Thermo Scientific
NESLAB
ThermoFlex™
Recirculating Chillers
(Basic Controller)
Thermo Scientific Manual P/N U00933 Rev. 07/07/11

Installation
Operation
Basic Maintenance

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WARRANTY
Pull out the plastic shipping plugs.

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.

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.)

For ThermoFlex 5000 through 10000 units, place the circuit protector to the on (1) 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.

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 MQ-cm, compensated)

0 – 75% Ethylene Glycol/Water

0 – 75% Propylene Glycol/Water
Quick Start - Used for Initial Start Up Only — perform steps 5 to 20 for all units.

NOTE: Some ranges/defaults are pump dependent, see Section 4 in the manual. Once any Setup step is completed, meaning you pressed the STOP key a second time, you cannot repeat the step to make corrections. You can make changes after the unit is started.

Press [F] to continue the setup procedure.

1. Lo P  
   Sets the fluid’s Low Temperature Alarm Limit.  
   Range: +3°C to +42°C  
   Factory Default: 3°C

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between Lo P and the default

2. Hi P  
   Sets the Pump’s High Pressure Discharge Alarm Limit.  
   Range: Varies by pump  
   Factory Default: Varies by pump

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between Hi P and the default

3. Lo Pi  
   Sets the Pumps Low Pressure Alarm Limit.  
   Range: Varies by pump  
   Factory Default: Varies by pump

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between Lo Pi and the default

4. Hi Pi  
   Sets the Pumps High Pressure Discharge Alarm Limit.  
   Range: Varies by pump  
   Factory Default: 0 seconds

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between Hi Pi and the default

5. dELAY  
   Is the length of time the pump can exceed the Lo Pi Alarm Limit before shutting down.  
   Range: 0 to 30 seconds  
   Factory Default: 10 seconds

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between dELAY and 10

6. RLr  
   Configures the unit’s reaction to temperature, pressure, and flow (optional) alarm limits — either shut down (RLr) or continue to run (IndC).  
   See Section 4 in the manual for more information

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between RLr and RLr

7. ALr  
   Configures the unit’s alarm limit.

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between ALr and ALr

8. CACr  
   Enables/disables autoclean.  
   Range: on or OFF  
   Factory Default: ON

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between CACr and CACr

9. CYc  
   Stopped is used to indicate the number of start cycles.  
   Display: 8

   - Press [H] if desired, use [A] to adjust the value  
   - Press [P] if desired, use [B] to adjust the value  
   - Press [L] if desired, use [C] to adjust the value  
   - Press [X] if desired, use [D] to adjust the value  
   - The display will flash between CYc and CYc

10. dAAl  
    Enables/disables autoclean.  
    Range: on or OFF  
    Factory Default: OFF

    - Press [H] if desired, use [A] to adjust the value  
    - Press [P] if desired, use [B] to adjust the value  
    - Press [L] if desired, use [C] to adjust the value  
    - Press [X] if desired, use [D] to adjust the value  
    - The display will flash between dAAl and dAAl

11. PAr  
    Enables/disables autoclean.  
    Range: on or OFF  
    Factory Default: OFF

    - Press [H] if desired, use [A] to adjust the value  
    - Press [P] if desired, use [B] to adjust the value  
    - Press [L] if desired, use [C] to adjust the value  
    - Press [X] if desired, use [D] to adjust the value  
    - The display will flash between PAr and PAr

12. ud  
    Enables/disables autoclean.  
    Range: on or OFF  
    Factory Default: OFF

    - Press [H] if desired, use [A] to adjust the value  
    - Press [P] if desired, use [B] to adjust the value  
    - Press [L] if desired, use [C] to adjust the value  
    - Press [X] if desired, use [D] to adjust the value  
    - The display will flash between ud and ud

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.

**Option - Voltage — Step A**
- Press [H] if desired, use [A] to change the frequency
- Press [P] if your unit does not have a flow transducer or serial communications see Step 20.

**Option - Flow Transducer — Steps B and C**
- Press [H] if desired, use [A] to change the value
- Press [P] if your unit does not have a flow transducer or serial communications see Step 20.

**Option - Serial Communications (DCOM) — Steps D to I**
- Press [H] if desired, use [A] to change the value
- Press [P] if your unit does not have a flow transducer or serial communications see Step 20.
Veiligheidsmaatregelen:

De unit is alleen ontworpen voor gebruik binnenshuis.
Plaats een unit nooit op een plek met overtredende warmte, vocht, onvoldoende ventilatie of corrosieve materialen.

Gebruik nooit onthardbare of corrosieve vloeistoffen met deze unit.

Sluit nooit procesvloeistofleidingen aan op de watervoorziening van uw locatie of andere vloeistoffbronnen 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.

<table>
<thead>
<tr>
<th>Totaal 1 - Toegestane vloeistoffen:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door gebruik van vloeistoffen die niet hieronder worden vermeld, kan de fabrikant onantastbaar worden.</td>
</tr>
<tr>
<td>Gedeflene in elkervoudig gedestilleerd water</td>
</tr>
<tr>
<td>Gedeioniseerde water (1:3 M3:G, gecompenseerd)</td>
</tr>
<tr>
<td>0 - 75% Ethenyleenglycol/water</td>
</tr>
<tr>
<td>0 - 75% Propyleenglycol/water</td>
</tr>
</tbody>
</table>
Quick Start - Alleen gebruikt voor het initiële opstarten - voor de stappen 9 tot 20 uit voor alle units.

Let op: Sommige bereik/standaardwaarden zijn afhankelijk van de pomp, zie hoofdstuk 4 in de handling. Als een Setup-stap eenmaal is voltooid, wat betekent dat u de instellingen niet meer kunt wijzigen, kunt u de unit uitoust en installatie tekenen. U kunt wijzigingen doen nadat de unit is gestart.

Druk op om de procedure opnieuw te starten.

---

**Option - Universele spanning - Stap A**

Met Hi t kan de Alarmlamp voor hoge temperatuur van de Vloostof worden ingeschakeld.

**Met Hi t kan de Alarmlamp voor hoge temperatuur van de Vloostof worden ingeschakeld.**

**Stap 1:**
- Druk op om de Universele spanning te starten.
- Druk op om de universele spanning te wijzigen.
- Druk op om de Universele spanning te vernemen.

**Stap 2:**
- Druk op om de Universele spanning te starten.
- Druk op om de universele spanning te wijzigen.
- Druk op om de Universele spanning te vernemen.

---

**Option - Volumestroomomzetter - Stappen B en C**

**Stap 1:**
- Druk op om de Volume omzetter B en C te starten.
- Druk op om de Volume omzetter B en C te wijzigen.
- Druk op om de Volume omzetter B en C te vernemen.

**Stap 2:**
- Druk op om de Volume omzetter B en C te starten.
- Druk op om de Volume omzetter B en C te wijzigen.
- Druk op om de Volume omzetter B en C te vernemen.

---

**Option - Seriële communicatie (DCOM) - Stappen D tot I**

**Stap 1:**
- Druk op om de seriële communicatie te starten.
- Druk op om de seriële communicatie te wijzigen.
- Druk op om de seriële communicatie te vernemen.

**Stap 2:**
- Druk op om de seriële communicatie te starten.
- Druk op om de seriële communicatie te wijzigen.
- Druk op om de seriële communicatie te vernemen.

---

**Raadpleeg, indien van toepassing, de kaders rechts voor het instellen van de opties. Raadpleeg voor units met Analooog i/o (ACOM) de additionele quick start die bij de unit is geleverd.**

---

**De Setup-procedure is nu voltooid.**

Als de unit start, zal de besturing van de temperatuur van de vloostof worden geëvengeen.

**Indien gewenst kunt u het setup menu van de unit wijzigen.**

**Druk op om de procedure opnieuw te starten.**

---

**SP wordt gebruikt om het setup menu van de unit te starten.**

**Druk op om de procedure opnieuw te starten.**

---

**PAr wordt gebruikt als een middel om op communicatiefouten te contouren.**

**Druk op om de procedure opnieuw te starten.**

---

**A20**

---

**Baud wordt gebruikt om de baudrate (seuilbaat) voor serieuze communicatie te kiezen.**

**Druk op om de procedure opnieuw te starten.**

---

**Stop wordt gebruikt om het aantallen stopbits aan te geven.**

**Druk op om de procedure opnieuw te starten.**

---

**Zie stap 20.**
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 appareil ont la capacité de supporter la pression de 180 psi.
Avant d'utiliser un liquide quelconque ou d'effectuer des travaux d'entretien susceptibles d'éventrer un contact avec le liquide, consultez les recommandations de santé-sécurité du fabricant.

Tableau 1 - Liquides acceptables : 
<table>
<thead>
<tr>
<th>Liquide</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eau filtrée/mono distillée</td>
<td></td>
</tr>
<tr>
<td>Eau déionisée (1 à 3 MD-um, compensée)</td>
<td></td>
</tr>
<tr>
<td>Éthylène glycol liquide 0 à 75 %</td>
<td></td>
</tr>
<tr>
<td>Propylène glycol liquide 0 à 75 %</td>
<td></td>
</tr>
</tbody>
</table>

Remarque : Si l'appareil est équipé d'une cartouche de filtre de déionisation, consultez le manuel, Section 5, pour l'installation.
Démarrage rapide - Ne sert que pour le premier démarrage - effectuer les étapes 9 à 20 pour toutes les unités.

**Option - Tension globale - Étape A**

- **H2**
  - Appuyer sur pour identifier la fréquence d'entrée pour les unités de tension globale. La fréquence sélectionnée ajuste automatiquement le réglage de haute pression par défaut fixé du microprogramme.
  - Plage : 50 ou 60 Hz Par défaut : 60 Hz

**Option - Transducteur de débit - étapes B et C**

- **HFL0** défair 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

**Option - Communications série (DCOM) - étapes D à I**

- **SR** peut être activé/désactivé et configurer le mode de communications série.
  - Plage : off, r252, r6495
  - Réglage d'usine par défaut : off

**Conseil de lecture**

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.
Ziehen Sie die Kunststoff-Verbandsdrücker heraus.

Beschneiden Sie den Behälter am Glas mit sauberer Flussigkeit (siehe Tabelle 1) und kollidieren Sie die Flüssigkeitsmenge. Falls der Behälter voll ist, schrauben Sie die Behälterkappe fest auf. Die möglicherweise die Kapazität des Behälters im Vergleich zu Ihrer Applikation eher klein ist und Luft aus den Leitungen gespült werden muss, halten Sie weiter die Kühlkörper zur Nachfüllung bereit, wenn der externe Kühler aufgestellt wird.

Verwenden Sie Wasser, kühle Flüssigkeit oder korrosive Flüssigkeiten in diesem Gerät.

