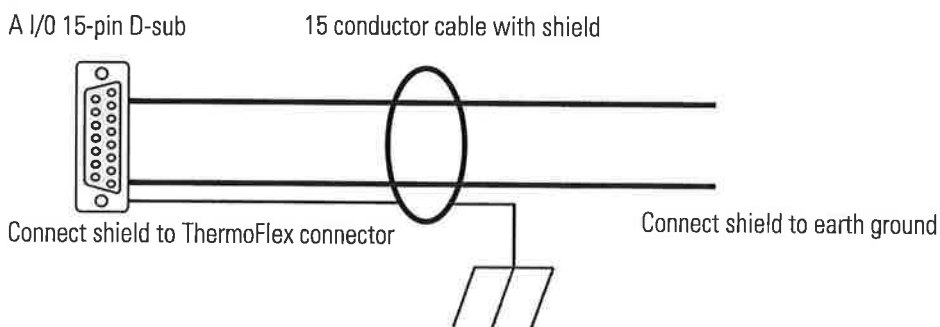
Note 4: Remote setpoint must be enabled, pin 13



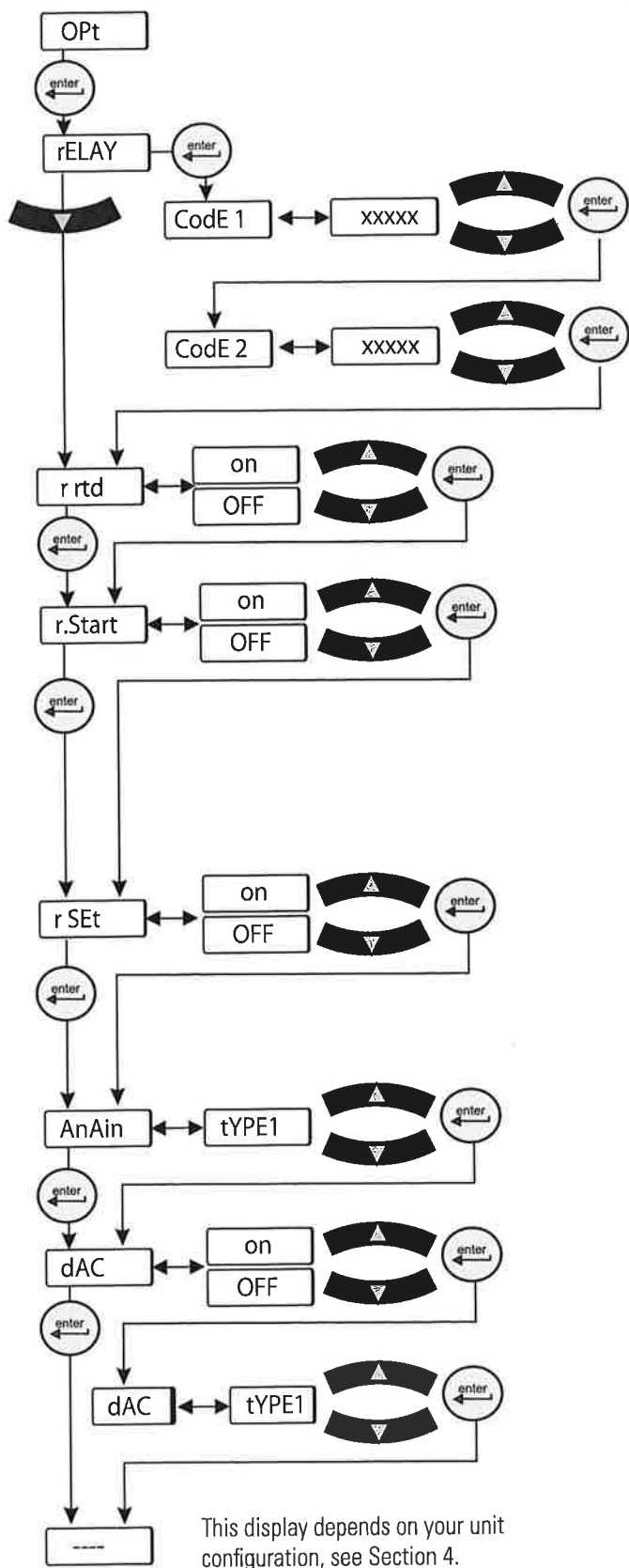
**WARNING** Never apply line voltage to any of the connections. ▲

**NOTE** When making your connection to the ThermoFlex Analog I/O connector, in order to comply with the EMC directive:

- Use a shielded I/O cable
- Connect the remote end of the cable shield to earth ground.
- Connect cable shield to ThermoFlex end connector. ▲



**Figure C-1** Analog I/O Connector



**Figure C-2** Analog I/O Loop

• **rELAY** is used to configure relay 1 (**CodE 1**) and relay 2 (**CodE 2**), see Tables 1 and 2 on the next page.

For example: To have just the drip pan, 4, **and** low temp, 8, error faults enabled for relay 1 you would enter their sum, 12, at the **CodE 1** display. To have the tank overflow, 2, the low temp, 16, **and** high pressure, 1024, error faults enabled for relay 2 you would enter their sum, 1040, at the **CodE 2** display.

• **r rtd** is used to enable/disable the remote temperature sensor. See Table 3 for pin out information.

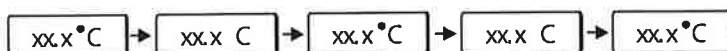
**NOTE** There is no other indication on the unit that the remote sensor is enabled. ▲

• **r.Start** is used to enable/disable the remote start/stop.

**NOTE** The analog I/O remote start/stop capability has priority over the controller's start/stop, as well as any serial communications start/stop message. ▲

• **r SEt** is used to enable/disable the remote setpoint.

**NOTE** When remote setpoint is enabled a flashing dot will appear on the controller's display as shown below. ▲



• **AnAin** is used to configure the analog voltage input type.

**Type 1:** 0 - 10 VDC (Default)

**Type 2:** 10 mV/°C

**Type 3:** 4 - 20 mA

• **dAC** is used to enable/disable the digital to analog converter. Once enabled, the desired output type can be selected.

