

Installation & Operation Manual

MicroTherm

Circulating Oil Temperature Control System



PQ451
161-123417-037
April 2023

Table of Contents

| Contents | Page Number |
|-------------------------------------|-------------|
| Section 1 Getting Started | 1 |
| Section 2 Installation..... | 4 |
| Section 3 Temperature Control | 7 |
| Section 4 Operation | 8 |
| Section 5 Diagnostics | 9 |
| Section 6 Maintenance | 10 |
| Section 7 Troubleshooting..... | 13 |
| Section 8 Specifications | 14 |

Table of Illustrations

| Figure | Topic | Page Number |
|--------|--|-------------|
| 1.1 | System Photo | 2 |
| 1.2 | Control Panel | 3 |
| 2.1 | Piping..... | 5 |
| 2.2 | Piping Connections | 5 |
| 2.3 | Power Connection Terminals..... | 6 |
| 2.4 | Control Voltage Fuse. | 6 |
| 3.1 | Control Panel Layout | 7 |
| 5.1 | Diagnostic Indicators..... | 9 |
| 5.2 | Pump Reset Switch | 9 |
| 5.3 | Over Temperature Controller Reset Switch | 9 |
| 8.1 | Pump Capacity | 14 |
| 8.2 | Replacement Parts Identification..... | 15 |

Section 1 – Getting Started

Installation Instructions

⚠ CAUTION

Read and understand all instructions in this user's manual and the enclosed temperature control instruction manual before attempting to install or operate system.

Introduction

Congratulations on purchasing the Chromalox microTHERM™ Oil Temperature Control System. This system has been thoroughly engineered, carefully built, and fully tested to assure years of service.

The microTHERM™ Oil can be operated at a maximum temperature of 550°F. Oil temperature is maintained by a microprocessor based temperature controller which applies heating and cooling as needed.

Electrical and hydraulic components are located in distinctly separate areas in the system to better manage heat buildup and prevent component damage. It is designed to drastically reduce the chance of oil dripping inside the product and provide ease of service and maintenance. Standard casters make it easy to move the system from machine to machine.

Power requirements for the system are 240 or 480 volts, 3 phase, 60 cycle, and 6 to 24 kW. See the system nameplate for the appropriate voltage and wattage ratings.

Oil or other synthetic fluids or mineral based fluids may be used with this product. See section 4 number 1.

The System Photo and Control Panel Illustrations, on the following pages identifies all key components.

Figure 1.1 System Photo (Side View)

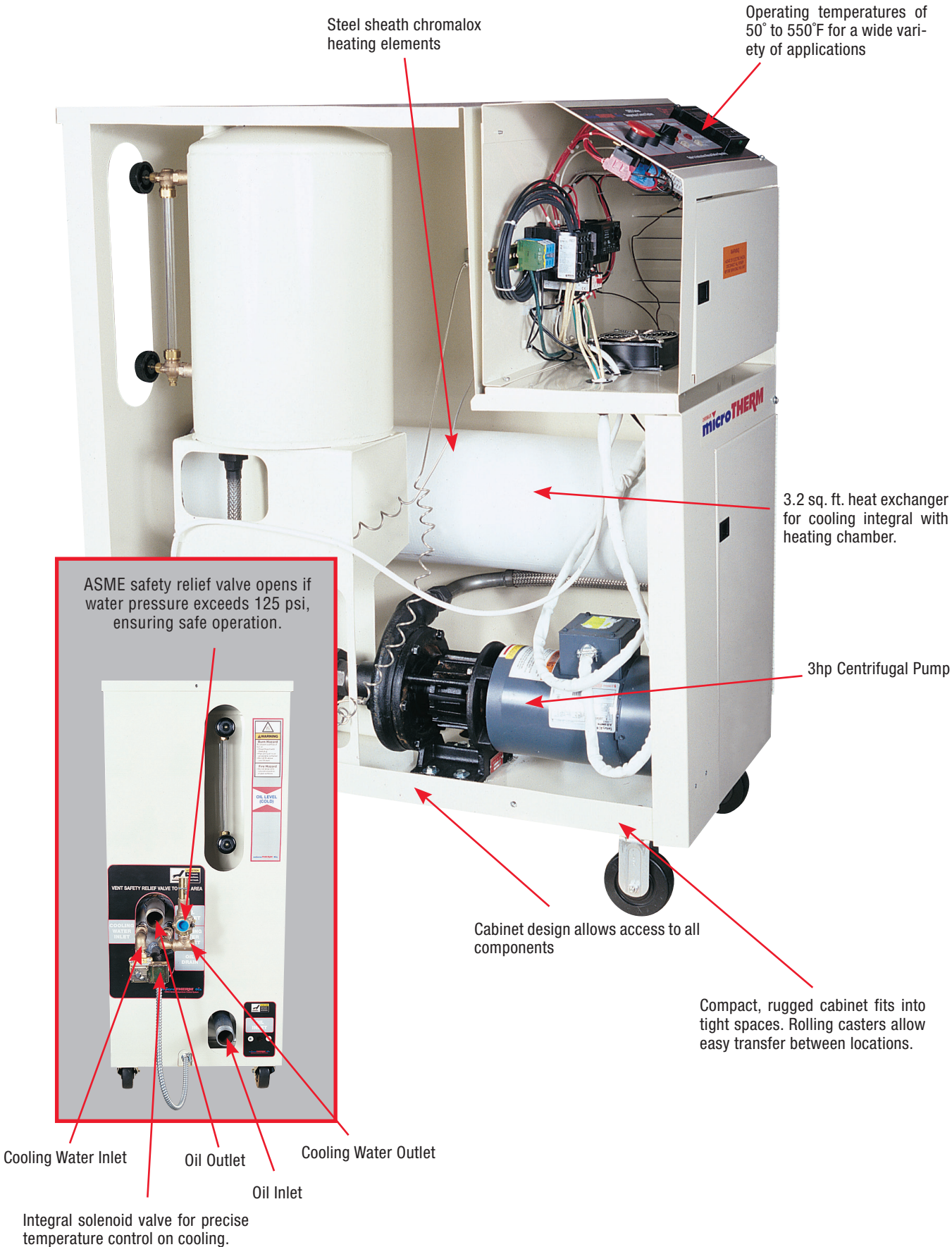
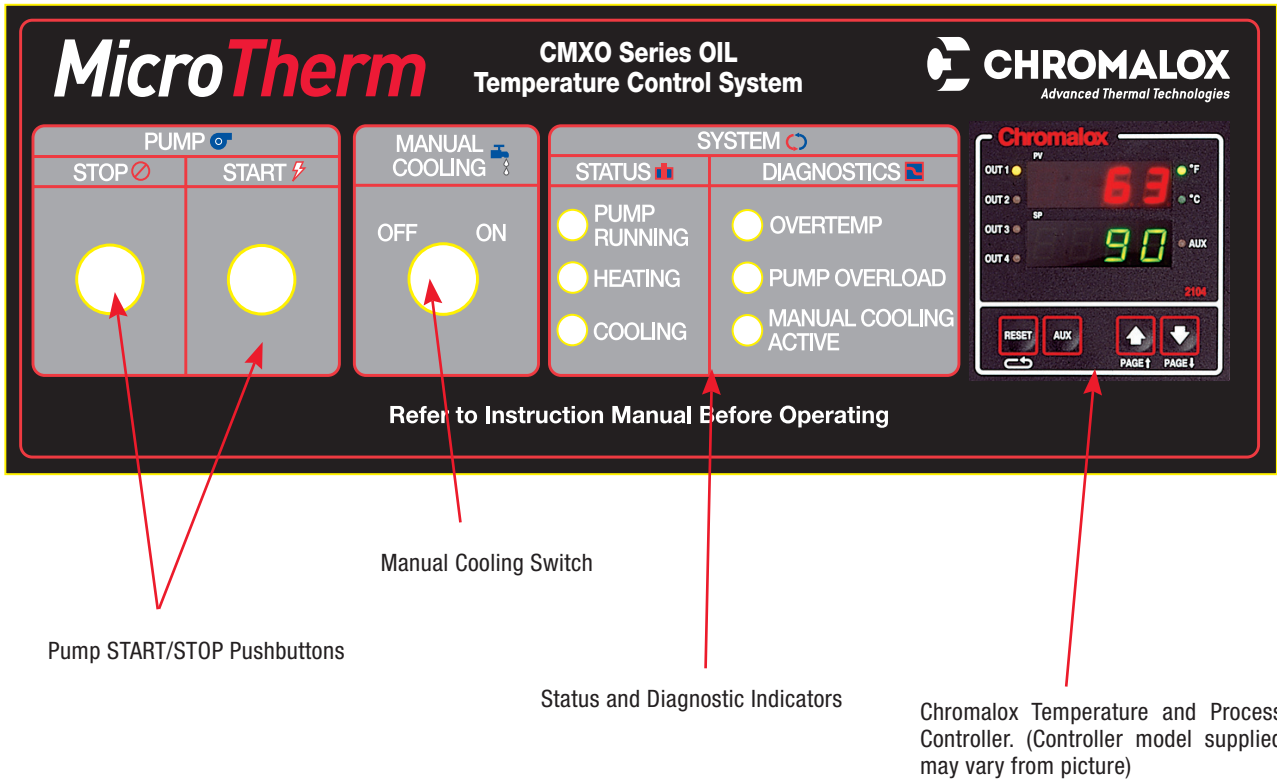