Schutzlied: Unter Druck stehende Flüssigkeiten an, nicht in Druckrichtung aus der Kuhlapparatur entfernen. Falls Sie Flüssigkeiten aus dem Gerät entfernen, stellen Sie sicher, dass die Flüssigkeiten und Flüssigkeitseinschläge einer Applikation einem Druck von mindestens 185 psca. 9.8 bar standhalten.

Vor der Suche nach Festkühlern einsetzen oder eine Wartung durchführen, bei deren Sie möglicherweise mit Flüssigkeiten in Berührung kommen, beachten Sie die im Sicherheitsdoku-ment des Herstellers beschriebenen Vorsichtsmaßnahmen.

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.

Tabelle 1 - Zulässige Flüssigkeiten:

<table>
<thead>
<tr>
<th>Flüssigkeit</th>
<th>Prozent</th>
<th>Flüssigkeitsgehalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deionisiertes Wasser</td>
<td>0 - 75%</td>
<td>0 - 75% Propylanolol/Wasser</td>
</tr>
<tr>
<td>Deionisiertes Wasser</td>
<td>0 - 75%</td>
<td>0 - 75% Propylanolol/Wasser</td>
</tr>
</tbody>
</table>

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

Gerütseltes/desinfiziertes Wasser

- Deionisiertes Wasser (1-3 Miohm, kompensiert)
- 0 - 75% Ethylenol/Wasser
- 0 - 75% Propylanolol/Wasser
**Schnellstart - Nur für die erste Inbetriebnahme — führen Sie die Schritte 9 bis 20 für alle Geräte aus.**


**Drücken Sie **Setup**, um den Vorgang fortzusetzen.
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.

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
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. 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

<table>
<thead>
<tr>
<th>Process Fluid Temperature and Setpoint Range</th>
<th>ThermoFlex900</th>
<th>ThermoFlex1400</th>
<th>ThermoFlex2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5°C to +40°C</td>
<td>+5°C to +40°C</td>
<td>+5°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+41°F to +104°F</td>
<td>+41°F to +104°F</td>
<td>+41°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Temperature Range</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+10°C to +40°C</td>
<td>+10°C to +40°C</td>
<td>+10°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+50°F to +104°F</td>
<td>+50°F to +104°F</td>
<td>+50°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

| Temperature Stability                       | ±0.1°C        | ±0.1°C        | ±0.1°C        |

<table>
<thead>
<tr>
<th>Cooling Capacity at 20°C</th>
<th>60 Hz</th>
<th>1400 W (4781 BTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 Hz</td>
<td>1170 W (3996 BTU)</td>
</tr>
<tr>
<td>900 W (3074 BTU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>750 W (2561 BTU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2500 W (8538 BTU)*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*To meet this specification, the ThermoFlex2500 air-cooled units require the fan to be operating in the high-speed mode, see Section 3.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>R134A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Reservoir Volume</th>
<th>Gallons</th>
<th>Liters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.9</td>
<td>7.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footprint or Dimensions (H x W x D)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inches</td>
</tr>
<tr>
<td></td>
<td>Centimeters</td>
</tr>
</tbody>
</table>

|                                     | 27.3 x 14.2 x 24.6 | 27.3 x 14.2 x 24.6 |
|                                     | 69.2 x 36.0 x 62.4 | 69.2 x 36.0 x 62.4 |
|                                     | 29.0 x 17.2 x 26.5 | 73.6 x 43.6 x 67.3 |

<table>
<thead>
<tr>
<th>Unit Weight P2 Pump (empty)</th>
<th>lb</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>130.5</td>
<td>59.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pumping Capacity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 - Positive Displacement 60 Hz</td>
<td>2.1 gpm @ 60 psig (7.9 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>P2 - Positive Displacement 60 Hz</td>
<td>4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>T1 - Turbine 60 Hz*</td>
<td>3.5 gpm @ 60 psig (13.3 lpm @ 4.1 bar)</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Process Fluid Temperature and Setpoint Range</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5°C to +40°C</td>
<td>+5°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+41°F to +104°F</td>
<td>+41°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Temperature Range</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>+10°C to +40°C</td>
<td>+10°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+50°F to +104°F</td>
<td>+50°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

| Temperature Stability     | ± 0.1°C         |

<table>
<thead>
<tr>
<th>Cooling Capacity at 20°C</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>3500 W (11953 BTU)</td>
<td>5000 W (17076 BTU)</td>
</tr>
<tr>
<td>50 Hz</td>
<td>3050 W (10416 BTU)</td>
<td>4400 W (15027 BTU)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>R407C</td>
<td>R407C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reservoir Volume</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallons</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Liters</td>
<td>7.2</td>
<td>7.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footprint or Dimensions (H x W x D)</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches</td>
<td>38.9 x 19.3 x 30.9</td>
<td>38.9 x 19.3 x 30.9</td>
</tr>
<tr>
<td>Centimeters</td>
<td>98.7 x 48.8 x 78.4</td>
<td>98.7 x 48.8 x 78.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit Weight P1/P2/P3/P4 (empty)</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb</td>
<td>264/264/270/303</td>
<td>NA/264/270/303</td>
</tr>
<tr>
<td>kg</td>
<td>120/120/123/138</td>
<td>NA/120/123/138</td>
</tr>
</tbody>
</table>

**Pumping Capacity**

<table>
<thead>
<tr>
<th>Pumping Capacity</th>
<th>ThermoFlex3500</th>
<th>ThermoFlex5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 - Positive Displacement 60 Hz</td>
<td>2.1 gpm @ 60 psig (7.9 lpm @ 4.1 bar)</td>
<td>Not Available</td>
</tr>
<tr>
<td>50 Hz</td>
<td>1.7 gpm @ 60 psig (6.4 lpm @ 4.1 bar)</td>
<td>Not Available</td>
</tr>
<tr>
<td>P2 - Positive Displacement 60 Hz</td>
<td>4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)</td>
<td>4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>50 Hz</td>
<td>3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)</td>
<td>3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>T1 - Turbine 60 Hz*</td>
<td>3.5 gpm @ 60 psig (13.3 lpm @ 4.1 bar)</td>
<td>3.5 gpm @ 60 psig (13.3 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>50 Hz*</td>
<td>2.5 gpm @ 60 psig (9.5 lpm @ 4.1 bar)</td>
<td>2.5 gpm @ 60 psig (9.5 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>P3 - Centrifugal Pump 60 Hz*</td>
<td>10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)</td>
<td>10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)</td>
</tr>
<tr>
<td>50 Hz*</td>
<td>10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)</td>
<td>10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)</td>
</tr>
<tr>
<td>P4 - Centrifugal Pump 60 Hz*</td>
<td>15 gpm @ 57 psid (56.8 lpm @ 3.9 bar)</td>
<td>15 gpm @ 57 psid (56.8 lpm @ 3.9 bar)</td>
</tr>
<tr>
<td>50 Hz*</td>
<td>15 gpm @ 34 psid (56.8 lpm @ 2.3 bar)</td>
<td>15 gpm @ 34 psid (56.8 lpm @ 2.3 bar)</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Process Fluid Temperature and Setpoint Range</th>
<th>ThermoFlex 7500</th>
<th>ThermoFlex 10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5°C to +40°C</td>
<td>+5°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+41°F to +104°F</td>
<td>+41°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Temperature Range</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+10°C to +40°C</td>
<td>+10°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+50°F to +104°F</td>
<td>+50°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

| Temperature Stability                      | ±0.1°C         | ±0.1°C         |

<table>
<thead>
<tr>
<th>Cooling Capacity at 20°C 60Hz 50Hz</th>
<th>ThermoFlex 7500</th>
<th>ThermoFlex 10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>7500 W (25575 BTU)</td>
<td>10000 W (34100 BTU)</td>
<td></td>
</tr>
<tr>
<td>6425 W (21910 BTU)</td>
<td>8500 W (28995 BTU)</td>
<td></td>
</tr>
</tbody>
</table>

| Refrigerant                               | R407C          | R407C          |

<table>
<thead>
<tr>
<th>Reservoir Volume</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallons</td>
<td>4.75</td>
<td>4.75</td>
</tr>
<tr>
<td>Liters</td>
<td>17.9</td>
<td>17.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footprint or Dimensions (H x W x D)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-Cooled Inches</td>
<td>52.3 x 25.2 x 33.8</td>
<td>52.3 x 25.2 x 33.8</td>
</tr>
<tr>
<td>Centimeters</td>
<td>132.7 x 63.9 x 85.6</td>
<td>132.7 x 63.9 x 85.6</td>
</tr>
<tr>
<td>Water-Cooled Inches</td>
<td>45.9 x 25.2 x 33.8</td>
<td>45.9 x 25.2 x 33.8</td>
</tr>
<tr>
<td>Centimeters</td>
<td>116.6 x 63.9 x 85.6</td>
<td>116.6 x 63.9 x 85.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit Weight P2/P3/P5 (empty)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-Cooled lb kg</td>
<td>356/372.5/405.5</td>
<td>356/372.5/405.5</td>
</tr>
<tr>
<td></td>
<td>161.5/169/184</td>
<td>161.5/169/184</td>
</tr>
<tr>
<td>Water-Cooled lb kg</td>
<td>315/331.5/364.5</td>
<td>315/331.5/364.5</td>
</tr>
<tr>
<td></td>
<td>143/150/165</td>
<td>143/150/165</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pumping Capacity</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P2 - Positive Displacement 60Hz 50Hz</td>
<td>4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)</td>
<td>4.0 gpm @ 60 psig (15.1 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td></td>
<td>3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)</td>
<td>3.3 gpm @ 60 psig (12.5 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td>P3 - Centrifugal Pump 60Hz* 50Hz*</td>
<td>10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)</td>
<td>10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)</td>
</tr>
<tr>
<td></td>
<td>10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)</td>
<td>10 gpm @ 20 psid (37.9 lpm @ 1.4 bar)</td>
</tr>
<tr>
<td>P5 - Centrifugal Pump 60Hz* 50Hz*</td>
<td>20 gpm @ 60 psid (75.7 lpm @ 4.1 bar)</td>
<td>20 gpm @ 60 psid (75.7 lpm @ 4.1 bar)</td>
</tr>
<tr>
<td></td>
<td>20 gpm @ 35 psid (75.7 lpm @ 2.4 bar)</td>
<td>20 gpm @ 35 psid (75.7 lpm @ 2.4 bar)</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Process Fluid Temperature and Setpoint Range</th>
<th>ThermoFlex 15000</th>
<th>ThermoFlex 20000</th>
<th>ThermoFlex 24000</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5°C to +40°C</td>
<td>+5°C to +40°C</td>
<td>+5°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+41°F to +104°F</td>
<td>+41°F to +104°F</td>
<td>+41°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Temperature Range</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+10°C to +40°C</td>
<td>+10°C to +40°C</td>
<td>+10°C to +40°C</td>
<td></td>
</tr>
<tr>
<td>+50°F to +104°F</td>
<td>+50°F to +104°F</td>
<td>+50°F to +104°F</td>
<td></td>
</tr>
</tbody>
</table>

| Temperature Stability                      | ±0.1°C            | ±0.1°C            | ±0.1°C            |

| Cooling Capacity at 20°C 60 Hz             | 15000 W (51228 BTU) | 20000 W (68304 BTU) | 24000 W (81964 BTU) |
|                                           | 12525 W (42775 BTU) | 16700 W (57043 BTU) | 21000 W (71719 BTU) |

| Refrigerant                                | R407C             | R407C             | R407C             |