**NOTE** The **Type** display only appears if **dAC** is set to **on**. ▲

**Type 1:** 0 - 10 VDC (Default)

**Type 2:** 10 mV/°C

**Type 3:** 4 - 20 mA

**Table 1** **Configurable Relay #1 (CodE1)**

Error	Error Number	Factory Default	
Low Level (option)	31	Enable	1 (Default)
Tank Overflow	44	Disable	2
Drip Pan Full (option)	57	Disable	4
Low Temp	19*	Disable	8
High Temp	21*	Disable	16
Low Flow (option)	27*	Enable	32 (Default)
High Flow (option)	29*	Disable	64
Low Resistivity (option)	28*	Disable	128
High Resistivity (option)	30*	Disable	256
High Pressure	60*	Disable	512
Low Pressure	61*	Disable	1024
Unit Fault	Any Fault	Enable	2048 (Default)
Pump/Unit Shut Off	Status bit(s)	Disable	4096
Refrigeration Shut Off	Status Bit	Disable	8192
Limit Fault (option)	39, 40, 45, 46, 47, 48	Enable	16384 (Default)
Sensor Fault	17, 18, 23, 24, 25, 26+ external sensor opened or shorted	Disable	32768
			Default Relay Code 1 Display = 18465 (1 + 32 + 2048 + 16384 = 18465)

\*Regardless of alarm setting - fault or indicator

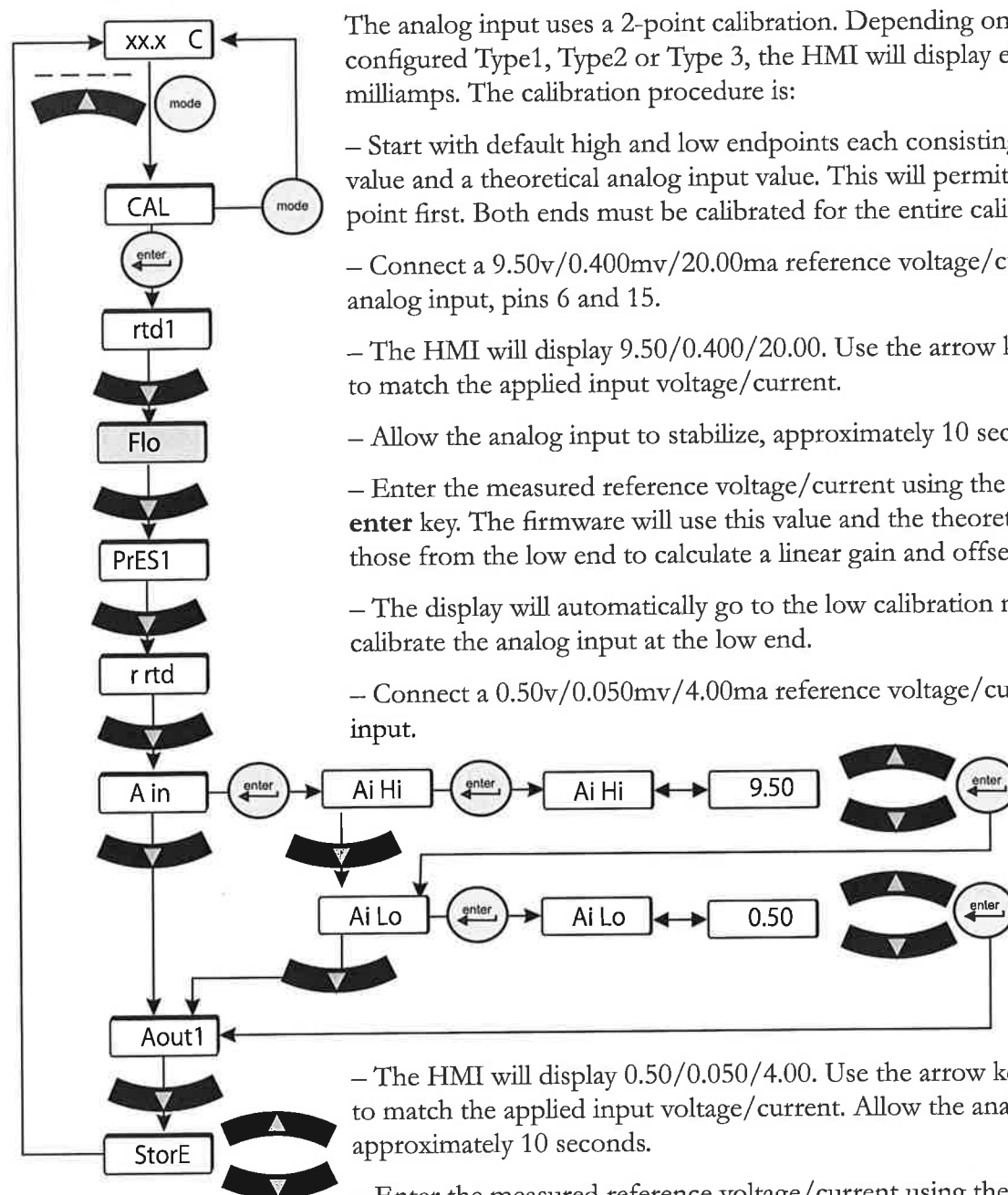
**Table 2** **Configurable Relay #2 (CodE2)**

Error	Error Number	Factory Default	
Low Level (option)	20	Disable	1
Tank Overflow	44	Disable	2
Drip Pan Full (option)	57	Disable	4
Auto Refill Error (option)	43	Disable	8
Low Temp	19*	Enable	16 (Default)
High Temp	21*	Enable	32 (Default)
Low Flow (option)	27*	Disable	64
High Flow (option)	29*	Disable	128
Low Resistivity (option)	28*	Disable	256
High Resistivity (option)	30*	Enable	512 (Default)
High Pressure	60*	Disable	1024
Low Pressure	61*	Disable	2048
Indicator (warning)	Any Indicator	Disable	4096
PM Timer (option)	50 - 56	Disable	8192
Comm Error	15, 41, 42	Disable	16384
Sensor Fault	17, 18, 23, 24, 25, 26+ external sensor opened or shorted	Enable	32768 (Default)
			Default Relay Code 2 Display = 33328 (16 + 32 + 512 + 32768 = 33328)