Figure 1.2 Control Panel



Section 2 – Installation

Before Hydraulic Installation:

Before proceeding with the installation please take note of the following information:

⚠ WARNING

HAZARD OF EXPLOSION, FIRE AND SCALDING BURNS.

The cooling water feed line must not have any obstructions which could cause buildup in pressure.

When installing system, allow sufficient room to remove the heater element and other serviceable items when necessary.

To avoid excessive pressures, do not connect any valves or obstructions which could prevent free discharge from relief valve in a safe manner. Vent outlet of pressure relief valve to a drain where steam or scalding water will not cause personal injury. Do not allow drain to freeze or corrode shut.

Use only on concrete floor or other nonflammable surface. Use in an open area with at least 1 foot clearance from walls and combustible materials.

1. This product is designed to roll over smooth flat floors. Do not roll over uneven floors and on ramps. Do not move while hot or containing fluid.
2. Reduced diameter fittings may be used down to 1" if they do not reduce flow rate and increase pressure drop significantly.
3. Use softened water for cooling.
4. Use and maintain oil filters.

Hydraulic Installation:

⚠ WARNING

HAZARD OF EXPLOSION, FIRE AND SCALDING BURNS.

Connect the 1/2" NPT port identified as "COOLING OUTLET" to an open or plant drain that contains no valves or obstructions that could impede discharge. Review the condition of potential hot water or steam going down a plant drain. Verify that local codes and materials are acceptable for this service.

This system is for use only with liquid phase heat transfer fluids suitable for a max bulk temperature of 550°F at atmospheric pressure. Use with any other fluids could result in death, personal injury, fire or damage to the equipment.

Do not place valves in vent line or allow vent line to become even partially clogged. Vent line on the expansion tank must be piped to a safe area and/or catch drum. Provisions must be taken to allow constant slope on vent to allow draining and to prevent liquids from collecting in the vent pipe. Vent should be periodically checked to verify it is free and clear of all obstructions. Vent piping should be no smaller than connection on the system. Do not place valves in vent line as system must remain vented at all times.

Do not overfill expansion tank.

Do not allow heat transfer oil to saturate insulation. Failure to comply could result in personal injury or property damage.

⚠ CAUTION

Read and understand all instructions in this manual and other manuals shipped with the system prior to installation. All work specified within this instruction sheet should be performed by qualified personnel as required (electrician, plumber or mechanic).

1. System should be mounted on a solid level foundation. Where required, containment area should be provided in case of fluid loss. The system should be installed at the same level or higher than the process to be heated.
2. Before installing, check that all mounting bolts on equipment are tight. These sometimes loosen in shipment.
3. Piping to and from the process should match the piping on the system. If extremely long runs of pipe are to be used, one size larger than the system connections can be used to minimize pressure drop. Piping should be arranged to be self-supporting and not supported by the heat transfer system. On long runs, isolation from thermal expansion should also be provided. If the above are not taken into consideration, unnecessary stress will be put on the pump and/or piping.
4. Thread sealant and/or gaskets used on process piping should be rated for temperatures and heat transfer fluid to be used. Check with manufacturer for compatibility.
5. The piping of the entire system should be arranged to minimize pockets where air may be trapped. Manual bleed valves must be provided at any location where air may be trapped.
6. Connect the cooling water supply (30 psi to 80 psi) to the unit's 1/2" NPT "WATER SUPPLY/COOLING INLET" port with suitable pipe or hose.