<table>
<thead>
<tr>
<th>Reservoir Volume</th>
<th>Gallons</th>
<th>Gallons</th>
<th>Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.75</td>
<td>4.75</td>
<td>4.75</td>
</tr>
<tr>
<td></td>
<td>Liters</td>
<td>Liters</td>
<td>Liters</td>
</tr>
<tr>
<td></td>
<td>17.9</td>
<td>17.9</td>
<td>17.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footprint or Dimensions (H x W x D)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-Cooled Inches</td>
<td>49.0 x 46.5 x 30.9</td>
<td>49.0 x 46.5 x 30.9</td>
<td>58.6 x 46.5 x 30.9</td>
</tr>
<tr>
<td>Centimeters</td>
<td>124.4 x 118.1 x 78.6</td>
<td>124.4 x 118.1 x 78.6</td>
<td>148.9 x 118.1 x 78.6</td>
</tr>
<tr>
<td>Water-Cooled Inches</td>
<td>49.0 x 46.5 x 30.9</td>
<td>49.0 x 46.5 x 30.9</td>
<td>49.0 x 46.5 x 30.9</td>
</tr>
<tr>
<td>Centimeters</td>
<td>124.4 x 118.1 x 78.6</td>
<td>124.4 x 118.1 x 78.6</td>
<td>124.4 x 118.1 x 78.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit Weight (empty)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-Cooled lb</td>
<td>550</td>
<td>550</td>
<td>650</td>
</tr>
<tr>
<td>kg</td>
<td>249.5</td>
<td>249.5</td>
<td>294.8</td>
</tr>
<tr>
<td>Water-Cooled lb</td>
<td>510</td>
<td>510</td>
<td>513</td>
</tr>
<tr>
<td>kg</td>
<td>231.3</td>
<td>231.3</td>
<td>231.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pumping Capacity</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P3 - Centrifugal Pump 60 Hz*</td>
<td>10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)</td>
<td>10 gpm @ 32 psid (37.9 lpm @ 2.2 bar)</td>
<td></td>
</tr>
<tr>
<td>50 Hz*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5 - Centrifugal Pump 60 Hz*</td>
<td>20 gpm @ 60 psid (75.7 lpm @ 4.1 bar)</td>
<td>20 gpm @ 35 psid (75.7 lpm @ 2.4 bar)</td>
<td></td>
</tr>
<tr>
<td>50 Hz*</td>
<td></td>
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</tr>
</tbody>
</table>

* 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

- 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.
- 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

27 1/8''
69.2

15/16''
2.4

12 3/16''
31.0

Side View

3 3/8''
8.6

18 1/2''
47.0

24 9/16''
62.4

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

Optional 1/2" Auxiliary and 1/4" Auto-Refill Ports

Facility water connections 1/2" FNPT Cast Bronze

Water-cooled only

Rear View

Process fluid drain (1/4" FNPT) Stainless Steel with Brass plug

Top View

Shipping crate dimensions (approximate):
21" (53 cm) wide
35" (89 cm) tall
40" (102 cm) deep

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

- Thermo Fisher Scientific reserves the right to change specifications without notice.
ThermoFlex2500
Dimensions
(inches/centimeters)

Front View

Side View

* Add 1/8" (3 mm) for SEMI units, see Section 5.
ThermoFlex2500

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

Optional 1/2" Auxiliary and
1/4" Auto-Refill Ports

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.

Top View

Process fluid drain
(1/4" FNPT)
Stainless Steel with Brass plug

Rear View

Water-cooled only

Facility water connections
1/2" FNPT Cast Bronze

Top View

Shipping crate dimensions (approximate):
23" (58 cm) wide
36" (91 cm) tall
40" (102 cm) deep

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

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

2-12 NESLAB ThermoFlex

Thermo Scientific
ThermoFlex 3500/5000 Dimensions (inches/centimeters)

Front View

38 7/8" (98.7 cm)

1" (2.5 cm)

17 3/16" (43.7 cm)

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

Side View

3 7/16" (8.7 cm)

24 1/2" (62.2 cm)

30 3/4" (78.0 cm)
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
  - P3, P4 pumps 3/4" FNPT
  - 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

Optional 1/2" Auxiliary and 1/4" Auto-Refill Ports

Rear View

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

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.
ThermoFlex 7500/10000
Dimensions
(inches/centimeters)

Side View

To end of P3 - P5 Outlet Fitting

Top View

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.
ThermoFlex 7500/10000

Process Discharge
P2 = 1/2" FNPT
Cast Bronze
P3 - P5 = 1" FNPT
Wrought Copper

Rear View
(Air-Cooled)

Process Return
Stainless Steel
P2 = 1/2" FNPT
P3 - P5 = 1" FNPT

See Section 3 for additional plumbing information.

Process fluid drain (1/4" FNPT)
Stainless Steel with Brass plug

Rear View
(Water-Cooled)

Facility water connections
Cast Bronze
3/4" FNPT

Optional 1/2" Auxiliary and 1/4" Auto-Refill Ports
ThermoFlex 15000/20000/24000

Rear View
- Power Inlet
- Process Discharge 1" FNPT Wrought Iron
- Optional 1/4" FNPT Auto-Refill Port

Process Return
1" FNPT Stainless

Process drain 1/4"

Facility drain 1/4"

Water-cooled only

The applicable options fit within this envelope, see Section 5.

Top View
- 25" 63.5
- 8 1/8" 20.5

Shipping crate dimensions
(approximate):
62" (157 cm) wide
76" (198 cm) tall
48" (122 cm) deep
Section 3 Installation

Site Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature Range*</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td>Relative Humidity Range</td>
<td>10% to 80% (non-condensing)</td>
</tr>
<tr>
<td>Operating Altitude*</td>
<td>Sea Level to 8000 feet (2438 meters)</td>
</tr>
<tr>
<td>Overvoltage Category</td>
<td>II</td>
</tr>
<tr>
<td>Pollution Degree</td>
<td>2</td>
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<tr>
<td>Degree of Protection</td>
<td>IP 20</td>
</tr>
</tbody>
</table>

*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):

<table>
<thead>
<tr>
<th></th>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>Branch Circuit Requirements</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ThermoFlex900</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 VAC</td>
<td>50 Hz</td>
<td>1Ø</td>
<td></td>
<td>15A</td>
<td>5-15P</td>
</tr>
<tr>
<td>115 VAC</td>
<td>60 Hz</td>
<td>1Ø</td>
<td></td>
<td>15A</td>
<td>5-15P</td>
</tr>
<tr>
<td>200 VAC</td>
<td>50 Hz</td>
<td>1Ø</td>
<td></td>
<td>15A</td>
<td>6-15P</td>
</tr>
<tr>
<td>208-230 VAC</td>
<td>60 Hz</td>
<td>1Ø</td>
<td></td>
<td>15A</td>
<td>6-15P</td>
</tr>
<tr>
<td>230 VAC</td>
<td>50 Hz</td>
<td>1Ø</td>
<td>*16A, 15A, 13A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **ThermoFlex1400** |              |           |       |                              |                |
| 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, 15A, 13A                |                |

| **ThermoFlex2500** |              |           |       |                              |                |
| 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, 15A, 13A                |                |

* Refer to Appendix A for country specific ratings.

Continued on next page.
### Electrical Service Requirements (Standard units):

<table>
<thead>
<tr>
<th>ThermoFlex3500/5000</th>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>Branch Circuit Requirements</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 VAC P1, P2 Pump</td>
<td>50 Hz</td>
<td>1Ø</td>
<td></td>
<td>15A</td>
<td>6-15P</td>
</tr>
<tr>
<td>200 VAC T1, P3 Pump</td>
<td>50 Hz</td>
<td>1Ø</td>
<td></td>
<td>20A</td>
<td>6-20P</td>
</tr>
<tr>
<td>200 VAC P4 Pump</td>
<td>50 Hz</td>
<td>1Ø</td>
<td></td>
<td>30A</td>
<td>6-30P</td>
</tr>
<tr>
<td>208-230 VAC P1, P2 Pump</td>
<td>60 Hz</td>
<td>1Ø</td>
<td></td>
<td>15A</td>
<td>6-15P</td>
</tr>
<tr>
<td>208-230 VAC T1, P3 Pump</td>
<td>60 Hz</td>
<td>1Ø</td>
<td></td>
<td>20A</td>
<td>6-20P</td>
</tr>
<tr>
<td>208-230 VAC P4 Pump</td>
<td>60 Hz</td>
<td>1Ø</td>
<td></td>
<td>30A</td>
<td>6-30P</td>
</tr>
<tr>
<td>230 VAC P1 - P4 Pump</td>
<td>50 Hz</td>
<td>1Ø</td>
<td></td>
<td>*16A¹, 15A², 13A³</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ThermoFlex7500/10000 (Air-cooled)</th>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>MCA</th>
<th>MOPD</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 VAC P2 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td></td>
<td>16.5</td>
<td>20</td>
<td>L15-20P</td>
</tr>
<tr>
<td>200 VAC P3 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td></td>
<td>18.7</td>
<td>20</td>
<td>L15-20P</td>
</tr>
<tr>
<td>200 VAC P5 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td></td>
<td>22.3</td>
<td>30</td>
<td>L15-30P</td>
</tr>
<tr>
<td>208-230 VAC P2 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td></td>
<td>16.5</td>
<td>20</td>
<td>L15-20P</td>
</tr>
<tr>
<td>208-230 VAC P3 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td></td>
<td>18.7</td>
<td>20</td>
<td>L15-20P</td>
</tr>
<tr>
<td>208-230 VAC P5 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td></td>
<td>22.3</td>
<td>30</td>
<td>L15-30P</td>
</tr>
<tr>
<td>400 VAC P2 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td></td>
<td>10.9</td>
<td>20</td>
<td>IEC309</td>
</tr>
<tr>
<td>400 VAC P3 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td></td>
<td>9.5</td>
<td>15</td>
<td>IEC309</td>
</tr>
<tr>
<td>400 VAC P5 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td></td>
<td>11.8</td>
<td>20</td>
<td>IEC309</td>
</tr>
</tbody>
</table>

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

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.
### Electrical Service Requirements (Variable voltage units):