\*Regardless of alarm setting - fault or indicator



## Analog Input Calibration

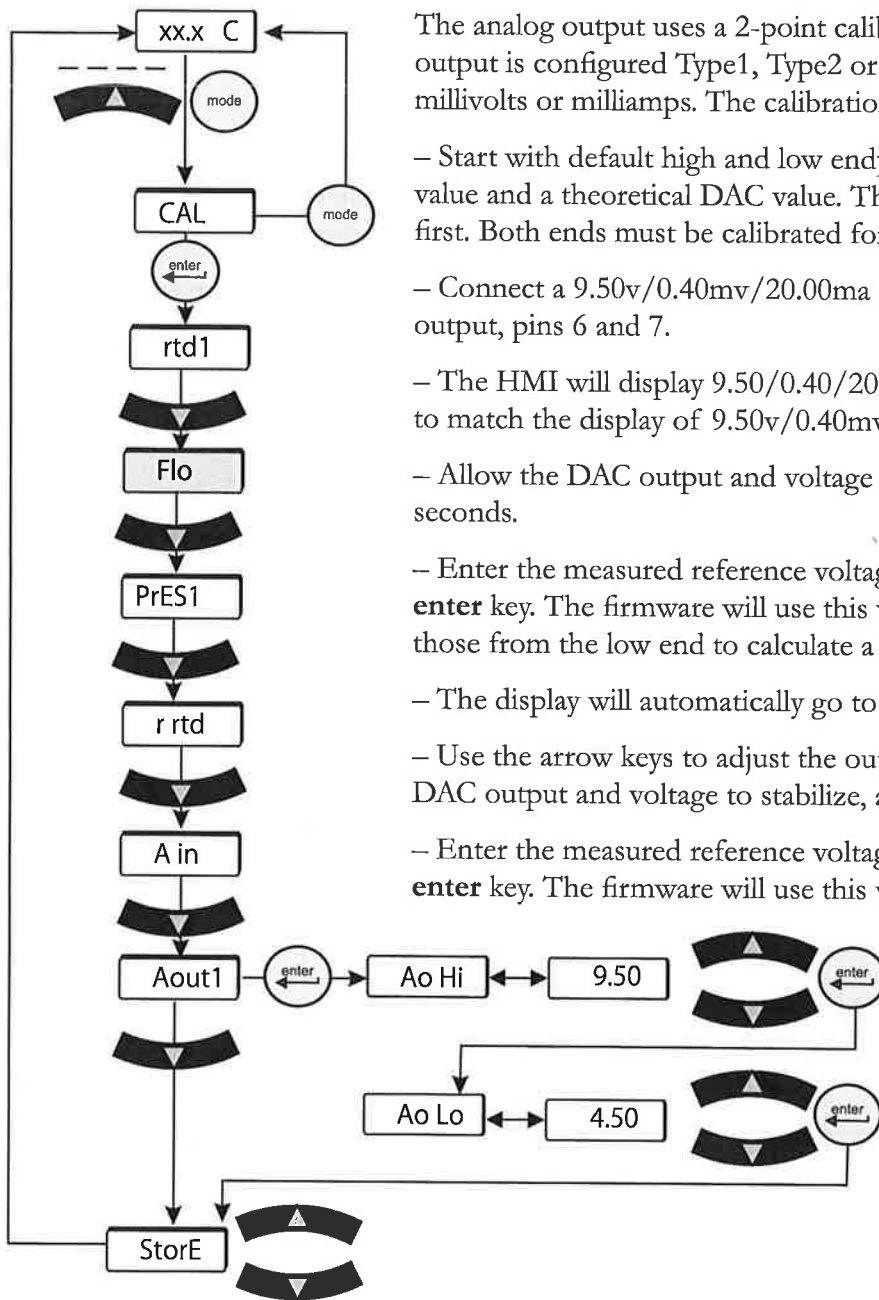


**Figure C-3** Analog Input Calibration Loop

The analog input uses a 2-point calibration. Depending on how the analog input is configured Type1, Type2 or Type 3, the HMI will display either volts, millivolts or milliamps. The calibration procedure is:

- Start with default high and low endpoints each consisting of a voltage/current value and a theoretical analog input value. This will permit calibration of either point first. Both ends must be calibrated for the entire calibration to be valid.
- Connect a 9.50v/0.400mv/20.00ma reference voltage/current source to the analog input, pins 6 and 15.
- The HMI will display 9.50/0.400/20.00. Use the arrow keys to adjust the display to match the applied input voltage/current.
- Allow the analog input to stabilize, approximately 10 seconds.
- Enter the measured reference voltage/current using the HMI by pressing the **enter** key. The firmware will use this value and the theoretical analog value and those from the low end to calculate a linear gain and offset.
- The display will automatically go to the low calibration message. Press **enter** to calibrate the analog input at the low end.
- Connect a 0.50v/0.050mv/4.00ma reference voltage/current source to the analog input.
- The HMI will display 0.50/0.050/4.00. Use the arrow keys to adjust the display to match the applied input voltage/current. Allow the analog input to stabilize, approximately 10 seconds.
- Enter the measured reference voltage/current using the HMI by pressing the **enter** key. The firmware will use this value and the theoretical analog input value and those from the high end to calculate a linear gain and offset.
- If the gain and offset are acceptable, the calibration is accepted and the calibration is now valid at the low end. Otherwise, the calibration is rejected and a bad calibration error message (**Er 16**) is displayed.

## Analog Output Calibration



The analog output uses a 2-point calibration. Depending on how the analog output is configured Type1, Type2 or Type 3, the HMI will display either volts, millivolts or milliamps. The calibration procedure is:

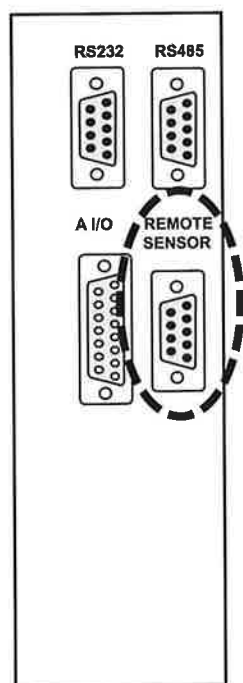
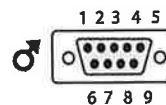
- Start with default high and low endpoints each consisting of a voltage/current value and a theoretical DAC value. This will permit calibration of either point first. Both ends must be calibrated for the entire calibration to be valid.
- Connect a 9.50v/0.40mv/20.00ma reference voltage/current meter to the DAC output, pins 6 and 7.
- The HMI will display 9.50/0.40/20.00. Use the arrow keys to adjust the output to match the display of 9.50v/0.40mv/20.00ma.
- Allow the DAC output and voltage reading to stabilize, approximately 10 seconds.
- Enter the measured reference voltage/current using the HMI by pressing the **enter** key. The firmware will use this value and the theoretical DAC value and those from the low end to calculate a linear gain and offset.
- The display will automatically go to the low calibration point.
- Use the arrow keys to adjust the output to match the displayed value. Allow the DAC output and voltage to stabilize, approximately 10 seconds .
- Enter the measured reference voltage/current using the HMI by pressing the **enter** key. The firmware will use this value and the theoretical DAC value and those from the high end to calculate a linear gain and offset.
- If the gain and offset are acceptable, the calibration is accepted and the calibration is now valid at the low end. Otherwise, the calibration is rejected and a bad calibration error message (**Er 16**) is displayed.

