Installation & Operation Manual

MicroTherm

Circulating Water Temperature Control System

CHROMALOX
Advanced Thermal Technologies

PQ450
161-123417-036
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Table of Contents

Contents **Page Number**

Section 1 – Getting Started

Installation Instructions

⚠CAUTION

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

Introduction

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

The CMX can be operated at a maximum temperature of 250°F at a minimum pressure of 30psi. CMX-180 models do not require minimum pressure. Water temperature is maintained by a microprocessor-based temperature controller which applies heating and cooling as needed. Heat is applied by a long-life, INCOLY® sheathed heater. Cooling is either via direct injection, in an open loop, or through a closed loop heat exchanger.

Every system is equipped with an automatic vent that removes unwanted air from the system during operation, and an ASME pressure relief valve that is factory-set to 125 psi (150 psi with 7.5 hp motor.) A pressure switch ensures adequate water pressure in the system to help prevent pump cavitation and steam buildup on the heater elements, which can shorten the lives of the heater and pump. The switch is factory-set to 20 psi. This switch is not included on CMX-180 models.

Electrical and hydraulic components are located in distinctly separate areas in the system to better manage heat buildup and prevent component damage. The pump housing, heater, and cooling chambers are single cast pieces, designed to drastically reduce the chance of leaks 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 4.5 to 24 kW. See the system nameplate for the appropriate voltage and wattage ratings.

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

Figure 1.1 System Photo (Side View)