Figure 2.1 Piping

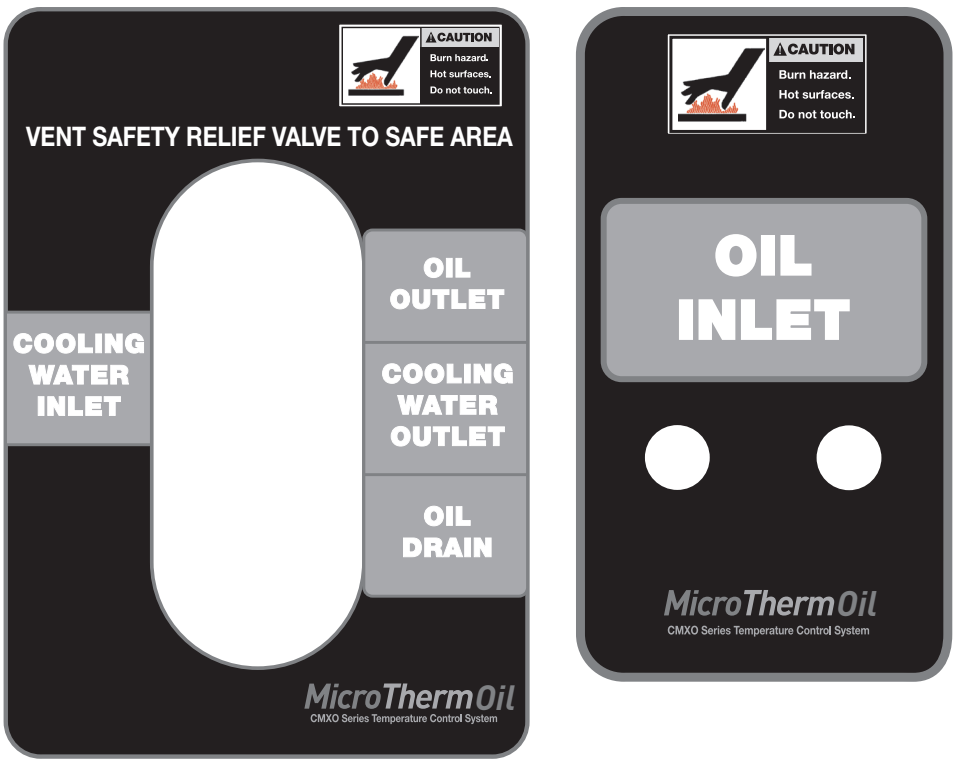
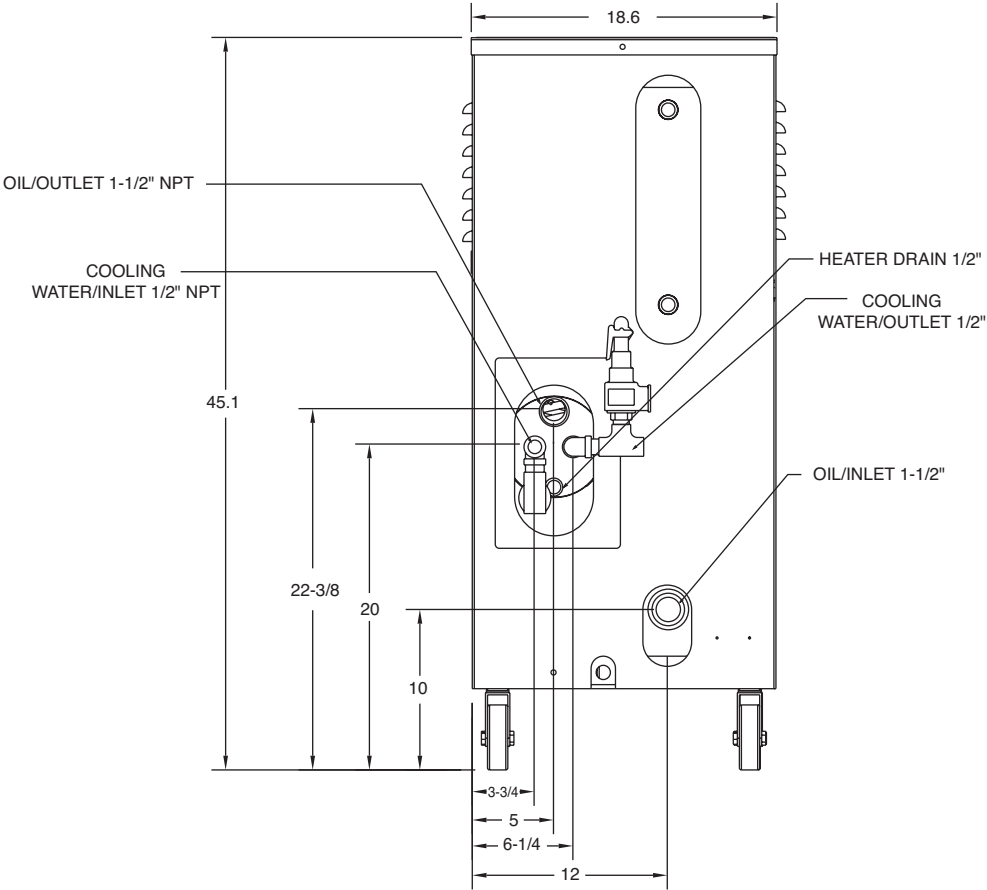


Figure 2.2 Piping Connections



Hydraulic Installation

⚠ WARNING

HAZARD OF ELECTRIC SHOCK. Disconnect all power before installing or servicing the heat transfer system. This system must be installed by a qualified person in accordance with National Electric Code, NFPA 70. Failure to comply can result in personal injury or equipment damage. The heat transfer system must be effectively grounded to the grounding means provided in control box in accordance with National Electric Code.

Fusing or other over-current protection must be supplied to the system by the user.