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

<table>
<thead>
<tr>
<th>ThermoFlex1400</th>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>Branch Circuit Requirements</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 VAC</td>
<td>60 Hz</td>
<td>1Ø</td>
<td></td>
<td>20A</td>
<td>-</td>
</tr>
<tr>
<td>100 VAC</td>
<td>50/60 Hz</td>
<td>1Ø</td>
<td></td>
<td>20A</td>
<td>-</td>
</tr>
</tbody>
</table>

* 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):

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>MCA</th>
<th>MOPD</th>
<th>Line Cord Plug</th>
</tr>
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<tbody>
<tr>
<td><strong>ThermoFlex900</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>1Φ</td>
<td>10.9</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200/230 VAC</td>
<td>50 Hz</td>
<td>1Φ</td>
<td>9.6</td>
<td>15</td>
<td></td>
</tr>
<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200/208/230 VAC</td>
<td>60 Hz</td>
<td>1Φ</td>
<td>10.9</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200/230 VAC</td>
<td>50 Hz</td>
<td>1Φ</td>
<td>9.6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>ThermoFlex2500</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>200 VAC, 1 Pump</td>
<td>60 Hz</td>
<td>1Φ</td>
<td>10.9</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>208-230 VAC, 1 Pump</td>
<td>60 Hz</td>
<td>1Φ</td>
<td>9.6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>230 VAC</td>
<td>50 Hz</td>
<td>1Φ</td>
<td>11.8</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>ThermoFlex3500/5000</strong></td>
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<tr>
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<td>200/208-230 VAC, 1 Pump</td>
<td>50/60 Hz</td>
<td>1Φ</td>
<td>10.9</td>
<td>20</td>
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<tr>
<td></td>
<td>200/208-230 VAC, 1 Pump</td>
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<td>1Φ</td>
<td>9.6</td>
<td>15</td>
<td></td>
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<tr>
<td></td>
<td>200/208-230 VAC, 1 Pump</td>
<td>50/60 Hz</td>
<td>1Φ</td>
<td>11.8</td>
<td>20</td>
<td></td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>400 VAC, 2 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>10.6</td>
<td>20</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 3 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>9.3</td>
<td>15</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 4 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>11.5</td>
<td>20</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 5 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>10.6</td>
<td>20</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 6 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>9.3</td>
<td>15</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 7 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>11.5</td>
<td>20</td>
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<tr>
<td>400 VAC, 2 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>10.6</td>
<td>20</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 3 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>9.3</td>
<td>15</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 4 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>11.5</td>
<td>20</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 5 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>10.6</td>
<td>20</td>
<td>Hard wire</td>
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</tr>
<tr>
<td>400 VAC, 6 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>9.3</td>
<td>15</td>
<td>Hard wire</td>
<td></td>
</tr>
<tr>
<td>400 VAC, 7 Pump</td>
<td>50 Hz</td>
<td>3Φ</td>
<td>11.5</td>
<td>20</td>
<td>Hard wire</td>
<td></td>
</tr>
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Continued on next page.
<table>
<thead>
<tr>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>MCA</th>
<th>MOPD</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 VAC P3 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td>16.2</td>
<td>30</td>
<td>Hard wire</td>
</tr>
<tr>
<td>400 VAC P5 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td>18.4</td>
<td>30</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P3 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>16.2</td>
<td>30</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P5 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>18.4</td>
<td>30</td>
<td>Hard wire</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>MCA</th>
<th>MOPD</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 VAC P3 Pump</td>
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<td>3Ø</td>
<td>14.5</td>
<td>25</td>
<td>Hard wire</td>
</tr>
<tr>
<td>400 VAC P5 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td>16.7</td>
<td>30</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P3 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>14.5</td>
<td>25</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P5 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>16.7</td>
<td>30</td>
<td>Hard wire</td>
</tr>
</tbody>
</table>

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<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>MCA</th>
<th>MOPD</th>
<th>Line Cord Plug</th>
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<td>400 VAC P3 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
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<td>35</td>
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<td>50 Hz</td>
<td>3Ø</td>
<td>22.3</td>
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<td>Hard wire</td>
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<td>460 VAC P3 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>20.1</td>
<td>35</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P5 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>22.3</td>
<td>40</td>
<td>Hard wire</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage ±10%</th>
<th>Frequency</th>
<th>Phase</th>
<th>MCA</th>
<th>MOPD</th>
<th>Line Cord Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 VAC P3 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td>18.8</td>
<td>35</td>
<td>Hard wire</td>
</tr>
<tr>
<td>400 VAC P5 Pump</td>
<td>50 Hz</td>
<td>3Ø</td>
<td>21.0</td>
<td>35</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P3 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>18.8</td>
<td>35</td>
<td>Hard wire</td>
</tr>
<tr>
<td>460 VAC P5 Pump</td>
<td>60 Hz</td>
<td>3Ø</td>
<td>21.0</td>
<td>35</td>
<td>Hard wire</td>
</tr>
</tbody>
</table>

** 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.
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
ThermoFlex 900 - 10000 P1 P2 T1 1/2" cast bronze
ThermoFlex 3500 - 5000 P3 P4 3/4" cast bronze
ThermoFlex 7500 - 24000 P3 P5 1" wrought copper
Inlet - Same size as outlet all units stainless steel

Supplied Adapters
P1 P2 T1 1/2" x 3/8" Polyethylene and 1/2" x 1/2" Nylon
P3 P4 3/4 MPT x 1/2 barb PVC
P3 P5 1" MPT x 1" Barb PVC and 1" MPT x 3/4" Barb PVC

Stainless steel outlet connection for units with P1/P2 pumps and a flow transducer
See Section 2 for the specific locations on your unit.

Figure 3-4 Typical Plumbing Connections (1 of 2)
Connect the PROCESS OUTLET to the fluid outlet on your application. Connect the PROCESS INLET to the fluid inlet on your application. Ensure all connections are secure and that the proper sealant/lubricant for the fitting material is used. (If Teflon® 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 ½" Female NPT for ThermoFlex900 - 5000, ¾" 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® tape is used, ensure the tape does not overhang the first thread as it could shred and get into the fluid.)
Process Fluid Requirements

**WARNING**

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)

**WARNING**

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. ▲

**CAUTION**

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. ▲

**CAUTION**

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. ▲

**CAUTION**

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. ▲

**CAUTION**

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

**CAUTION**

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 MΩ/cm, with pure water having a resistance of 18 MΩcm.

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 MΩcm 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

<table>
<thead>
<tr>
<th>Process Fluid</th>
<th>Permissible (PPM)</th>
<th>Desirable (PPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microbiologicals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(algae, bacteria, fungi)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Inorganic Chemicals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>&lt;25</td>
<td>&lt;0.6</td>
</tr>
<tr>
<td>Chloride</td>
<td>&lt;25</td>
<td>&lt;10</td>
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<tr>
<td>Copper</td>
<td>&lt;1.3</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>0.020 ppm if fluid in contact with aluminum</td>
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</tr>
<tr>
<td>Iron</td>
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<td>7-8</td>
</tr>
<tr>
<td>Resistivity</td>
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<td>0.05-0.1*</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
* 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.

**WARNING**

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.

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.

**CAUTION**

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. ▲

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

![Reservoir Ball Stopper](image3-8)