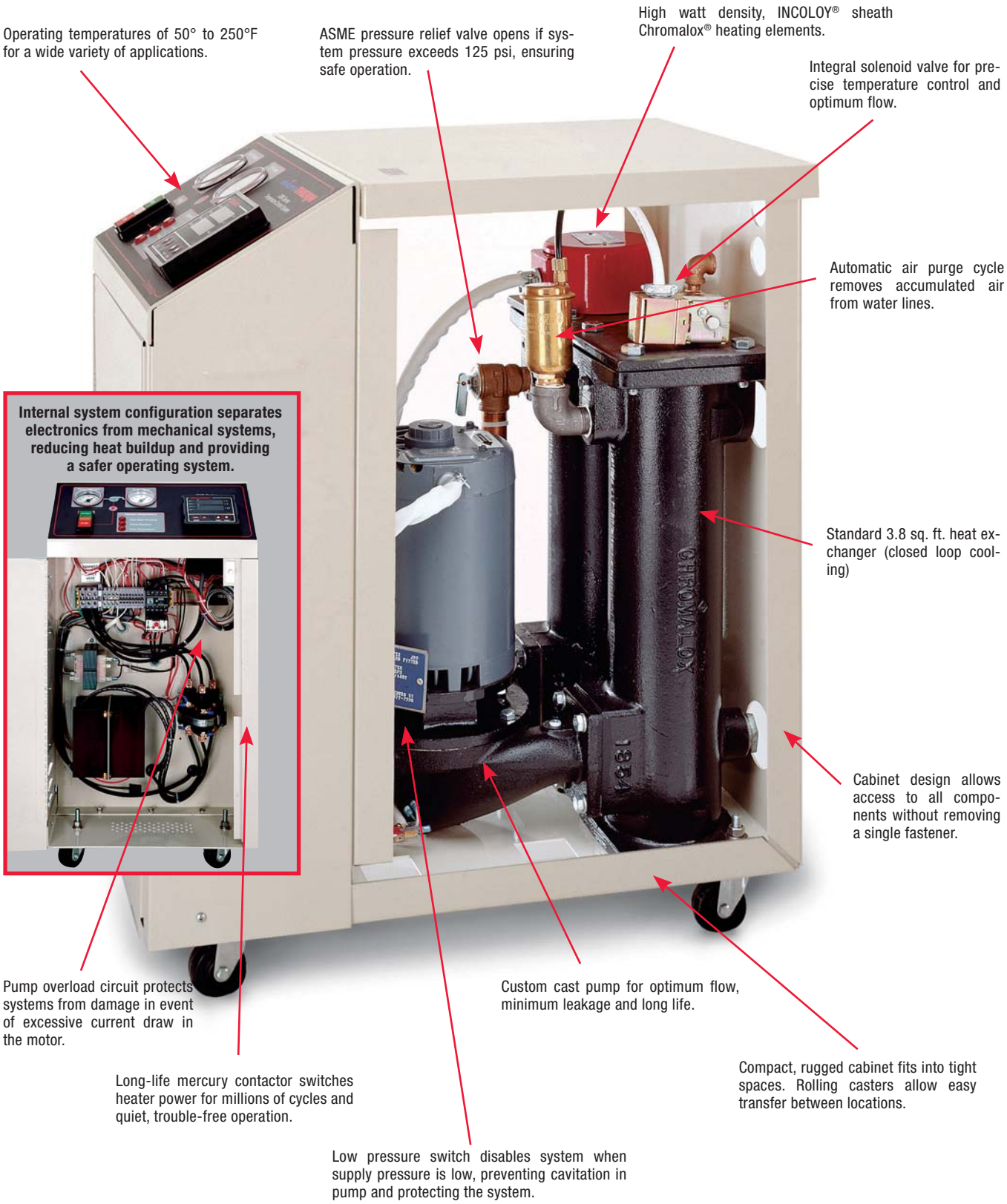
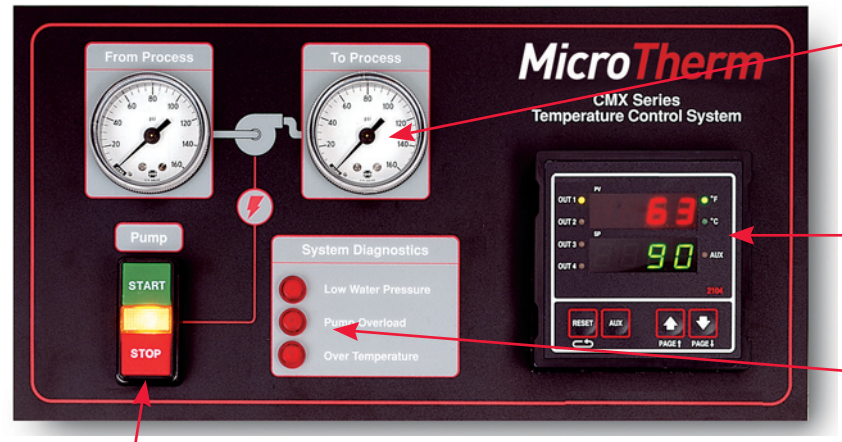


Figure 1.2 Control Panel



Dual pressure gauges simplify monitoring of both to process and from process pressures.

Chromalox's Temperature and Process Controller features separate PID algorithms for heat and cool control modes, dual display of setpoint and process temperatures, and simple configuration parameters with alphanumeric cues. Optional digital communications expand microTHERM's application flexibility. (Controller model supplied may vary from picture)

Diagnostic Indicators allow you to constantly monitor microTHERM's performance, giving you early detection of potential problems before they occur and simplifying maintenance.

Pump START/STOP Pushbuttons

Ordering Information

Open Loop Cooling			
Model	**kW**	**Volts**	**Total Amperage**
CMX-250-4	4.5	240	13.6
CMX-250-4	4.5	480	6.8
CMX-250-9	9	240	24.5
CMX-250-9	9	480	12.2
CMX-250-12	12	240	31.7
CMX-250-12	12	480	15.8
CMX-250-18	18	240	46.1
CMX-250-18	18	480	23.1
CMX-250-24	24	240	60.5
CMX-250-24	24	480	30.3

Closed Loop Cooling			
Model	**kW**	**Volts**	**Total Amperage**
CMX-250-4C	4.5	240	13.6
CMX-250-4C	4.5	480	6.8
CMX-250-9C	9	240	24.5
CMX-250-9C	9	480	12.2
CMX-250-12C	12	240	31.7
CMX-250-12C	12	480	15.8
CMX-250-18C	18	240	46.1
CMX-250-18C	18	480	23.1
CMX-250-24C	24	240	60.5
CMX-250-24C	24	480	30.3