The unit is completely wired when shipped. The only wiring necessary is to the blue colored terminals L1, L2, L3, and the green and yellow colored ground. To make these connections:

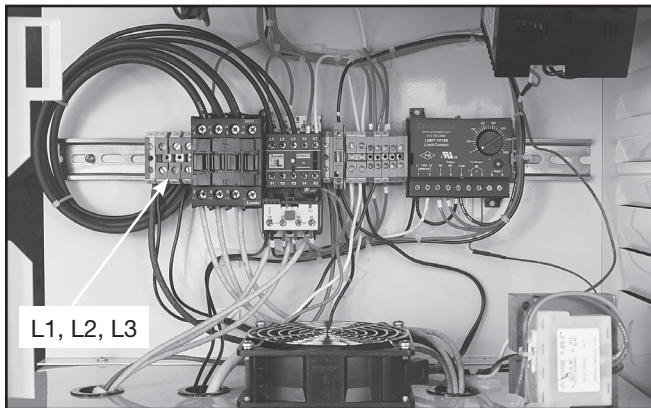


Figure 2.3 Power Connection Terminals

1. Loosen the screw on the front electrical enclosure door to unlock the latch.
2. Open the front electrical enclosure door. Using 90°C wire sized per National and local codes, run each leg of the three phase supply power and ground to the appropriate terminals as shown in Figure 2.3.
3. A separate fused disconnect is required. Locate this fused disconnect near the equipment. Codes may require the location of disconnect in sight of operation standing next to the equipment. Consult applicable codes for details.
4. With power off, check the wiring connections by tugging on the lines. Tighten all terminals in the control area. These can loosen due to vibration in shipping.

Pump Rotation Check

5. Close the front electrical enclosure door. Pull the top cover off of the heat transfer system and locate the pump motor.
6. Press the **START** and **STOP** buttons in quick succession. Watch the rotation on the pump motor to insure it matches the label.
7. If rotation is incorrect, disconnect power to the system and swap any two of the supply lines. Repeat rotation check.

⚠ WARNING

ELECTRIC SHOCK HAZARD. Close the front electrical enclosure door and retighten the locking screw. This must be done to limit access to high voltage components. Failure to comply result in personal injury or equipment damage.

Control Voltage Fusing

Figure 2.4 contains a 120V fuse for the control circuitry. This fuse protects the control transformer and circuitry.

1. Should the fuse blow, an indicator will light on the terminal block.
2. Disconnect power from the system.
3. Determine the cause of the blown fuse.
4. Replace with an equivalent fuse.
5. Reconnect power.

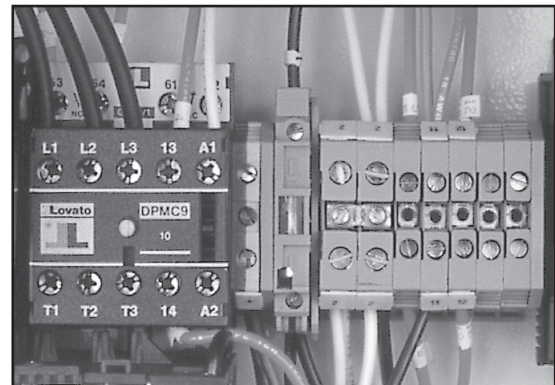
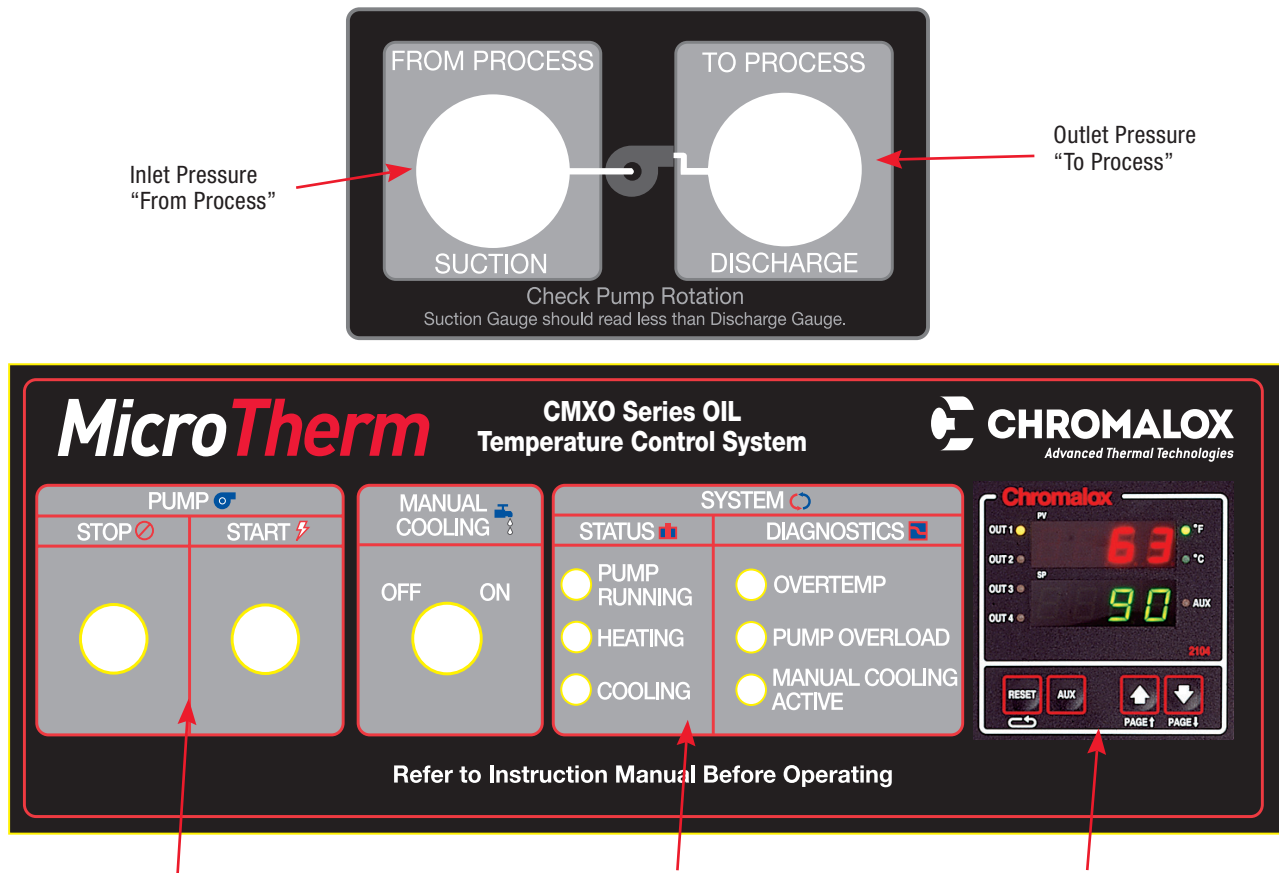


Figure 2.4 Control Voltage Fuse

Section 3 – Temperature Control Options

Figure 3.1 Control Panel Layout



START/STOP Pushbuttons

Press **START** to start the pump.