**Figure C-4** Analog Output Calibration Loop

## Remote Sensor Connector Pinout

**Table 3**

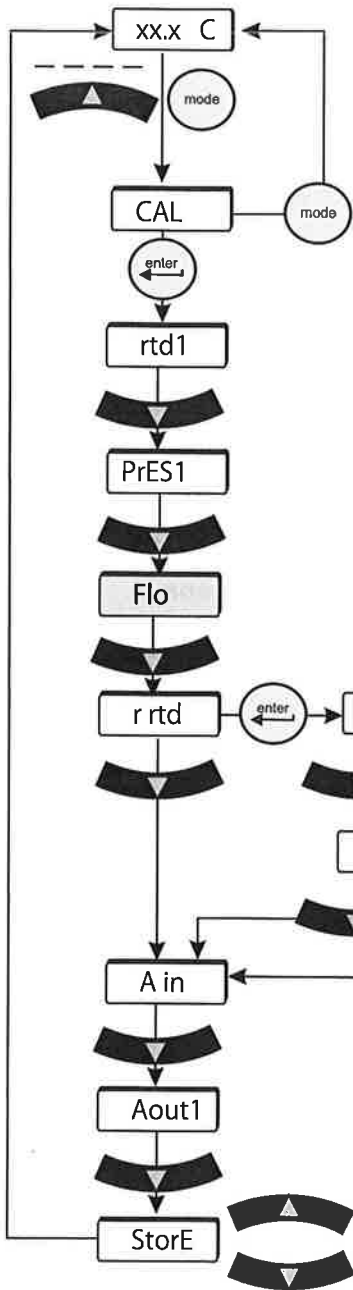
Pin	Color
1	White
2	NA
3	NA
4	White
5	NA
6	NA
7	Red
8	NA
9	Red (4th wire not connected to the control board)



**WARNING** Never apply line voltage to any of the connections. ▲

**Figure C-5** Remote Sensor Connector

# Remote Sensor Calibration



This procedure requires a running unit and a calibrated reference thermometer.

**NOTE** If it is more convenient, perform the low-end calibration before doing the high-end. ▲

Do not pick calibration points that are outside the safe operating limits of the fluid in your application. For example with water, 40°C and 5°C are typical high and low calibration points.

Place the remote sensor and a calibrated reference thermometer in the high temperature remote reservoir. Ensure the fluid temperature is stabilized.

Press the key and the controller will display **rtd H**. Press again and the controller will flash between **rtd H** and the temperature. Use the arrow keys to adjust the temperature to match the reference thermometer.

Press the key again to accept the value.

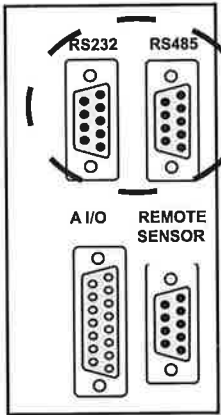
Place the remote sensor and calibrated reference thermometer in a low temperature reservoir. At the **rtd L** (low-end calibration) display repeat the procedure.

After the low-end calibration is accepted **StorE** is displayed. Press the up arrow to accept the calibration, press the down arrow key to not accept it.

**NOTE** After pressing the up arrow button at the **StorE** prompt wait several seconds before proceeding to ensure that a bad calibration message (**Er 16**) does not appear. Premature use of the keypad after pressing the up arrow may cancel the bad calibration error message. ▲

**Figure C-6** Remote Sensor Calibration Loop

# Appendix D NC Serial Communications Protocol



**NOTE** Appendix D assumes you have a basic understanding of communications protocols. ▲

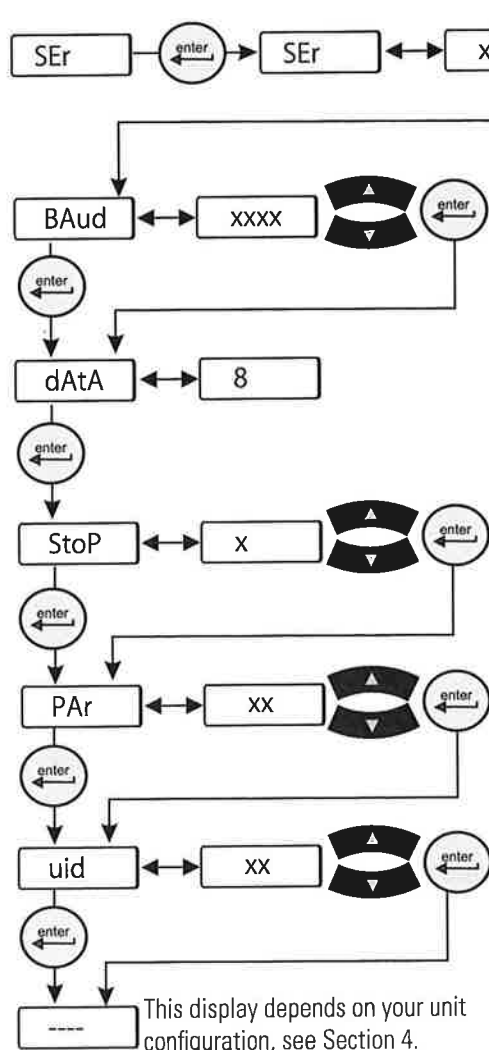


**WARNING** Never apply line voltage to any of the connections. ▲

Connect your PC to the applicable connector on the rear of the unit. Use the Setup Loop, see Section 4, to enable serial communications.

**NOTE** Once RS232 or RS485 is activated, all keypad operations are disabled except for turning the unit off and changing the serial communication's settings. ▲

**Figure D-1** Connectors



• **SEr** is used to enable/disable and to configure serial communications.  
**Range:** oFF, rS232, rS485      **Default:** oFF

• **BAud** is used to select the baud rate (speed) for serial communications.  
**Range:** 9600, 4800, 2400, 1200, 600, or 300 bits per second  
**Default:** 9600

• **dAtA** is used to display the number of data bits.  
**Range:** Fixed at 8

• **StoP** is used to indicate the number of stop bits.  
**Range:** 2 or 1      **Default:** 1

• **PAr** is used as a means to check for communication errors.  
**Range:** even, odd, or none      **Default:** none

• **uid** (unit id) is used in RS485 only. Identifies devices connected to the RS 485 port.  
**Range:** 1 to 99      **Default:** 1

**NOTE:** To prevent data errors limit the number of units to 32. ▲

**Figure D-2** Serial Communications Loop

All data is sent and received in binary form, do not use ASCII. In the following pages the binary data is represented in hexadecimal (hex) format.