**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.
```
Example: See below.

Example:
Follow the dashed 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)

<table>
<thead>
<tr>
<th>Facility Water</th>
<th>Permissible (PPM)</th>
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<td>0</td>
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<td><strong>Inorganic Chemicals</strong></td>
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<td>Calcium</td>
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<td>Chloride</td>
<td>&lt;250</td>
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<td>Iron</td>
<td>&lt;0.3</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Lead</td>
<td>&lt;0.015</td>
<td>0</td>
</tr>
<tr>
<td>Magnesium</td>
<td>&lt;12</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Manganese</td>
<td>&lt;0.05</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td>Nitrates/Nitrites</td>
<td>&lt;10 as N</td>
<td>0</td>
</tr>
<tr>
<td>Potassium</td>
<td>&lt;20</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Silicate</td>
<td>&lt;25</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Sodium</td>
<td>&lt;20</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Sulfate</td>
<td>&lt;250</td>
<td>&lt;50</td>
</tr>
<tr>
<td>Hardness</td>
<td>&lt;17</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>&lt;50</td>
<td>&lt;10</td>
</tr>
</tbody>
</table>

**NOTE** A corrosion inhibitor is recommended if mixed metals are in the facility water loop. ▲
Section 3
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.

- 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 16000 units, place the circuit protector located on the rear of the unit to the on (1) position. The display will indicate a series of upward scrolling bars (-console-).

* For ThermoFlex15000 and 24000 units, the display will indicate a series of upward scrolling bars (console-) 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.

---

**CAUTION**

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 \[ \downarrow \] 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 \[ \downarrow \downarrow \] 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 \[ \downarrow \downarrow \] key is not depressed the display will automatically revert to the process fluid temperature.

Press \[ \downarrow \downarrow \] again to display the process fluid temperature.

\[ \downarrow \downarrow \] indicates the controller display is alternating between the two displays.

P1 - Pump discharge pressure in PSI, bar or kPa*.

FLo - Flow rate in liters or gallons per minute* (optional feature).

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

Figure 4-2 Main Loop
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.

![Diagram of controller loops](image)

**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.

**diA3** 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 (1) position. ▲

![Diagram of controller loops](image)

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

- Ensure the controller is either a blank screen or displaying the process fluid temperature.

- Press the ** mode ** key and the controller display will alternate between **SP** and the setpoint value.

- If no change is required press the ** enter ** 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 ** enter ** key to confirm the change.

- The controller will return to the process fluid temperature display or a blank screen.

![Diagram](image)

*Figure 4-5 Setpoint Loop*
Setup Loop

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  Defaults: GPM
  PSI, Bar or kPa  Defaults: 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).
- **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)**
- **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.
• **HZ** is used to identify the incoming frequency for units with P3 - P5 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.

• **dil** 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 **dil**, 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. ▲
- **LoFLO** is used to set the low flow alarm limit.
  P1 Pump **Range:** 0.0 to 10.5 GPM  \hspace{1cm} **Default:** 0.0 GPM
  T1 Pump **Range:** 0.0 to 10.5 GPM  \hspace{1cm} **Default:** 0.0 GPM
  P2 Pump **Range:** 0.0 to 10.5 GPM  \hspace{1cm} **Default:** 0.0 GPM
  P3 Pump **Range:** 0.0 to 30.0 GPM  \hspace{1cm} **Default:** 0.0 GPM
  P4 Pump **Range:** 0.0 to 30.0 GPM  \hspace{1cm} **Default:** 0.0 GPM
  P5 Pump **Range:** 0.0 to 30.0 GPM  \hspace{1cm} **Default:** 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**.

  P1 and T1 Pump  \hspace{1cm} 0.3 GPM
  P2 Pump  \hspace{1cm} 1.0 GPM
  P3, P4 and P5 Pump  \hspace{1cm} 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  \hspace{1cm} **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 (0) 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 **OFF**. 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.

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

⚠️ **CAUTION** 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 ¼" 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 ¼" Male brass plug installed in the connection, remove the plug before connecting the makeup fluid.

![Auto Refill Fitting](image)

**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. ▲

**CAUTION**

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 MΩ-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 ¼ 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.

**CAUTION**

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

Next rotate the cartridge ¼ turn counterclockwise 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 ± 5 psi (5.5 ± 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.

Use the controller’s \(\downarrow\) to display P1, it should display 80 ± 5 psi.

![Figure 5-4 Nut and Screw]

![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 P 2 pump is 32 psi (2.2 bar), and 8 psi (0.6 bar) for a P 1 (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 \(\frac{3}{8}\)" 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 ± 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 ± 5 psi (5.5 ± 0.4 bar).

The valve's inlet/outlet connections are ½" 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.

Use the controller's button to display P1, it should display 80 ± 5 psi.

![Figure 5-6 Nut and Screw](image)

**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.

**CAUTION**

*Do not exceed 100 psi (6.9 bar). ▲*

When complete, inspect the area around the 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 ½" FNPT. See Figure 5-8.

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.

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

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 ½" FNPT. See Figure 5-10.
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

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 locked out 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.

![Drip Pan Drain Diagram]

**Figure 5-11** Drip Pan Drain

<table>
<thead>
<tr>
<th></th>
<th>900/1400</th>
<th>2500</th>
<th>3500/5000</th>
<th>7500/10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3 (\frac{1}{2})&quot; 8.8 cm</td>
<td>4&quot; 10.1 cm</td>
<td>3(\frac{3}{8})&quot; 11.3 cm</td>
<td>4 (\frac{1}{6}) 10.8 cm</td>
</tr>
<tr>
<td>B</td>
<td>2 (\frac{3}{4})&quot; 7.6 cm</td>
<td>2 (\frac{17}{16})&quot; 6.8 cm</td>
<td>2 (\frac{3}{4})&quot; 7.1 cm</td>
<td>2 (\frac{3}{8})&quot; 6.6 cm</td>
</tr>
<tr>
<td>C</td>
<td>6 (\frac{15}{16})&quot; 17.7 cm</td>
<td>6 (\frac{3}{16})&quot; 16.7 cm</td>
<td>9 (\frac{3}{16})&quot; 24.3 cm</td>
<td>7 (\frac{11}{16})&quot; 19.5 cm</td>
</tr>
</tbody>
</table>
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.

![Diagram showing Seismic Tie-Downs with labels for 5/16" Washer, Bolt, Nut, and typical setup with dimensions A, B, C, and D as shown in side and front view diagrams.]

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

<table>
<thead>
<tr>
<th></th>
<th>900/1400</th>
<th>2500</th>
<th>3500/5000</th>
<th>7500/10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2 11/16&quot;</td>
<td>6.8 cm</td>
<td>2 11/16&quot;</td>
<td>6.8 cm</td>
</tr>
<tr>
<td>B*</td>
<td>18 3/8&quot;</td>
<td>47.0 cm</td>
<td>20 1/8&quot;</td>
<td>51.0 cm</td>
</tr>
<tr>
<td>C*</td>
<td>19 3/8&quot;</td>
<td>48.4 cm</td>
<td>22 3/8&quot;</td>
<td>56.1 cm</td>
</tr>
<tr>
<td>D</td>
<td>20 3/8&quot;</td>
<td>52.2 cm</td>
<td>23 3/8&quot;</td>
<td>59.9 cm</td>
</tr>
</tbody>
</table>

*Distance between 0.53 Seismic mounting holes
Center of Gravity ± ½", P2 pump (P3 for 7500/10000), air-cooled unit, no fluid in tank

**Figure 5-13 Center of Gravity**

<table>
<thead>
<tr>
<th></th>
<th>900/1400</th>
<th>2500</th>
<th>3500/5000</th>
<th>7500/10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10 ¾&quot;</td>
<td>12&quot;</td>
<td>13 ¾&quot;</td>
<td>14 ¼&quot;</td>
</tr>
<tr>
<td></td>
<td>27.3 cm</td>
<td>30.5 cm</td>
<td>34.0 cm</td>
<td>37.8 cm</td>
</tr>
<tr>
<td>B</td>
<td>6 ⅜&quot;</td>
<td>8 ⅜&quot;</td>
<td>9&quot;</td>
<td>12 ⅜&quot;</td>
</tr>
<tr>
<td></td>
<td>17.2 cm</td>
<td>21.3 cm</td>
<td>22.9 cm</td>
<td>32.1 cm</td>
</tr>
<tr>
<td>C</td>
<td>13 ⅜&quot;</td>
<td>13 ⅛&quot;</td>
<td>16&quot;</td>
<td>25 ⅛&quot;</td>
</tr>
<tr>
<td></td>
<td>34.3 cm</td>
<td>34.3 cm</td>
<td>40.6 cm</td>
<td>64.1 cm</td>
</tr>
</tbody>
</table>

**Weight Distribution**

<table>
<thead>
<tr>
<th></th>
<th>900/1400</th>
<th>2500</th>
<th>3500/5000</th>
<th>7500/10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Front</td>
<td>29.5 lbs</td>
<td>42.8 lbs</td>
<td>56.6 lbs</td>
<td>99.3 lbs</td>
</tr>
<tr>
<td></td>
<td>13.4 kg</td>
<td>19.5 kg</td>
<td>25.7 kg</td>
<td>45.0 kg</td>
</tr>
<tr>
<td>Left Rear</td>
<td>26.8 lbs</td>
<td>43.6 lbs</td>
<td>66.4 lbs</td>
<td>101.9 lbs</td>
</tr>
<tr>
<td></td>
<td>13.1 kg</td>
<td>19.8 kg</td>
<td>30.1 kg</td>
<td>46.2 kg</td>
</tr>
<tr>
<td>Right Front</td>
<td>34.3 lbs</td>
<td>46.9 lbs</td>
<td>64.9 lbs</td>
<td>98.2 lbs</td>
</tr>
<tr>
<td></td>
<td>15.6 kg</td>
<td>21.3 kg</td>
<td>29.4 kg</td>
<td>44.5 kg</td>
</tr>
<tr>
<td>Right Rear</td>
<td>33.4 lbs</td>
<td>47.7 lbs</td>
<td>76.1 lbs</td>
<td>100.7 lbs</td>
</tr>
<tr>
<td></td>
<td>15.1 kg</td>
<td>21.6 kg</td>
<td>34.6 kg</td>
<td>45.7 kg</td>
</tr>
</tbody>
</table>
Other Accessories

Installation kit - includes replacement air and fluid filters

Maintenance kit - includes a set of hoses, adaptor fittings and Teflon® 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.

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 \[\text{[CHNG]} \rightarrow \text{[FLS]}\] and, if enabled, an audible alarm will sound.

To clear this message press \[\text{[CLR]}\]. 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. ▲

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

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.

![Fluid Bag Filter](image)

**Figure 6-1 Fluid Filter Bag**

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

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. ▲

**WARNING**

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

**CAUTION** 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.

**WARNING**

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 ¼" brush. Use caution not to scratch the glass.

**CAUTION**

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.

![Reservoir Cleaning and Diffuser](image)

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

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

**CAUTION**
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.

**WARNING**
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. ▲

**WARNING**
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](image)
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 scft-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.

![Image](image.png)

**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{ MΩ-cm})

\textbf{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 dt 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 dt display. When the time is reached, the controller will flash dl 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 dt 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 dl display, see next page. Check the system run hours, this will give you an accurate DI replacement time. Adjust the dt 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 dl display, see next page.