Indicator will illuminate while pump is running. Press **STOP** to stop the pump.

Status and Diagnostic Indicators

System shuts down if any red diagnostic indicator is illuminated.

Pump Overload:

- Pump has drawn too much current.

Over Temperature:

- System temperature has exceeded 600°F.

Pump Running

Heating

Cooling

Manual Cooling:

- If manual cooling is on, heaters shut off and water cooling is on. Normally this is off and the temperature controller determines when to heat or cool.

Temperature Controller

Most CMXO units shipped from 1995 through 2018 will have been equipped with a Chromalox model 2104 temperature controller. For these units, please refer to the 2104 Quick Info Manual or Instruction Manual 0037-75276 for complete technical details.

For specific controller Set-up Parameters, please refer Chromalox Manual PQ445-5

Most CMX units shipped from 2019 and onward will have been equipped with a Chromalox model 4081 (standard controller) or 4082 (advanced controller). For these units, please reference the 4081 & 4082 Quick Start Manual, Document PK531 (0037-75563) or Instruction manual PK532-1 (0037-75562) for complete technical details.

Some CMX units shipped from 2023 and onward will have been equipped with a Chromalox model 4040. For these units, please reference the 4040 Quick Start Manual, Document PK502 (0037-75484) or Instruction manual PK508 (0037-75514) for complete technical details.

Section 4 – Operation

⚠ CAUTION

Damage to the pump and/or heater may occur if the system is operated without fluid. Fill system prior to starting. Operate in 105°F or less surrounding temperature.

Note: Read and understand instructions on the temperature control before operating the system.

1. Check to ensure the fluid is the same as or compatible with the fluid with which the system was factory pretested. (Mobiltherm 603)

IMPORTANT: For disposal see fluid manufacturer's recommendations.

2. The system is filled with heat transfer fluid directly from the 55 gallon drum by simply connecting a hose from the expansion tank (located on the top of the system) to the drum. Fill expansion tank until sight glass indicates it is approximately 1/3 full.
3. The overheat temperature control is located inside the control panel. Setpoint should be adjusted 50°F higher than the indicating temperature control. **WARNING: Never exceed a setting of 600°F on the overtemperature control.**
4. Close control box door and turn circuit breaker on. Start pump — do not be alarmed if the pump is noisy during the initial start-up operation, this is due to air in the system.
5. Bleed out all air by opening bleeder valves in the customer's piping. The pump should become quiet.

CAUTION: During the initial start-up operation, the liquid level in the expansion tank must be checked continually. This level should not exceed the three-quarter mark on the glass nor drop below the one-quarter mark.

Note: If abnormal fluid expansion is detected, this is probably due to a pocket of air or steam still present in the system. Check all bleed valves. If problem continues, de-energize pump and check bleed valves.

6. Set indicating or controlling thermostat at 220°F, which will energize the heater. The heater is interlocked with the pump motor starter so that, in the event of motor failure, the heating elements will shut off automatically.
7. Run the system until 220°F is reached. Periodically open the bleed valves in the customer's piping to remove air from the system. At 220°F any moisture that has been trapped in the system will flash into steam as it goes through the heater and can be bled out through the bleed valves.
8. Excessive moisture and air in the system will cause the heat transfer liquid to back up into the expansion tank, thus evacuating the piping or process. If this happens, shut the system down, bleed off the steam and air allowing the liquid to return. If prob-

lem persists, drain the system and recharge with new moisture-free heat transfer liquid.

9. After the system is completely free of air pockets and moisture, set control thermostat at the desired temperature. Never set temperature control above 550°F.
10. For detailed operation and tuning procedure on the temperature control, consult instruction manual on the temperature control.

⚠ WARNING

BURN HAZARD. Operating systems at temperatures above 140°F will create surface temperatures on pipes that can cause burns. Precautions should be taken to prevent operator contact with hot pipes. Also, bleed valves should be locked down to prevent release of hot fluid.

Note: This is a PID type controller and cycling of the heat and cool can be expected below and above setpoint.

11. For system shutdown, lower the setpoint to 90°F or lower (see Section 3). Allow the system to cool to this temperature.
12. Press **STOP** to de-energize the pump and disable the system.
13. Disconnect power to the unit.

⚠ WARNING

ELECTRIC SHOCK AND BURN HAZARD. Do not leave system unattended in a HOT electrical condition. Do not leave system unattended while HOT.

Manual Cooling

If manual cooling is on, heaters will be off and water cooling will be on. Normally, manual cooling is off and the temperature controller determines when to heat or cool. Manual cooling is optional.

To use manual cooling:

1. Turn manual cooling on and observe temperature.
2. Optional. If at a safe temperature, you may stop the pump until you are ready to run again. Important, even if the pump is off, cooling water will run to the heater as long as manual cooling is on and there is electricity to the product.
3. When ready, turn pump on and turn manual cooling off. The temperature controller will heat or cool to the desired temperature. Important, even if electricity is turned off to the product, when electricity is turned on, the temperature controller will go back to the previous temperature before manual cooling. If this is not desired, it is best to use the temperature controller instead of manual cooling.

Section 5 – Diagnostics

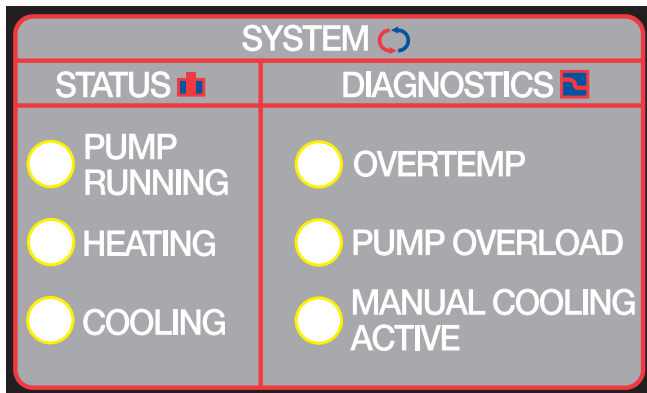


Figure 5.1 Diagnostic Indicators

Hydraulic Installation

All red light diagnostic functions will shut down the system and require the operator to remedy the problem before it can be restarted.