The NC Serial Communications Protocol is based on a master-slave model. The master is a host computer, while the slave is the chiller's controller. Only the master can initiate a communications transaction (half-duplex). The slave ends the transaction by responding to the master's query. The protocol uses RS-232/RS-485 serial interface with the default parameters: 9600 baud, 8 data bits, 1 stop bit, and no parity. RS-485 offers a slave address selection, default parameter: 1.

The unit can be controlled through your computer's serial port by using the unit's standard female 9-pin connection.

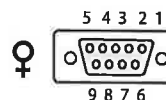
#### RS-232 COMM

Pin #	Function
1	No connection
2	TX
3	RX
4	No connection
5	GND = Signal ground
6 - 9	No connection

TX = Transmitted data from controller  
RX = Received data to controller.

#### RS-485 COMM

Pin #	Function
1-7	No connection
8	T+
9	T-



**Hardware Mating Connector**  
**AMP Part# 745492-2 or equivalent**

Communication cables are available from Thermo Fisher. Contact us for additional information.

All commands must be entered in the exact format shown in the tables on the following pages. The tables show all commands available, their format and responses. Controller responses are either the requested data or an error message. The controller response *must* be received before the host sends the next command.

The host sends a command embedded in a single communications packet, then waits for the controller's response. If the command is not understood or the checksums do not agree, the controller responds with an error command. Otherwise, the controller responds with the requested data. If the controller fails to respond within 1 second, the host should resend the command.

**NOTE** All byte values are shown in hex, hex represents the binary values that must be sent to the chiller. **Do not use ASCII.**

The framing of the communications packet in both directions is:

	Checksum region							
Lead char 0xCA/0xCC	Addr-MSB	Addr-LSB	Command	n d-bytes	d-byte 1	...	d-byte n	Checksum
<i>Lead char</i>	<b>0xCA (RS-232) 0xCC (RS-485)</b>							
	Device address is 1 (RS-232)							
<i>Addr-msb</i>	Most significant byte of slave address (RS-232: 0)							
<i>Addr-lsb</i>	Least significant byte of slave address (RS-232: 1)							
<i>Command</i>	Command byte (see Table of Commands)							
<i>n d-bytes</i>	Number of data bytes to follow							
<i>d-byte 1</i>	1 <sup>st</sup> data byte (the qualifier byte is considered a data byte)							
...	...							
<i>d-byte n</i>	n <sup>th</sup> data byte.							
<i>Checksum</i>	Bitwise inversion of the 1 byte sum of bytes beginning with the most significant address byte and ending with the byte preceding the checksum. (To perform a bitwise inversion, "exclusive OR" the one byte sum with FF hex.)							

When a command has no value associated with it (e.g., REQ ACK), "n d-bytes" will be set to 0. Values such as temperature and flow are sent as either 2 or 4 byte signed integers, depending on how they are stored in the controller RAM.

When the controller sends a value, a qualifier byte is sent first, followed by a 2 or 4 byte integer (the least significant byte is sent last). The qualifier indicates the precision and units of the value. The host does not send the qualifier byte; it must send the value using the correct precision, units and number of bytes. The host first inquires about a value it wants to change, then uses the number of data bytes and the qualifier byte it receives to generate the proper integer to send.

**Analog Values**

Qualifier Byte	
b.7	Precision of measurement
b.6	
b.5	
b.4	
b.3	Unit of measure index
b.2	
b.1	
b.0	

Unit of Measure	
Index	Unit
0	NONE
1	Temperature in °C
2	Temperature in °F
3	Flow liters per minute
4	Flow in gallons per minute
5	Time in seconds
6	Pressure in PSI
7	Pressure in bars
8	Resistivity in MΩ-cm
9	%
10	Volts
11	Pressure in kPa

A qualifier byte of 0x12 indicated that the value contains one decimal point and the units are °F, e.g., 98.6°F.

Examples to set setpoint to 25°C:

A. The precision and units are 1°C; a 2 byte integer is used. If you already know this, skip to step 3.

1. Master sends: CA 00 01 70 00 8E (Request Setpoint 1)
  2. Slave responds: CA 00 01 70 03 01 00 14 76 Precision =1, units =°C, value=20  
(20 x 1°C=20°C)
- Response indicates:  
 uses a 2 byte integer (nn=03)  
 precision and units are 1°C (d1=01)
3. Master sends: CA 00 01 F0 02 00 19 F3 (Set Setpoint 1 to 25°C)
  4. Slave responds: CA 00 01 F0 03 01 00 19 F1 Precision =1, units =°C, value=25  
(25 x 1°C=25°C)

B. The precision and units are 0.1°C; a 2 byte integer is used. If you already know this, skip to step 3.

1. Master sends: CA 00 01 70 00 8E (REQ SETPOINT1)
  2. Slave responds: CA 00 01 70 03 11 00 C8 B2 Precision =0.1, units =°C, value=200  
(200 x 0.1°C=20.0°C)
- Response indicates:  
 uses a 2 byte integer (nn=03)  
 precision and units are 0.1°C (d1=11)
3. Master sends: CA 00 01 F0 02 00 FA 12 (Set Setpoint 1 to 25.0°C)
  4. Slave responds: CA 00 01 F0 03 11 00 FA 00 Precision =0.1, units =°C, value=250  
(250 x 0.1°=25.0.0°C)

See Additional Command Examples in this Appendix.