\textbf{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

Diagnostic Loop

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

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 mode key and the display will indicate SP, press mode again to display SETup, press mode again to display dRA9.

Press enter to enter the loop or press mode 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.

<table>
<thead>
<tr>
<th>OR</th>
<th>mode</th>
<th>SP</th>
<th>mode</th>
<th>SETup</th>
<th>mode</th>
<th>dRA9</th>
<th>mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxx C</td>
<td>mode</td>
<td>FLtrS</td>
<td>xxxx</td>
<td>di</td>
<td>xxxx</td>
<td>unit</td>
<td>xxxx</td>
</tr>
</tbody>
</table>

**FLtrS** - Indicates the total hours the air and fluid filters have been in use. If desired, press and hold and then press to reset the value to 0.

**di** - Indicates the total hours the optional di filter cartridge has been in use. If desired, press and hold and then press to reset the value to 0.

**unit** - Indicates the unit operating hours. This value can not be reset.

**Figure 6-6 Diagnostic Loop**
## 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.

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Reaction</th>
<th>Cause</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8888</strong></td>
<td>Unit will not start.</td>
<td>Software communication error.</td>
<td>• Cycle circuit protector on the rear of the unit, ThermoFlex900-10000 units.</td>
</tr>
<tr>
<td>(or blank-screen)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add</strong></td>
<td>Unit continues to run.</td>
<td>The auto refill time chosen for the customer adjustable fill setting in the Setup Loop is set to 0 and the unit is configured to keep running, see Section 4.</td>
<td>• Check for leaks.</td>
</tr>
<tr>
<td></td>
<td>Auto refill, if installed, shuts off.</td>
<td></td>
<td>• Check rEFi l settings and adjust if necessary, see Section 4.</td>
</tr>
<tr>
<td></td>
<td>(Optional display)</td>
<td></td>
<td>• Add fluid to the tank.</td>
</tr>
<tr>
<td><strong>di</strong></td>
<td>Unit continues to run.</td>
<td>The unit operating time exceeded Setup Loop di t alarm value. The optional DI cartridge may need replacing.</td>
<td>• Check the Puralite sensor on the rear of the unit, if the light is red change the cartridge. See Section 6.</td>
</tr>
<tr>
<td></td>
<td>(Optional display)</td>
<td></td>
<td>• If the Puralite sensor is green, see Section 4 to revise di t alarm value.</td>
</tr>
<tr>
<td><strong>driP</strong></td>
<td>Unit will shut down.</td>
<td>Fluid in drip pan (SEMI units only).</td>
<td>• Check for leaks.</td>
</tr>
<tr>
<td></td>
<td>(Optional display)</td>
<td></td>
<td>• Remove the fluid from the drip pan and reset the fault.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td><strong>FLo-LoFLo</strong></td>
<td>Unit continues to run.</td>
<td>The low flow alarm is set to 0.0 and the pump flow rate is below the minimum required, see Section 4.</td>
<td>• See LoFLo error code.</td>
</tr>
<tr>
<td><strong>FLtrS</strong></td>
<td>Unit continues to run.</td>
<td>Air and fluid filters require preventive maintenance/replacement.</td>
<td>• Check air and fluid filters. If required, clean/change air and fluid filters, see Section 6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 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.</td>
</tr>
</tbody>
</table>

Thermo Scientific
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Reaction</th>
<th>Cause</th>
<th>Actions</th>
</tr>
</thead>
</table>
| HiFLo     | Unit reaction depends on **ALr** 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. | • If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.  
• Verify your HiFLo setting, see Section 4, and adjust setting if necessary.  
• Check all application and plumbing shut off valves for correct position.  
• Adjust flow if unit is equipped with a flow control valve (option), see Section 5.  
• If flow transducer was recently calibrated double check calibration, see Section 8.  
• Contact our Sales, Service and Customer Support. |
| Hi P1 | Unit reaction depends on **ALr** setting chosen in the Setup Loop, see Section 4. | The pump’s high discharge pressure exceeded Setup Loop high alarm value. | • If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.  
• Verify your Hi P1 setting, see Section 4.  
• Check application valves and ensure that they have not changed or been closed. **NOTE** If routine shut-off of the process flow is required then an external pressure relief valve should be added, see Section 5. ▲  
• 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.  
• Check for debris in the application or external filters.  
• Double check fluid lines. Excessive bends, long tubing and diameter reductions can affect the pump’s discharge pressure. **NOTE** If diameter reductions must be made, they should be made at the inlet and outlet of your application, not at the chiller. ▲  
• Contact our Sales, Service and Customer Support. |
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Reaction</th>
<th>Cause</th>
<th>Actions</th>
</tr>
</thead>
</table>
| Hi t       | Unit reaction depends on **AL**r setting chosen in the Setup Loop, see Section 4. **NOTE** 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. | • If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.  
• Verify your Hi t setting, see Section 4.  
• Ensure the unit meets all environmental requirements, see Section 3.  
• Ensure unit has adequate ventilation, see Section 3.  
• Clean the air filter. Dirt and debris on the filter can prevent the unit from functioning at full capacity, see Section 6.  
• Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher for assistance on calculating heat loads.  
• Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.  
• Verify/adjust controller PID values, see the end of this section.  
• Contact our Sales, Service and Customer Support. |
| HPC        | Unit will shut down. | High refrigeration pressure. | **Air-cooled units**  
• Ensure that the ambient temperature is not exceeding the recommended range, see Section 3.  
• Ensure unit has adequate ventilation, see Section 3.  
• Clean the air filter. Dirt and debris on the filter can prevent the filter from functioning at full capacity, see Section 6.  
• Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.  
• Contact our Sales, Service and Customer Support.  

**Water-cooled units**  
• Ensure the plastic plugs were removed from the facility connections.  
• Ensure facility water is on and connected.  
• Check facility water flow rate and pressure.  
• Contact our Sales, Service and Customer Support. |
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Reaction</th>
<th>Cause</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLF</td>
<td>Unit will shut down. Optional auto refill shuts down.</td>
<td>Reservoir fluid level too low for normal operation. The auto refill time chosen for the customer adjustable fill setting in the Setup Loop is set to 0 and the unit is configured to shut down, see Section 4</td>
<td>• Excessive evaporation. Ensure the unit is operating with the funnel and cap in place. • Check for leaks. • Check rEFil settings and adjust if necessary, see Section 4. • Add fluid to the tank. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>LoFLo</td>
<td>Unit reaction depends on ALr setting chosen in the Setup Loop, see Section 4. (Units equipped with a flow transducer.)</td>
<td>The process fluid flow rate has gone below the adjustable setting's value.</td>
<td>• If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded. • Verify your LoFLo setting, see Section 4. • Adjust flow if unit is equipped with a flow control valve (option), see Section 5. • Check all valves in your application and plumbing lines to ensure that they have not changed or closed. • If flow transducer has recently been calibrated, double check calibration to ensure it was done properly, see Section 8. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Lo P1</td>
<td>Unit reaction depends on ALr setting chosen in the Setup Loop, see Section 4.</td>
<td>Pump’s low discharge pressure is below Setup Loop low alarm value.</td>
<td>• If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded. • Ensure that chiller reservoir level is not too low. • Verify your LoP1 setting, see Section 4. • 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. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Reaction</td>
<td>Cause</td>
<td>Actions</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>-------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| Lo t       | Unit reaction depends on ALr setting chosen in the Setup Loop, see Section 4. **NOTE** 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. | - If the unit is still running press enter to see if the code clears, the limit may have been only temporarily exceeded.  
- Verify your Lo t setting, see Section 4.  
- 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.)  
- Verify/adjust controller PID values.  
- Add insulation to external plumbing lines to reduce the heat-loss to the environment.  
- For water-cooled units check facility water temperature.  
- Contact our Sales, Service and Customer Support. |
| oFLo       | Unit will shut down. | There is an overflow condition in the reservoir. | - Ensure the reservoir was not filled above the MAX LEVEL line.  
- Check for clogged reservoir filter.  
- Contact our Sales, Service and Customer Support. |
| oL         | Unit will shut down.  
(Units equipped with 3-Φ pump motor overload.) | Pump motor overload activated.  
Pump motor exposed to excessive current due to high pressure, flow or ambient temperature. | - Allow pump to cool down.  
- Contact our Sales, Service and Customer Support. |
| oL 2       | Unit will shut down.  
(Units equipped with 3-Φ fan.) | Fan motor overload activated. | - Allow unit to cool down.  
- For air-cooled units, clean the air filter  
- Contact our Sales, Service and Customer Support. |
| PHEr       | Unit will shut down.  
(3-Φ units only) | Phase rotation is wrong. | - Disconnect unit from power source and reverse any two line conductors on the line side of the main circuit breaker.  
- Contact our Sales, Service and Customer Support. |
<table>
<thead>
<tr>
<th>Error Code</th>
<th>Reaction</th>
<th>Cause</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>rEFil</td>
<td>Auto refill will shut off. Unit reaction depends on ALr setting chosen in the Setup Loop, see Section 4. (Optional display.)</td>
<td>The fluid level did not reach the minimum operating level within the time chosen for the customer adjustable fill setting, chosen in the Setup Loop, see Section 4. The auto refill successfully filled within the time frame chosen for the customer adjustable fill setting, but the unit tried to refill 5 times in 40 hours.</td>
<td>• Check auto refill connection. • Check for leaks. • 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. • Check rEFil settings and adjust if necessary, see Section 4. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 4</td>
<td>Unit will not start.</td>
<td>Normal if new software installed and all values in the Setup and Tune Loops were reset to factory defaults.</td>
<td>• Clear the error code. • If error remains, contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 15</td>
<td>Unit will continue to run. (Units equipped with serial communications.)</td>
<td>Bad, communications connection.</td>
<td>• Check the serial communication connection. • See serial communication connections in Appendix D. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 16</td>
<td>Unit continues to run.</td>
<td>Bad sensor calibration detected several seconds after performing a calibration.</td>
<td>• Redo calibration, see Section 8. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Reaction</td>
<td>Cause</td>