Pump Overload Indicator

The Pump Overload Indicator will illuminate when the pump draws too much current. Low line voltage, single phase power input, and a seized pump motor are all possible causes for pump overload.

⚠ WARNING

ELECTRIC SHOCK HAZARD. If the Pump Overload Indicator is illuminated, disconnect all power and piping to the system. Failure to do so could result in personal injury or equipment damage.

After the system power is disconnected, solve the electrical current problem. To put the pump back on-line, open the front electrical enclosure and press the pump reset switch. See Figure 5.2.

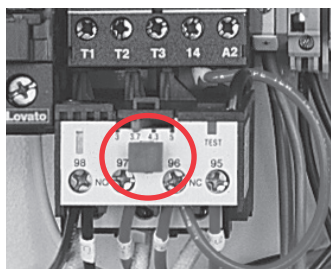


Figure 5.2 Pump Reset Switch

⚠ WARNING

ELECTRIC SHOCK HAZARD. Close the front electrical enclosure door and retighten the locking screw. This must be done to limit access to high voltage components. Failure to comply could result in personal injury or equipment damage.

Over-Temperature Controller

If the system temperature exceeds 600°F (315°C), the Over Temperature Indicator will illuminate. When the system temperature drops below 550°F, press reset on the over temperature controller inside the panel. Close door and retighten the screw. The controller will not reset until the temperature is below 600°F. Or remove electricity to the product and the over temperature controller will reset after temperature is below 600°F.

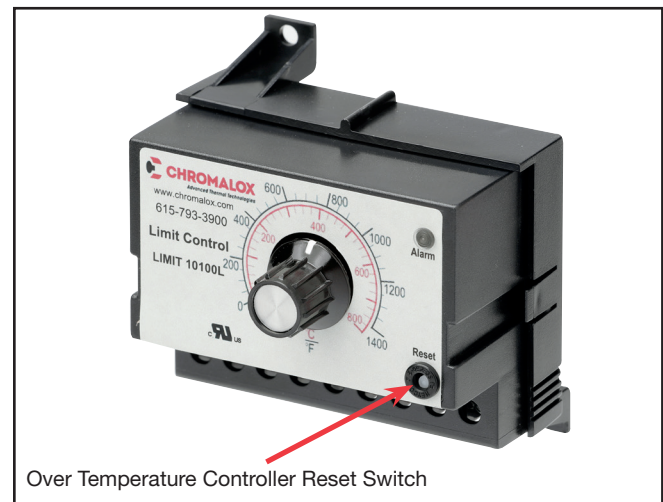


Figure 5.3 Over Temperature Controller Reset Switch

Section 6 – Maintenance

⚠ WARNING

ELECTRIC SHOCK AND BURN HAZARD. *Disconnect all power before servicing or performing maintenance to the system. Do not attempt to service system while it is operating or while hot. Failure to comply can result in:*

- a. Electric shock.*
- b. Burns from hot heating elements, piping, and hot oil or water.*
- c. Injury from operating or rotating pump and motor.*

Maintenance is to be performed by qualified personnel only. Thoroughly read and understand these instructions. Consult the factory if you have any questions.

Take Out of Service

To take the unit out of service, the following steps must be done in sequence:

1. Set the temperature controller setpoint to 90°F or lower. Allow to cool.
2. Turn off power to the unit. The controller will turn off.
3. Turn off the water supply to the unit.
4. Disconnect electrical supply to the unit.
5. Drain the system.
6. If it is exposed to freezing temperatures while out of service, remove water by blowing air through cooling pipe. You will need to open the cooling valve by turning on manual cooling or removing it.

Heater Removal/Replacement

⚠ WARNING

ELECTRIC SHOCK HAZARD. *Disconnect all power to system before servicing. Failure to comply can result in personal injury or equipment damage.*

⚠ WARNING

BURN HAZARD. *Never service system while hot. Allow system to cool to room temperature before servicing.*

1. Check that power is disconnected from the system and remove wiring to heater.
2. Disconnect thermocouple from control cabinet.
3. Drain heater and pump.
4. Remove bolts on heater and undo fittings on pipe. Remove heater through the front door.
5. Install new heater and retighten all bolts and fittings.
6. Put all sheet metal back in place and retighten screws.
7. Refill system and follow operation procedure in Section 4.

Leaks

1. Leaks should be minimized.
2. CAUTION: Hazard of Fire. Some heat transfer fluids are flammable and if allowed to leak on hot pipes or in fibrous thermal insulation, a fire hazard can be created.
3. Disassemble, clean and reseal the connections using high temperature sealant. (Do not use TFE or other tape.) Sealants are to be rated for temperatures and fluids used in the system.

⚠ WARNING

ELECTRIC SHOCK HAZARD. *Close the front electrical enclosure door and retighten the locking screw. This must be done to limit access to high voltage components. Failure to comply could result in personal injury or equipment damage.*

Pump Removal/Replacement

⚠ WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power to system before servicing. Failure to comply can result in personal injury or equipment damage.

⚠ WARNING

BURN HAZARD. Never service system while hot. Allow system to cool to room temperature before servicing.

1. If pump requires service, drain system and remove top and side panels.
2. Pump/motor can be removed from the system as an assembly for service.
3. Disconnect piping at unions on inlet and outlet piping leading to the pump.
4. Remove four bolts which hold the pump/motor base to the base of the system.
5. After verifying power is disconnected remove conduit and wiring from the motor.
6. Lift out pump/motor assembly.

7. Service pump per pump manufacturers instructions.
8. If replacing the pump, be sure to remove piping from old pump casing before discarding. Clean thread on pipe and thread into new pump casing using high temperature oil resistant thread sealant.
DO NOT USE TFE OR OTHER TAPE SEALANTS.
9. Install new pump in system reconnect piping.
10. Reconnect wiring and check rotation as indicated in "INSTALLATION" section.

⚠ WARNING

ELECTRIC SHOCK HAZARD. Close the front electrical enclosure door and retighten the locking screw. This must be done to limit access to high voltage components. Failure to comply could result in personal injury or equipment damage.