### Table of Commands

Command	M: Master Sends S: Slave Responds	Notes
Request Status		
REQ ACK	M: lc a1 a2 <b>00</b> 00 cs S: lc a1 a2 <b>00</b> 02 v1 v2 cs	protocol version v1=0; v2=1
REQ UNIT SW VER or FIRMWARE CHECKSUM	M: lc a1 a2 <b>02</b> 00 cs S: lc a1 a2 <b>02</b> nn d1 ... dn cs	Unit SW version in ASCII
Example: Request SW version, unit returns 084992.2N		
1. Master sends:	lc a1 a2 <b>02</b> 00 cs	
2. Slave responds:	lc a1 a2 <b>02</b> 0A 30 38 34 39 39 32 2E 32 4E 20 E4	
Example: Request unit checksum, unit returns 20FA		
1. Master sends:	CA 00 01 <b>02</b> 01 01 FA	
2. Slave responds:	CA 00 01 <b>02</b> 04 32 30 46 41 0F	
REQ DISPLAY MSG	M: lc a1 a2 <b>07</b> 00 cs S: lc a1 a2 <b>07</b> nn d1 ... dn cs	Display message in ASCII
REQ STATUS	M: lc a1 a2 <b>09</b> 00 cs S: lc a1 a2 <b>09</b> nn d1 ... dn cs	see Request Status Table in this Appendix
ERROR	M: S: lc a1 a2 <b>0F</b> 02 en ed cs	Response Only! ed = Error Data en = Error Number 1: Bad Command 2: Bad Data 3: Bad Checksum See Error in this Appendix

Request Low Alarm Values		
REQ LO FLOW1	M: lc a1 a2 <b>30</b> 00 cs S: lc a1 a2 <b>30</b> 03 d1 d2 d3 cs	Process Alarm
REQ LO TEMP1	M: lc a1 a2 <b>40</b> 00 cs S: lc a1 a2 <b>40</b> 03 d1 d2 d3 cs	Process Alarm
REQ LO ANALOG1	M: lc a1 a2 <b>48</b> 00 cs S: lc a1 a2 <b>48</b> 03 d1 d2 d3 cs	Pressure Process Supply Alarm
Request High Alarm Values		
REQ HI FLOW1	M: lc a1 a2 <b>50</b> 00 cs S: lc a1 a2 <b>50</b> 03 d1 d2 d3 cs	Process Alarm
REQ HI TEMP1	M: lc a1 a2 <b>60</b> 00 cs S: lc a1 a2 <b>60</b> 03 d1 d2 d3 cs	Process Alarm
REQ HI ANALOG1	M: lc a1 a2 <b>68</b> 00 cs S: lc a1 a2 <b>68</b> 03 d1 d2 d3 cs	Pressure Process Supply Alarm
Request Measurements		
REQ FLOW1	M: lc a1 a2 <b>10</b> 00 cs S: lc a1 a2 <b>10</b> 03 d1 d2 d3 cs	Process Fluid Flow
REQ TEMP1	M: lc a1 a2 <b>20</b> 00 cs S: lc a1 a2 <b>20</b> 03 d1 d2 d3 cs	Process Fluid Supply Temperature (RTD1)
REQ TEMP2	M: lc a1 a2 <b>21</b> 00 cs S: lc a1 a2 <b>21</b> 03 d1 d2 d3 cs	Refrigeration Suction Temperature (RTD2)
REQ TEMP3	M: lc a1 a2 <b>22</b> 00 cs S: lc a1 a2 <b>22</b> 03 d1 d2 d3 cs	Refrigeration Ambient Temperature (RTD3)
REQ ANALOG1	M: lc a1 a2 <b>28</b> 00 cs S: lc a1 a2 <b>28</b> 03 d1 d2 d3 cs	Process Fluid Supply Pressure (P1)
REQ ANALOG2	M: lc a1 a2 <b>29</b> 00 cs S: lc a1 a2 <b>29</b> 03 d1 d2 d3 cs	Refrigeration Suction Pressure (P2)
Request PID Settings		
REQ SETPT1	M: lc a1 a2 <b>70</b> 00 cs S: lc a1 a2 <b>70</b> 03 d1 d2 d3 cs	Process Fluid Setpoint
REQ COOL P TERM1	M: lc a1 a2 <b>74</b> 00 cs S: lc a1 a2 <b>74</b> 03 d1 d2 d3 cs	
REQ COOL I TERM1	M: lc a1 a2 <b>75</b> 00 cs S: lc a1 a2 <b>75</b> 03 d1 d2 d3 cs	
REQ COOL D TERM1	M: lc a1 a2 <b>76</b> 00 cs S: lc a1 a2 <b>76</b> 03 d1 d2 d3 cs	

## Set Status Settings

SET KEYSTROKE	M: lc a1 a2 <b>80</b> 01 d1 cs S: lc a1 a2 <b>80</b> 01 d1 cs	See Keystroke in this Appendix
SET ON/OFF ARRAY	M: lc a1 a2 <b>81</b> nn d1 ... dn cs S: lc a1 a2 <b>81</b> nn d1 ... dn cs	See Set On/Off Array in this Appendix di: 0 = OFF, 1 = ON, 2 = no change
SET CALIBRATION	M: lc a1 a2 <b>82</b> 05 d1 ... d5 cs S: lc a1 a2 <b>82</b> 07 d1 ... d7 cs	See Calibration in this Appendix
SET SAVE UNIT CALIBRATION	M: lc a1 a2 <b>8B</b> 02 d1 d2 cs S: lc a1 a2 <b>8B</b> 02 d1 d2 cs	Save unit calibration data to reset or backup See Save Unit Calibration in this Appendix. d1 calibration id d2 reset = 0/backup = 1
Set Low Alarm Values		
SET LO FLOW1	M: lc a1 a2 <b>B0</b> 02 d1 d2 cs S: lc a1 a2 <b>B0</b> 03 d1 d2 d3 cs	Process Alarm
SET LO TEMP1	M: lc a1 a2 <b>C0</b> 02 d1 d2 cs S: lc a1 a2 <b>C0</b> 03 d1 d2 d3 cs	Process Alarm
SET LO ANALOG1	M: lc a1 a2 <b>C8</b> 02 d1 d2 cs S: lc a1 a2 <b>C8</b> 03 d1 d2 d3 cs	Pressure Process Supply Alarm
SET High Alarm Values		
SET HI FLOW1	M: lc a1 a2 <b>D0</b> 02 d1 d2 cs S: lc a1 a2 <b>D0</b> 03 d1 d2 d3 cs	Process Alarm
SET HI TEMP1	M: lc a1 a2 <b>E0</b> 02 d1 d2 cs S: lc a1 a2 <b>E0</b> 03 d1 d2 d3 cs	Process Alarm
SET HI ANALOG1	M: lc a1 a2 <b>E8</b> 02 d1 d2 cs S: lc a1 a2 <b>E8</b> 03 d1 d2 d3 cs	Pressure Process Supply Alarm
SET PID Settings		
SET SETPT1	M: lc a1 a2 <b>F0</b> 02 d1 d2 cs S: lc a1 a2 <b>F0</b> 03 d1 d2 d3 cs	Process Fluid Setpoint
SET COOL P TERM1	M: lc a1 a2 <b>F4</b> 02 d1 d2 cs S: lc a1 a2 <b>F4</b> 03 d1 d2 d3 cs	Cool P Term
SET COOL I TERM1	M: lc a1 a2 <b>F5</b> 02 d1 d2 cs S: lc a1 a2 <b>F5</b> 03 d1 d2 d3 cs	Cool I Term
SET COOL D TERM1	M: lc a1 a2 <b>F6</b> 02 d1 d2 cs S: lc a1 a2 <b>F6</b> 03 d1 d2 d3 cs	Cool D term