<td>Actions</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>Er 22</td>
<td>This error code has priority over <strong>H iT.</strong> Unit will shut down. <strong>NOTE</strong> Unit will not restart until process fluid temperature is below +43°C. ▲</td>
<td>Reservoir fluid temperature exceeded the <em>factory preset</em> value of +43°C.</td>
<td>•Ensure the unit meets all environmental requirements, see Section 3. •Ensure unit has adequate ventilation, see Section 3. •Clean the air filter. Dirt and debris on the filter can prevent the unit from functioning at full capacity, see Section 6. •Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher for assistance on calculating heat loads. •Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan. •Verify/adjust controller PID values, see the end of this section. •Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 23</td>
<td>Unit will shut down.</td>
<td>Refrigeration temperature sensor shorted.</td>
<td>•Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 24</td>
<td>Unit will shut down.</td>
<td>Refrigeration temperature sensor open.</td>
<td>•Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 25</td>
<td>Unit will shut down.</td>
<td>Internal temperature sensor shorted.</td>
<td>•Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 26</td>
<td>Unit will shut down.</td>
<td>Internal temperature sensor open.</td>
<td>•Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 32</td>
<td>Unit will shut down.</td>
<td>Refrigeration suction gas temperature exceeded 50°C.</td>
<td>•Make sure supply voltage matches the unit’s nameplate rating ±10%. •Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Reaction</td>
<td>Cause</td>
<td>Actions</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>Er 33</td>
<td>This error code has priority over L o T. Unit will shut down. NOTE Unit will not restart until process fluid temperature exceeds +2°C. ▲</td>
<td>Reservoir fluid temperature below the factory preset value of +2°C.</td>
<td>• Check ambient temperature. Unit may not to be able to reach setpoint at low ambient temperatures. • Ensure that the ambient temperature is not exceeding the recommended range, see Section 3. • Verify/adjust controller PID values, see Section 7. • Add insulation to external plumbing lines to reduce the heat-loss to the environment. • For water-cooled units check facility water temperature. • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 35</td>
<td>This error code has priority over Hi P1. Unit will shut down.</td>
<td>Process pressure (P1) exceeded factory preset value for greater than 30 seconds. Preset Values: 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</td>
<td>• Check application valves and ensure that they have not changed or been closed. NOTE If routine shut-off of the process flow is required then an external pressure regulator accessory should be added - contact Thermo Fisher. ▲ • 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. • Check for debris in the application or clogged external filters. • Double check fluid lines. Excessive bends, long tubing and diameter reductions can affect the pump's discharge pressure. NOTE If diameter reductions must be made, they should be made at the inlet and outlet of your application, not the chiller. ▲ • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Er 36</td>
<td>This error code has priority over Lo P1. Unit will shut down.</td>
<td>Process pressure (P1) below factory preset limit of 3 psi (all pumps) for greater than 15 seconds. Possible pump motor overload.</td>
<td>• Ensure that the chiller reservoir is not too low. • 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. • Allow unit to cool down • Contact our Sales, Service and Customer Support.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Reaction</td>
<td>Cause</td>
<td>Actions</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>-------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| Er 41      | Unit continues to run. | Communication error between display and main control board. | • Cycle circuit protector on rear of unit off and on, ThermoFlex900-10000 units.  
• Contact our Sales, Service and Customer Support. |
| Er 42      | Unit continues to run. | Internal communications error. | • Contact our Sales, Service and Customer Support. |
| Er 48      | Unit will shut down. (Optional display.) | Unit’s optional EMO button depressed. | • When able, reset the EMO.  
• Contact our Sales, Service and Customer Support. |
| Er 59      | Unit will shut down. | Invalid level fault. Unit sensed both a high level and low level reservoir fluid level. | • Contact our Sales, Service and Customer Support. |
| Er 62      | Unit will not start. (Units equipped with optional Analog I/O.) | Probe not properly connected.  
Shorted remote temperature probe. | • Check connection.  
• Contact our Sales, Service and Customer Support. |
| Er 63      | Unit will not start. (Units equipped with optional Analog I/O.) | Probe not properly connected.  
Open remote temperature probe. | • Check connection.  
• Contact our Sales, Service and Customer Support. |
| Er 64      | 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. | • The error can be cleared only after a valid set point is received, or the remote analog setpoint is turned off. |
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 (1) position.

Make sure supply voltage is connected and matches the unit's nameplate rating ±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 ±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 ±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 ± 5 psi to eliminate the vibration.

Unit shuts down

Ensure button wasn't accidently 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 ±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

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. ▲

![Diagram of PID values](image)

Figure 7-1 Verifying/Adjusting PID Values

- **Pro**
  - Proportional value
  - \( P = \% \text{ of span (100°C)} \)
  - **Range**: 0.0 to 99.9
  - **Factory Preset**: ThermoFlex900-5000 10.0, ThermoFlex7500-10000 20.0, ThermoFlex15000-20000 30.0, ThermoFlex24000 40.0

- **Int**
  - Integral value
  - \( I = \text{ repeats/minute} \)
  - **Range**: 0.00 to 9.99
  - **Factory Preset**: 0.50

- **dEr**
  - Derivative value
  - \( D = \text{ minutes} \)
  - **Range**: 0.0 to 9.9
  - **Factory Preset**: 0.0

---

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![Diagram of PID values](image)

Figure 7-1 Verifying/Adjusting PID Values

- **Pro**
  - Proportional value
  - \( P = \% \text{ of span (100°C)} \)
  - **Range**: 0.0 to 99.9
  - **Factory Preset**: ThermoFlex900-5000 10.0, ThermoFlex7500-10000 20.0, ThermoFlex15000-20000 30.0, ThermoFlex24000 40.0

- **Int**
  - Integral value
  - \( I = \text{ repeats/minute} \)
  - **Range**: 0.00 to 9.99
  - **Factory Preset**: 0.50

- **dEr**
  - Derivative value
  - \( D = \text{ minutes} \)
  - **Range**: 0.0 to 9.9
  - **Factory Preset**: 0.0
Section 8 Additional Information

Draining

**WARNING**

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 $3\frac{1}{2}''$ in height) and have a volume of approximately 3 gallons (6 gallons for ThermoFlex7500 - 24000). Remove $\frac{1}{4}''$ 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 $\frac{1}{4}''$ 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)](image-url)
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 (rdt1) 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 ▲ key and then press the ▲ key. The display will indicate CAL.

Press the ● key and the controller will display rdt1. 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 \(\text{\textinsymb}{\text{ARROW UP}}\) and then press the \(\text{\textinsymb}{\text{MODE}}\) key. The display will indicate \textbf{CAL}.

Press the \(\text{\textinsymb}{\text{ARROW DOWN}}\) key and the controller will display rtd1. Press \(\text{\textinsymb}{\text{ARROW UP}}\) until the controller displays FLo. Press \(\text{\textinsymb}{\text{ARROW DOWN}}\) and the controller will flash between HiFLo and the flow rate.

Use \(\text{\textinsymb}{\text{ARROW UP}}\) to adjust the rate to match the reference flowmeter.

Press the \(\text{\textinsymb}{\text{ARROW DOWN}}\) 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 \(\text{\textinsymb}{\text{ARROW UP}}\) to adjust the rate to match the reference flowmeter.

Press the \(\text{\textinsymb}{\text{ARROW DOWN}}\) key and StorE is displayed, press \(\text{\textinsymb}{\text{ARROW UP}}\) to save both values, press \(\text{\textinsymb}{\text{ARROW DOWN}}\) to not save them.

\textbf{NOTE} After pressing the \(\text{\textinsymb}{\text{ARROW UP}}\) 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 \(\text{\textinsymb}{\text{ARROW UP}}\) may cancel the bad calibration error message. \(\text{\textinsymb}{\text{ARROW UP}}\)
Figure 8-5 Flow Transducer (Flo) Calibration

If you have any questions please contact Thermo Fisher Scientific's Sales, Service and Customer Support.
Section 8

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.

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.

3. Units shipped to the following locations require a **13 Amp service**:
   Abu Dhabi, Bahrain, Bangladesh, Botswana, Brunei, Cyprus, Dominica, Gambia, Ghana, Gibralta, 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.
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.

---

**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.

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

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, <=.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](image)

A I/O 15-pin D-sub 15 conductor cable with shield

Connect shield to ThermoFlex connector

Connect shield to earth ground
- 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 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)

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

*Regardless of alarm setting - fault or indicator*

Default Relay Code 1 Display = 18465
(1 + 32 + 2048 + 16384 = 18465)

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

<table>
<thead>
<tr>
<th>Error</th>
<th>Error Number</th>
<th>Factory Default</th>
<th>Factory Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Level (option)</td>
<td>20</td>
<td>Disable</td>
<td>1</td>
</tr>
<tr>
<td>Tank Overflow</td>
<td>44</td>
<td>Disable</td>
<td>2</td>
</tr>
<tr>
<td>Drip Pan Full (option)</td>
<td>57</td>
<td>Disable</td>
<td>4</td>
</tr>
<tr>
<td>Auto Refill Error (option)</td>
<td>43</td>
<td>Disable</td>
<td>8</td>
</tr>
<tr>
<td>Low Temp</td>
<td>19*</td>
<td>Enable</td>
<td>16 (Default)</td>
</tr>
<tr>
<td>High Temp</td>
<td>21*</td>
<td>Enable</td>
<td>32 (Default)</td>
</tr>
<tr>
<td>Low Flow (option)</td>
<td>27*</td>
<td>Disable</td>
<td>64</td>
</tr>
<tr>
<td>High Flow (option)</td>
<td>29*</td>
<td>Disable</td>
<td>128</td>
</tr>
<tr>
<td>Low Resistivity (option)</td>
<td>28*</td>
<td>Disable</td>
<td>256</td>
</tr>
<tr>
<td>High Resistivity (option)</td>
<td>30*</td>
<td>Enable</td>
<td>512 (Default)</td>
</tr>
<tr>
<td>High Pressure</td>
<td>60*</td>
<td>Disable</td>
<td>1024</td>
</tr>
<tr>
<td>Low Pressure</td>
<td>61*</td>
<td>Disable</td>
<td>2048</td>
</tr>
<tr>
<td>Indicator (warning)</td>
<td>Any Indicator</td>
<td>Disable</td>
<td>4096</td>
</tr>
<tr>
<td>PM Timer (option)</td>
<td>50 - 56</td>
<td>Disable</td>
<td>8192</td>
</tr>
<tr>
<td>Comm Error</td>
<td>15, 41, 42</td>
<td>Disable</td>
<td>16384</td>
</tr>
<tr>
<td>Sensor Fault</td>
<td>17, 18, 23, 24, 25, 26+</td>
<td>Enable</td>
<td>32768 (Default)</td>
</tr>
</tbody>
</table>

*Regardless of alarm setting - fault or indicator*

Default Relay Code 2 Display = 33328
(16 + 32 + 512 + 32768 = 33328)
Analog Input Calibration

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.

Figure C-3 Analog Input Calibration Loop
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>
<thead>
<tr>
<th>Pin</th>
<th>Pinout</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
</tr>
<tr>
<td>2</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>White</td>
</tr>
<tr>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>NA</td>
</tr>
<tr>
<td>7</td>
<td>Red</td>
</tr>