Maintenance Record

[illegible]

Section 7 – Troubleshooting

| Troubleshooting Guide - For qualified personnel only. See warnings in earlier sections. | | |
|--|---|--|
| Symptom | Probable Cause | Correction |
| Unit will not start, control display does not light. | 1. Unit not wired correctly. | 1. Check wiring. |
| | 2. Disconnect switch OFF. | 2. Turn disconnect ON. |
| | 3. Blown fuse. | 3. Check customer disconnect fuses and 120V fuse on terminal block (blown fuse indicator will light if fuse is blown). |
| | 4. Wrong voltage. | 4. Check supply voltage and unit's rated voltage. |
| Control display lights, unit will not start | 1. Pump motor overload. | 1. See Section 5. Determine problem and press pump reset. |
| | 2. System above temperature limit of 600°F. | 2. Allow unit to cool below 550°F and press reset on over temperature controller inside the panel. See Section 5. |
| Unit stops while running. | 1. Pump motor overload. | 1. Determine problem, press pump reset, and restart |
| | 2. System exceeds temperature limit of 600°F. | Allow unit to cool below 550°F, press reset on over temperature controller inside the panel, and restart. See Section 5 |
| Pump Overload Indicator illuminated | 1. Pump motor overload | 1. See Section 5. Determine problem and press pump reset button |
| Over Temperature Indicator illuminated | 1. System above temperature limit of 600°F. | 1. Allow unit to cool below 550°F and press reset on over temperature controller inside the panel. See Section 5. |
| Unit runs but fails to pump. | 1. Incoming phase reversed on pump motor. | 1. Swap any two legs on the incoming power. |
| Unit will not heat to setpoint. | 1. Cooling valve stuck open. | 1. Check for cooling water flow during heat cycle. |
| | 2. Heater element failure. | 2. Check current at heater contactor during heating. |
| | 3. Heater output insufficient. | 3. Excessive losses in process or incorrectly sized unit for application. |
| | 4. Controller needs to be tuned. | 4. Check factory MENU settings, Section 3 of this manual. Refer to 2104 Controller Technical Manual, page 35, for further information. |
| | 5. Manual cooling on. | 5. Turn manual cooling off. |
| Unit will not cool to setpoint. | 1. Inadequate cooling water flow. | 1. Open cooling water supply line more and assure adequate pressure. |
| | 2. Cooling outlet obstructed. | 2. Check cooling outlet for obstructions |
| | 3. Heater contactor fused closed. | 3. Check voltage across contactor during cooling cycle. |
| | 4. Controller needs to be tuned. | 4. Check factory MENU settings, Section 3 of this manual. Refer to 2104 Controller Technical manual, page 35, for further information. |
| If you continue to have problems with the system after review of the above issues, please contact Chromalox Product Service at 800-443-2640. | | |

Section 8 – Specifications

| Pump Size (HP) | Nominal Flow (gpm) | Oil Connections (Inches, dia.) | Water (Inches, dia.) | Approximate Dimensions (Inches) |
|----------------|--------------------|--------------------------------|----------------------|---------------------------------|
| 3 | 30 | 1-1/2 NPT | 1/2 NPT | 45H x 38D x 19W |