## Request Status Table

### Basic

nn	4				
	b0	Unit Running		b0	External EMO fault
	b1	RTD1 open or shorted		b1	Local EMO fault
	b2	RTD2 open or shorted		b2	Low Flow fault
d1	b3	RTD3 open or shorted	d3	b3	AutoRefill fault
	b4	High Temp fixed fault		b4	Sense 5V fault
	b5	Low Temp fixed fault		b5	Invalid level fault
	b6	High Temp fault or warn		b6	Low fixed flow warn
	b7	Low Temp fault or warn		b7	High pressure fault (set at factory)
	b0	High Pressure fault or warn		b0	Low pressure fault (set at factory)
	b1	Low Pressure fault or warn	d4	b1	Unit powering up
	b2	Drip Pan fault		b2	Unit powering down
d2	b3	High Level fault			
	b4	Phase Monitor fault			
	b5	Motor Overload fault			
	b6	LPC fault			
	b7	HPC fault			

## Error

The slave detected an error in the message it received from the master, so it returns this command instead of echoing the command sent by the master. The slave returns the command it received from the master in the ed byte, and an error code in the en byte.

en	Error
1	Bad command – not recognized by slave
2	Bad data
3	Bad checksum

Some errors may not result in any response. The slave ignores incoming bytes until it sees the valid lead character and its slave address. Then it must receive the correct number of bytes (determined by the length byte) before it can respond. If an incomplete frame is received, the slave will timeout and clear its input buffer without responding.

## Set On/Off Array

This command is used to set the state of the unit, on or off. Sending a 0 in the array turns off the unit while sending a 1 turns it on. Sending a 2 does not change the state. The array is returned showing the state after the command has been carried out. Sending all 2's effectively turns this command into a request status command.

nn	1
d1	Unit On/Off

## Set Keystroke

This command is used to effect a keystroke remotely as if someone pressed the key on the HMI.

d1 Value	
0	Null
1	Mode
2	Up/Yes
3	Down/No
4	Enter
5	Up/Mode
6	On/Off

### Set Special Commands

These commands are product specific.

Master Sends: lc a1 a2 **8D** nn d1 d2 d3 d4 d5 d6 cs

Slave Returns: lc a1 a2 **8D** nn d1 d2 d3 d4 d5 d6 cs

Byte	Master	Slave
d1	Command byte	
d2	Entered Value MSB	
d3	Entered Value	
d4	Entered Value	
d5	Entered Value	
d6	Entered Value LSB	

Command	Unit sends	Description	Slave returns
0x00	CA 00 01 8D 02 d1 d2 cs d1 = command byte = 00 d2 = analog option byte	Set analog option	CA 00 01 8D 03 00 d2 d3 cs
0x80	CA 00 01 8D 01 80 cs	Request PM status	CA 00 01 8D 03 80 d2 d3 cs

### Set analog option command

d2 analog option byte

b.6 - b.7 = unused	b.4 - b.5 = DAC enable	b.2 - b.3 = DAC out	b.0 - b.1 = analog in
	0 = voltage	0 = voltage	0 = voltage
	1 = millivolt	1 = millivolt	1 = millivolt
	2 = current	2 = current	2 = current
	3 = no change	3 = no change	3 = no change

Eg. Command to enable DAC, set DAC out to Voltage and set Analog in to millivolt

Unit sends	Slave returns
CA 00 01 8D 02 00 11 5E	CA 00 01 8D 02 00 11 5E

Eg. Command to set DAC out to current without changing DAC enable or analog in

Unit sends	Slave returns
CA 00 01 8D 02 00 3B 34	CA 00 01 8D 02 00 19 56

## DECLARATION OF CONFORMITY

Manufacturer: Thermo Fisher Scientific  
Address: 25 Nimble Hill Road  
Newington, NH 03801 USA



Products: Refrigerated chillers and heat exchangers.

Year of inception 2008

We declare that the following products conform to the Directives and Standards listed below:  
Unit has a 15 digit part number consisting of UU C VV PP c XXXXXXXX defined as follows:

UU = Unit type can be:

10 = TF 900    11 = TF 1400    12 = TF 2500    13 = TF 3500    14 = TF 5000  
15 = TF 7500    16 = TF 10000    17 = TF 15000    18 = TF 20000    19 = TF 24000

C = Cooling type and Temperature Range and can be a 1-4 inclusive, where:

1 = Air Cooled Standard Temp (5-40°C)    2 = Air Cooled Hi Temp (5-90°C)  
3 = Water Cooled Standard Temp (5-40°C)    4 = Water Cooled Hi Temp (5-90°C)

VV = Unit voltage rating:

UU = 10, 11, 12, 13 & 14	UU = 15, 16 & 17	UU = 18 & 19
10 = 115V, 60Hz    1Ph	17 = 200/208/230V, 60Hz    3Ph	17 = 208/230V, 60Hz    3Ph
100V, 50Hz    1Ph	200V, 50Hz    3Ph	
11 = 100/115V, 60Hz    1Ph	18 = 400V, 50Hz    3Ph	18 = 400V, 50Hz    3Ph
100/115V, 50Hz    1Ph	20 = 200/208/230V, 60Hz    3Ph	
12 = 208/230V, 60Hz    1Ph	200-230V, 50Hz    3Ph	
200V, 50Hz    1Ph	21 = 460V, 60Hz    3Ph	21 = 460V, 60Hz    3Ph
16 = 230V, 50Hz    1Ph	400V, 50Hz    3Ph	400V, 50Hz    3Ph
20 = 200/208/230V, 60Hz    1Ph		
200/230V, 50Hz    1Ph		

PP = Pump type, can be 10 through 25 inclusive.

c = Unit controller type, can be any digit from 1-6, inclusive.

X = Any digit from 0-9, used as sequential numbering only.