<tr>
<td>8</td>
<td>NA</td>
</tr>
<tr>
<td>9</td>
<td>Red (4th wire not connected to the control board)</td>
</tr>
</tbody>
</table>

![Remote Sensor Connector Diagram](image)

⚠️ **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. ▲
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

- QAud 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

- u id (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

Thermo Scientific
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.

<table>
<thead>
<tr>
<th>RS-232 COMM</th>
<th>RS-485 COMM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pin #</strong></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td>1</td>
<td>No connection</td>
</tr>
<tr>
<td>2</td>
<td>TX</td>
</tr>
<tr>
<td>3</td>
<td>RX</td>
</tr>
<tr>
<td>4</td>
<td>No connection</td>
</tr>
<tr>
<td>5</td>
<td>GND = Signal ground</td>
</tr>
<tr>
<td>6 - 9</td>
<td>No connection</td>
</tr>
<tr>
<td>TX = Transmitted data from controller</td>
<td>5 4 3 2 1</td>
</tr>
<tr>
<td>RX = Received data to controller.</td>
<td>9 8 7 6</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Lead char</th>
<th>Addr-MSB</th>
<th>Addr-LSB</th>
<th>Command</th>
<th>n</th>
<th>d-byte</th>
<th>d-byte 1</th>
<th>...</th>
<th>d-byte n</th>
<th>Checksum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0xCA</td>
<td>(RS-232)</td>
<td>0xCC</td>
<td>(RS-485)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Lead char**

Device address is 1 (RS-232)

**Addr-MSB**

Most significant byte of slave address (RS-232: 0)

**Addr-LSB**

Least significant byte of slave address (RS-232: 1)

**Command**

Command byte (see Table of Commands)

**n d-bytes**

Number of data bytes to follow

**d-byte 1**

1st data byte (the qualifier byte is considered a data byte)

...  

**d-byte n**

nth data byte.

**Checksum**

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.
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  
   precision and units are 1°C  
   (nn=03)  
   (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  
   precision and units are 0.1°C  
   (nn=03)  
   (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°C=25.0°C)

See Additional Command Examples in this Appendix.
## Table of Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>M: Master Sends</th>
<th>S: Slave Responds</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REQ ACK</td>
<td>lc a1 a2 00 00 cs</td>
<td>lc a1 a2 00 02 v1 v2 cs</td>
<td>protocol version v1=0; v2=1</td>
</tr>
<tr>
<td>REQ UNIT SW VER or FIRMWARE CHECKSUM</td>
<td>lc a1 a2 02 00 cs</td>
<td>lc a1 a2 02 nn d1 ... dn cs</td>
<td>Unit SW version in ASCII</td>
</tr>
</tbody>
</table>

**Example:** Request SW version, unit returns 084992.2N
1. Master sends: lc a1 a2 02 00 cs
2. Slave responds: lc a1 a2 02 0A 30 38 34 39 32 2E 32 4E 20 E4

**Example:** Request unit checksum, unit returns 20FA
1. Master sends: CA 00 01 02 01 01 FA
2. Slave responds: CA 00 01 02 04 32 30 46 41 0F

<table>
<thead>
<tr>
<th>Command</th>
<th>M: Master Sends</th>
<th>S: Slave Responds</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ DISPLAY MSG</td>
<td>lc a1 a2 07 00 cs</td>
<td>lc a1 a2 07 nn d1 ... dn cs</td>
<td>Display message in ASCII</td>
</tr>
<tr>
<td>REQ STATUS</td>
<td>lc a1 a2 09 00 cs</td>
<td>lc a1 a2 09 nn d1 ... dn cs</td>
<td>see Request Status Table in this Appendix</td>
</tr>
</tbody>
</table>
| ERROR                    | lc a1 a2 0F 02 en ed cs | lc a1 a2 0F 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

<table>
<thead>
<tr>
<th>Request</th>
<th>M:</th>
<th>S:</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ LO FLOW1</td>
<td>lc a1 a2 30 00 cs</td>
<td>lc a1 a2 30 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ LO TEMP1</td>
<td>lc a1 a2 40 00 cs</td>
<td>lc a1 a2 40 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ LO ANALOG1</td>
<td>lc a1 a2 48 00 cs</td>
<td>lc a1 a2 48 03 d1 d2 d3 cs</td>
</tr>
</tbody>
</table>

### Request High Alarm Values

<table>
<thead>
<tr>
<th>Request</th>
<th>M:</th>
<th>S:</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ HI FLOW1</td>
<td>lc a1 a2 50 00 cs</td>
<td>lc a1 a2 50 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ HI TEMP1</td>
<td>lc a1 a2 60 00 cs</td>
<td>lc a1 a2 60 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ HI ANALOG1</td>
<td>lc a1 a2 68 00 cs</td>
<td>lc a1 a2 68 03 d1 d2 d3 cs</td>
</tr>
</tbody>
</table>

### Request Measurements

<table>
<thead>
<tr>
<th>Request</th>
<th>M:</th>
<th>S:</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ FLOW1</td>
<td>lc a1 a2 10 00 cs</td>
<td>lc a1 a2 10 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ TEMP1</td>
<td>lc a1 a2 20 00 cs</td>
<td>lc a1 a2 20 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ TEMP2</td>
<td>lc a1 a2 21 00 cs</td>
<td>lc a1 a2 21 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ TEMP3</td>
<td>lc a1 a2 22 00 cs</td>
<td>lc a1 a2 22 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ ANALOG1</td>
<td>lc a1 a2 28 00 cs</td>
<td>lc a1 a2 28 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ ANALOG2</td>
<td>lc a1 a2 29 00 cs</td>
<td>lc a1 a2 29 03 d1 d2 d3 cs</td>
</tr>
</tbody>
</table>

### Request PID Settings

<table>
<thead>
<tr>
<th>Request</th>
<th>M:</th>
<th>S:</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ SETPT</td>
<td>lc a1 a2 70 00 cs</td>
<td>lc a1 a2 70 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ COOL P TERM1</td>
<td>lc a1 a2 74 00 cs</td>
<td>lc a1 a2 74 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ COOL I TERM1</td>
<td>lc a1 a2 75 00 cs</td>
<td>lc a1 a2 75 03 d1 d2 d3 cs</td>
</tr>
<tr>
<td>REQ COOL D TERM1</td>
<td>lc a1 a2 76 00 cs</td>
<td>lc a1 a2 76 03 d1 d2 d3 cs</td>
</tr>
</tbody>
</table>

### Alarm Information
- Process Alarm
- Process Alarm
- Pressure Process Supply Alarm
- Pressure Process Supply Alarm
- Process Fluid Flow
- Process Fluid Supply Temperature (RTD1)
- Refrigeration Suction Temperature (RTD2)
- Refrigeration Ambient Temperature (RTD3)
- Process Fluid Supply Pressure (P1)
- Refrigeration Suction Pressure (P2)
- Process Fluid Setpoint
Set Status Settings

SET KEYSTROKE
M: lc a1 a2 80 01 d1 cs
S: lc a1 a2 80 01 d1 cs
See Keystroke in this Appendix

SET ON/OFF ARRAY
M: lc a1 a2 81 nn d1 ... dn cs
S: lc a1 a2 81 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 82 05 d1 ... d5 cs
S: lc a1 a2 82 07 d1 ... d7 cs
See Calibration in this Appendix

SET SAVE UNIT CALIBRATION
M: lc a1 a2 8B 02 d1 d2 cs
S: lc a1 a2 8B 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/runup = 1

Set Low Alarm Values

SET LO FLOW1
M: lc a1 a2 B0 02 d1 d2 cs
S: lc a1 a2 B0 03 d1 d2 d3 cs
Process Alarm

SET LO TEMP1
M: lc a1 a2 C0 02 d1 d2 cs
S: lc a1 a2 C0 03 d1 d2 d3 cs
Process Alarm

SET LO ANALOG1
M: lc a1 a2 C8 02 d1 d2 cs
S: lc a1 a2 C8 03 d1 d2 d3 cs
Pressure Process Supply Alarm

Set High Alarm Values

SET HI FLOW1
M: lc a1 a2 D0 02 d1 d2 cs
S: lc a1 a2 D0 03 d1 d2 d3 cs
Process Alarm

SET HI TEMP1
M: lc a1 a2 E0 02 d1 d2 cs
S: lc a1 a2 E0 03 d1 d2 d3 cs
Process Alarm

SET HI ANALOG1
M: lc a1 a2 E8 02 d1 d2 cs
S: lc a1 a2 E8 03 d1 d2 d3 cs
Pressure Process Supply Alarm

SET PID Settings

SET SETPT1
M: lc a1 a2 F0 02 d1 d2 cs
S: lc a1 a2 F0 03 d1 d2 d3 cs
Process Fluid Setpoint

SET COOL P TERM1
M: lc a1 a2 F4 02 d1 d2 cs
S: lc a1 a2 F4 03 d1 d2 d3 cs
Cool P Term

SET COOL I TERM1
M: lc a1 a2 F5 02 d1 d2 cs
S: lc a1 a2 F5 03 d1 d2 d3 cs
Cool I Term

SET COOL D TERM1
M: lc a1 a2 F6 02 d1 d2 cs
S: lc a1 a2 F6 03 d1 d2 d3 cs
Cool D term
## Request Status Table

### Basic

<table>
<thead>
<tr>
<th>nn</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>b0</td>
<td>Unit Running</td>
</tr>
<tr>
<td>b1</td>
<td>RTD1 open or shorted</td>
</tr>
<tr>
<td>b2</td>
<td>RTD2 open or shorted</td>
</tr>
<tr>
<td>d1</td>
<td>RTD3 open or shorted</td>
</tr>
<tr>
<td>b3</td>
<td>High Temp fixed fault</td>
</tr>
<tr>
<td>b4</td>
<td>Low Temp fixed fault</td>
</tr>
<tr>
<td>b5</td>
<td>High Temp fault or warn</td>
</tr>
<tr>
<td>b6</td>
<td>Low Temp fault or warn</td>
</tr>
</tbody>
</table>

| b7 | High Pressure fault or warn |
| b0 | Low Pressure fault or warn |
| b1 | Drip Pan fault |
| b2 | High Level fault |
| b3 | Phase Monitor fault |
| b4 | Motor Overload fault |
| b5 | LPC fault |
| b6 | HPC fault |

<table>
<thead>
<tr>
<th>d2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>b3</td>
<td>External EMO fault</td>
</tr>
<tr>
<td>b1</td>
<td>Local EMO fault</td>
</tr>
<tr>
<td>b2</td>
<td>Low Flow fault</td>
</tr>
<tr>
<td>d3</td>
<td>AutoRefill fault</td>
</tr>
<tr>
<td>b3</td>
<td>Sense 5V fault</td>
</tr>
<tr>
<td>b4</td>
<td>Invalid level fault</td>
</tr>
<tr>
<td>b5</td>
<td>Low fixed flow warn</td>
</tr>
<tr>
<td>b6</td>
<td>High pressure fault (set at factory)</td>
</tr>
<tr>
<td>b7</td>
<td>Low pressure fault (set at factory)</td>
</tr>
<tr>
<td>d4</td>
<td>Unit powering up</td>
</tr>
<tr>
<td>b1</td>
<td>Unit powering down</td>
</tr>
</tbody>
</table>
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 cd byte, and an error code in the en byte.

<table>
<thead>
<tr>
<th>on</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bad command – not recognized by slave</td>
</tr>
<tr>
<td>2</td>
<td>Bad data</td>
</tr>
<tr>
<td>3</td>
<td>Bad checksum</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>nn</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>d1</td>
<td>Unit On/Off</td>
</tr>
</tbody>
</table>

Set Keystroke

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

<table>
<thead>
<tr>
<th>d1 Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Byte</th>
<th>Master</th>
<th>Slave</th>
</tr>
</thead>
<tbody>
<tr>
<td>d1</td>
<td>Command byte</td>
<td></td>
</tr>
<tr>
<td>d2</td>
<td>Entered Value MSB</td>
<td></td>
</tr>
<tr>
<td>d3</td>
<td>Entered Value</td>
<td></td>
</tr>
<tr>
<td>d4</td>
<td>Entered Value</td>
<td></td>
</tr>
<tr>
<td>d5</td>
<td>Entered Value</td>
<td></td>
</tr>
<tr>
<td>d6</td>
<td>Entered Value LSB</td>
<td></td>
</tr>
</tbody>
</table>

Command | Unit sends | Description | Slave returns |
0x00     | CA 00 01 8D 02 d1 d2 cs | 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
0 = voltage
1 = millivolt
2 = current
3 = no change
b.2 - b.3 = DAC out
0 = voltage
1 = millivolt
2 = current
3 = no change
b.0 - b.1 = analog in
0 = voltage
1 = millivolt
2 = current
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.

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 XXXXXXX 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
10 = 115V, 60Hz 1Ph
11 = 100/115V, 60Hz 1Ph
12 = 208/230V, 60Hz 1Ph
16 = 230V, 50Hz 1Ph
20 = 200/208/230V, 60Hz 1Ph

UU = 15, 16 & 17
15 = 208/230V, 60Hz 3Ph
16 = 200/230V, 50Hz 3Ph
20 = 460V, 60Hz 3Ph

UU = 18 & 19
17 = 208/230V, 60Hz 3Ph
18 = 400V, 50Hz 3Ph
21 = 460V, 60Hz 3Ph

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

= 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:

   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: Robin Wiley

Compliance Engineering

Date: 1 September 2010
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 recision 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 OF 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 X XXXXXX defined as follows:

UU = unit type can be:
10 = TF 900
11 = TF 1400
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:

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

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

Manufacturer's Authorized Representative: [Signature]
Robin Wiley
Compliance Engineering

Date: 21 July 2008
Model: TF25 B A 208/60 P1 IPR 2 SPFTG
Serial Number: 111056010

- 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)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
<th>Qty</th>
<th>UOM</th>
<th>Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>U00933</td>
<td>INST MAN,THERMOFLEX,BASIC KB</td>
<td>1</td>
<td>EA</td>
<td>TFLX</td>
</tr>
<tr>
<td>U00945</td>
<td>QCK START PROC,TFLEX,BASIC KB</td>
<td>1</td>
<td>EA</td>
<td>TFLX</td>
</tr>
<tr>
<td>094641</td>
<td>ELB,ADPTR,12MM T X 1/2MPT,BRS</td>
<td>2</td>
<td>EA</td>
<td>07162</td>
</tr>
</tbody>
</table>

This unit packaged with pride by

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