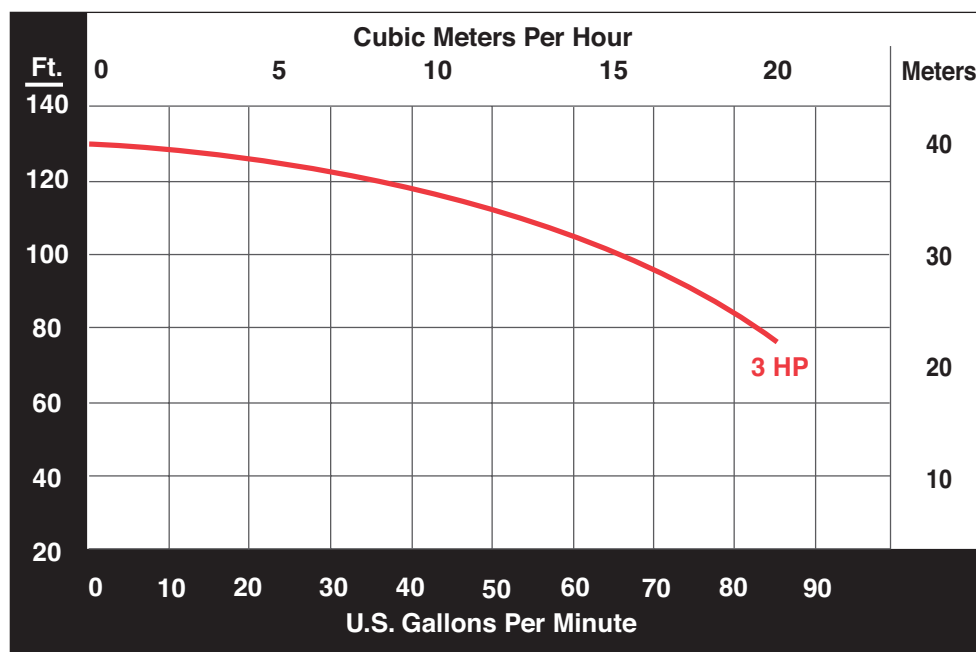


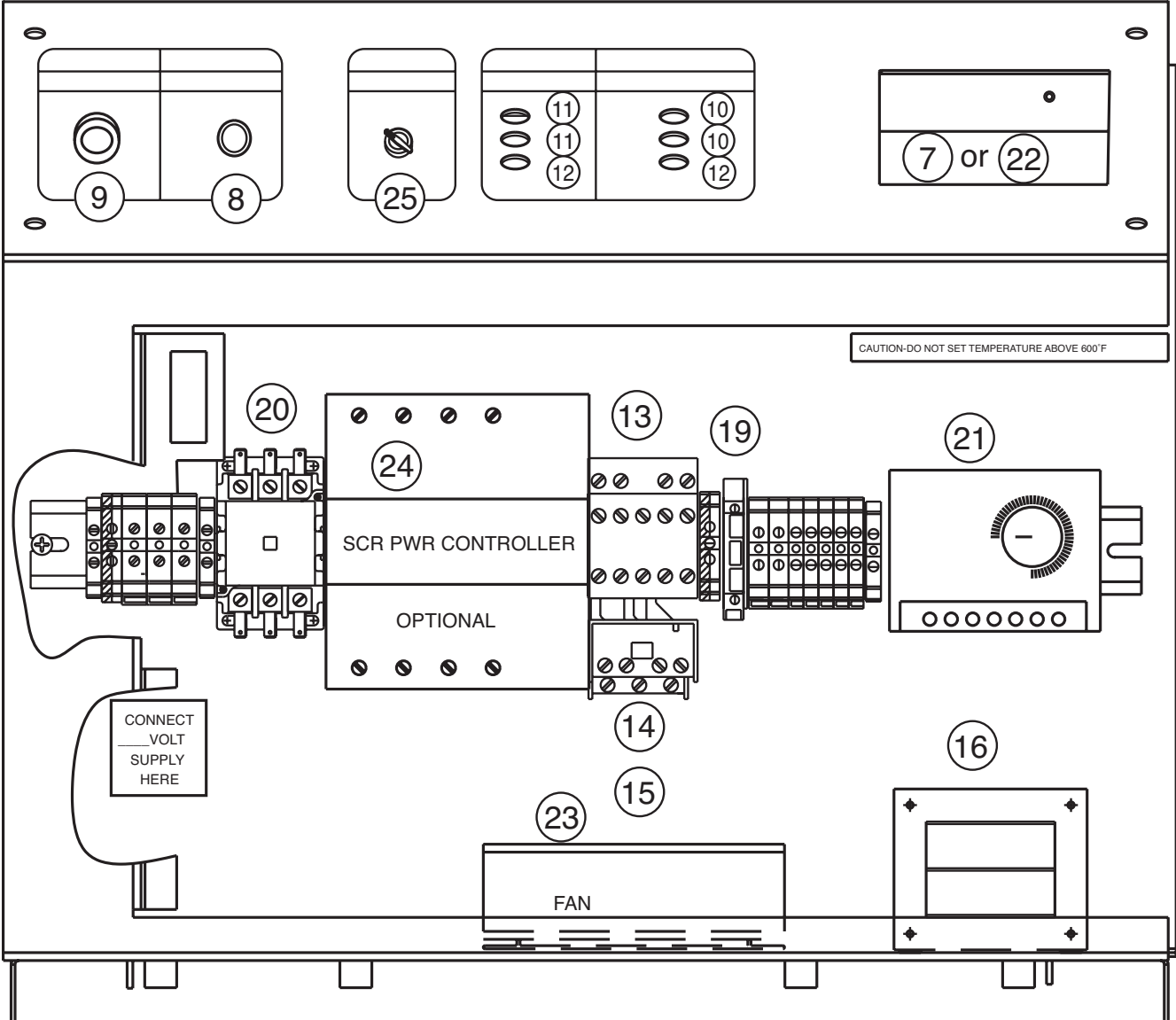
Figure 8.1 - Pump Capacity (As reported by pump manufacturer on Model HTO-80; Size 1.5 x 1.25; Speed 3450 RPM; S.G. (.85)).

Power & Capacity Information

| kW | BTU's Per Hour | Nominal Amps | | Volume (Gal.) | Heat Exchanger Surface Area (Ft.) |
|----|----------------|--------------|------|---------------|-----------------------------------|
| | | 240 V | 480V | | |
| 4 | 15,354 | 21.4 | 10.7 | 6.1 | 3.2 |
| 6 | 20,472 | 26.2 | 13.1 | 6.1 | 3.2 |
| 9 | 30,708 | 33.4 | 16.7 | 6.1 | 3.2 |
| 12 | 40,944 | 40.7 | 20.3 | 6.1 | 3.2 |
| 18 | 61,416 | 54.7 | 27.5 | 6.1 | 3.2 |
| 24 | 81,888 | | 34.6 | 6.1 | 3.2 |

*Total per leg based on 3 phase, 60 cycle power with heater at rated voltage, motor at rated output, and control transformer at full load. Measured value may vary depending on conditions.

Figure 8.2 - Replacement Parts Identification



Replacement Heaters

MicroTHERM Oil Replacement Parts

| kW | Voltage | Heater |
|----|---------|----------------|
| 6 | 240 | 052-305096-001 |
| 6 | 480 | 052-305096-002 |
| 9 | 240 | 052-305096-007 |
| 9 | 480 | 052-305096-008 |
| 12 | 240 | 052-305096-005 |
| 12 | 480 | 052-305096-006 |
| 18 | 240 | 052-305096-003 |
| 18 | 480 | 052-305096-004 |
| 24 | 480 | 052-305096-001 |

Replacement Parts Common to All Models

| Identification# | Part Name | Part Number |
|-----------------|---|----------------------------------|
| 1 | 3 HP Pump & Motor 230V/460V | 226-304843-002 |
| 2 | Pump Rebuild Kit (Seal, Gasket, etc.) | 251-121946-032 |
| 3 | Solenoid Valve | 344-072237-021 |
| 4 | Safety Relief Valve | 344-300032-103 |
| 5 | Pressure Gauge 0-100psig | 130-118661-037 |
| 6 | Pressure Gauge 30" Vac - 30 psig | 130-118661-038 |
| 7 | Thermocouple Process T/C Thermocouple Overtemp T/C | 309-304460-036 300-304460-012 |
| 8 | Push Button, Start | 292-304687-003 |
| 9 | Push Button, Stop | 292-304687-004 |
| 10 | Light, Red | 213-122066-041 |
| 11 | Light, Amber | 213-122066-042 |
| 12 | Light, Green | 213-122066-043 |
| 13 | Motor Contactor 240/480V | 072-123534-065 |
| 14 | Auxiliary Motor Contact Block | 071-122886-055 |
| 15 | Motor Thermal Overload 240V | 359-122078-097 |
| 16 | Motor Thermal Overload 480V | 359-122078-096 |
| 17 | Transformer 240/480V | 315-303786-001 |
| 18 | Caster, Swivel | 375-123425-006 |
| 19 | Caster, Rigid | 375-123425-007 |
| 20 | Control Voltage Fuse | 303-123432-024 |
| 21 | Heater Contactor | 072-304551-008 |
| 22 | Over Temperature Controller | 381-700400-297 |
| 23 | Fan | 112-121869-005 |
| 24 | SCR | 300-400360-610 |
| 25 | On/Off Cooling Switch | 292-304687-002 |

Limited Warranty:

Please refer to the Chromalox limited warranty applicable to this product at <http://www.chromalox.com/customer-service/policies/termsofsale.aspx>.

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