Equipment Class: Measurement, control and laboratory

Directives and Standards:

2004/108/EC – Electromagnetic Compatibility ( EMC Directive ):

EN 61326-1: 2006 – Electrical equipment for measurement, control, and laboratory use – EMC requirements, EMC Class A

2006/95/EC – Low Voltage Directive ( LVD ):

EN 61010-1: 2004 – Safety requirements for electrical equipment for measurement, control, and laboratory use – general requirements.

EN 61010-1: 2004 – Safety requirements for electrical equipment for measurement, control, and laboratory use – general requirements.

Additional EMC Evaluations with Certificates:

EN 61000-3-2: 2006 Harmonics

EN 61000-3-3: 2008 Flicker

Manufacturer's Authorized Representative:

Date:

1 September 2010

Robin Wiley Compliance Engineering

## WARRANTY

Thermo Fisher Scientific warrants for 24 months from date of shipment the Thermo Scientific NESLAB ThermoFlex unit according to the following terms.

Any part of the unit manufactured or supplied by Thermo Fisher Scientific and found in the reasonable judgment of Thermo Fisher to be defective in material or workmanship will be repaired at an authorized Thermo Fisher Repair Depot without charge for parts or labor. The unit, including any defective part must be returned to an authorized Thermo Fisher Repair Depot within the warranty period. The expense of returning the unit to the authorized Thermo Fisher Repair Depot for warranty service will be paid for by the buyer. Our responsibility in respect to warranty claims is limited to performing the required repairs or replacements, and no claim of breach of warranty shall be cause for cancellation or rescission of the contract of sales of any unit. With respect to units that qualify for field service repairs, Thermo Fisher Scientific's responsibility is limited to the component parts necessary for the repair and the labor that is required on site to perform the repair. Any travel labor or mileage charges are the financial responsibility of the buyer.

The buyer shall be responsible for any evaluation or warranty service call (including labor charges) if no defects are found with the Thermo Scientific product.

This warranty does not cover any unit that has been subject to misuse, neglect, or accident. This warranty does not apply to any damage to the unit that is the result of improper installation or maintenance, or to any unit that has been operated or maintained in any way contrary to the operating or maintenance instructions specified in this Instruction and Operation Manual. This warranty does not cover any unit that has been altered or modified so as to change its intended use.

In addition, this warranty does not extend to repairs made by the use of parts, accessories, or fluids which are either incompatible with the unit or adversely affect its operation, performance, or durability.

Thermo Fisher Scientific reserves the right to change or improve the design of any unit without assuming any obligation to modify any unit previously manufactured.

THE FOREGOING EXPRESS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

OUR OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE COMPONENT PARTS AND Thermo Fisher Scientific DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION.

Thermo Fisher Scientific ASSUMES NO RESPONSIBILITY FOR INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO LOSS OR DAMAGE TO PROPERTY, LOSS OF PROFITS OR REVENUE, LOSS OF THE UNIT, LOSS OF TIME, OR INCONVENIENCE.

This warranty applies to units sold in the United States. Any units sold elsewhere are warranted by the affiliated marketing company of Thermo Fisher Scientific. This warranty and all matters arising pursuant to it shall be governed by the law of the State of New Hampshire, United States. All legal actions brought in relation hereto shall be filed in the appropriate state or federal courts in New Hampshire, unless waived by Thermo Fisher Scientific.



**DECLARATION OF CONFORMITY**

Manufacturer: Thermo Fisher Scientific  
Address: 25 Nimble Hill Road  
Newington, NH 03801 USA

We declare that the following products conform to the Directives and Standards listed below:

Products: ThermoFlex ( TF ) product line of chillers and heat exchangers.

Unit has a 15 digit part number consisting of UU C VV PP c XXXXXXXX defined as follows:

UU = unit type can be:

10 = TF 900      14 = TF 3500  
11 = TF 1400     15 = TF 5000  
12 = TF 2500

C = Cooling type and Temperature Range and can be a 1-4 inclusive, where:

1 = Air Cooled Standard Temp      (5-40°C)  
2 = Air Cooled Hi Temp              (5-90°C)  
3 = Water Cooled Standard Temp    (5-40°C)  
4 = Water Cooled Hi Temp            (5-90°C)

VV = Voltage:

10 = 115V      60Hz    100V      50 Hz    1 PH  
11 = 100/115V 60Hz    100V      50 Hz    1 PH  
12 = 208-230V 60Hz    200V      50 Hz    1 PH  
16 =                    230V      50 Hz    1 PH  
20 = 200-230V 60Hz    200/230V 50 Hz    1 PH

PP = Pump type, can be 10, 11, 12, 13, 14, 15, 16 or 17

c = Controller and can be any digit from 1-6, inclusive

X = any digit from 0-9 used as sequential numbering only

Equipment Class: Measurement, control and laboratory - EMC Class A

Directives and Standards:

89/336/EEC – Electromagnetic Compatibility (EMC Directive):

EN 61326-1 : 2006 – Electrical equipment for measurement, control, and laboratory use – EMC requirements

73/23/EEC – Low Voltage Directive (LVD):

EN 61010-1:2001 – Safety requirements for electrical equipment for measurement, control, and laboratory use – general requirements.

Manufacturer's Authorized Representative:

Date:

  
\_\_\_\_\_

21 July 2008

Robin Wiley  
Compliance Engineering



# Thermo NESLAB

## Shipping Check List

ATTENTION CUSTOMER: *Do not discard carton or packing materials.  
Inspect carton and unit for damaged incurred in transit. If the unit is  
damaged, you must save the carton for inspection by the freight company.*

Model: TF25 B A 208/60 P1 IPR 2 SPFTG

Serial Number: 111056010

BOM: 121121010000005

- Unit clean.
- Unit inspected for cosmetic flaws.
- Unit Cords and fittings properly packaged.
- Cover secured (if applicable).
- Tank Isolation Valves in NORMAL Position (If applicable).

The following items should be included with this unit.

- End Item Inspection card (if applicable)

Item #	Description	Qty	UOM	Stock
<input checked="" type="checkbox"/> U00933	INST MAN,THERMOFLEX,BASIC KB	1	EA	TFLX
<input checked="" type="checkbox"/> U00945	QCK START PROC,TFLEX,BASIC KB	1	EA	TFLX
<input checked="" type="checkbox"/> 094641	ELB,ADPTR,12MM T X 1/2MPT,BRS	2	EA	07162

This unit packaged with pride by \_\_\_\_\_

*Josh*

Please phone Thermo NESLAB Sales Department if you  
have any questions regarding the equipment you ordered.

(800)258-0830 (603)436-9444 fax (603)436-8411

25 Nimble Hill Road, Newington, NH USA 03801

026324 03/21/01