Section 2 – Installation

Before Open-Loop Hydraulic Installation:

Before proceeding with the installation of the open-loop system, please take note of the following important information:

1. Reduced diameter fittings may be used if they do not reduce flow rate and increase pressure drop significantly. Galvanized steel unions are recommended at all connections.
2. If water pressure falls below 20 psi, a pressure switch will interrupt pump motor and heater operation. Use an external water pressure regulator and back pressure relief valve or regulator, set at maximum 125 psi (150 psi with 7.5 hp motor) connected in the external fill line, to reduce excessive water pressure. Not provided on CMX-180 models.

⚠WARNING

HAZARD OF EXPLOSION, FIRE AND SCALDING BURNS.

The water feed line on both open and closed loop systems must not have any obstructions which could prevent expanding water from backing up into the feed line.

Do not use oils or other synthetic heat transfer fluids. This system is for use with water or ethylene glycol and water mixture for freeze protection only as the heat transfer fluid.

When installing system, allow sufficient room to remove the heater element and other serviceable items when necessary. 18 inches clearance on sides of unit recommended.

If the water source is a potable water source, a back flow preventer and back pressure relief valve/regulator should be installed and may be required by local code. Do not install a check valve only on the fill line. The inability of the system to flow back into the fill line can lead to excessive pressure. Back pressure relief is required.

To avoid excessive pressures, do not connect any valves or obstructions which could prevent free discharge from relief valve in a safe manner. Route line so water drains completely. Do not allow drain to freeze or corrode shut.

Hydraulic Installation, Open Loop:

1. Locate the unit as close as possible to the controlled process in order to minimize pressure drops. Make sure the unit is sitting on a solid, level foundation.
2. Using 1 1/4" NPT or larger schedule 40 pipe (flexible hose suitable for 150 psi and 250°F minimum service conditions can be used), connect the 1 1/4" NPT "FROM PROCESS" and "TO PROCESS" ports to the mold, mold manifold, or other process.
3. Pipe the entire system to minimize air pockets. Provide air bleed valves at high points and drains at low points.
4. Connect the plant water supply (30 psi to 80 psi) to the unit's 1/2" NPT "WATER SUPPLY/COOLING INLET" port with suitable pipe or hose.

⚠WARNING

HAZARD OF EXPLOSION, FIRE AND SCALDING BURNS.

Connect the 1/4" NPT port identified as "DRAIN 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.

Locate floor drain under unit. The air bleed and relief valve may discharge hot water or steam from the bottom of the unit. Do not locate materials that could be damaged by hot water or steam adjacent to the unit.

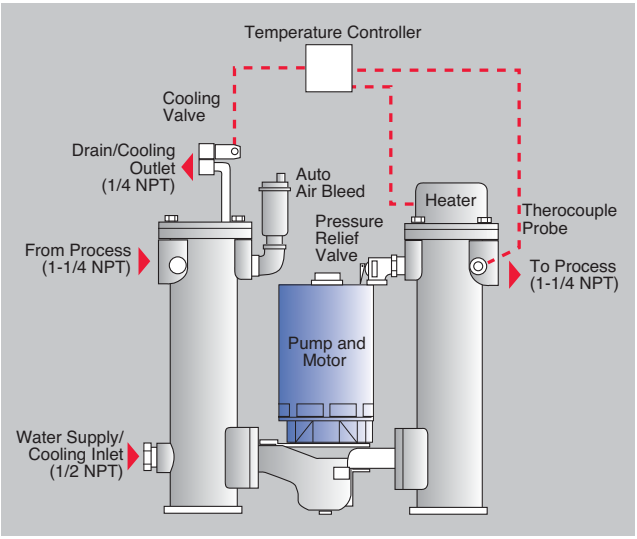
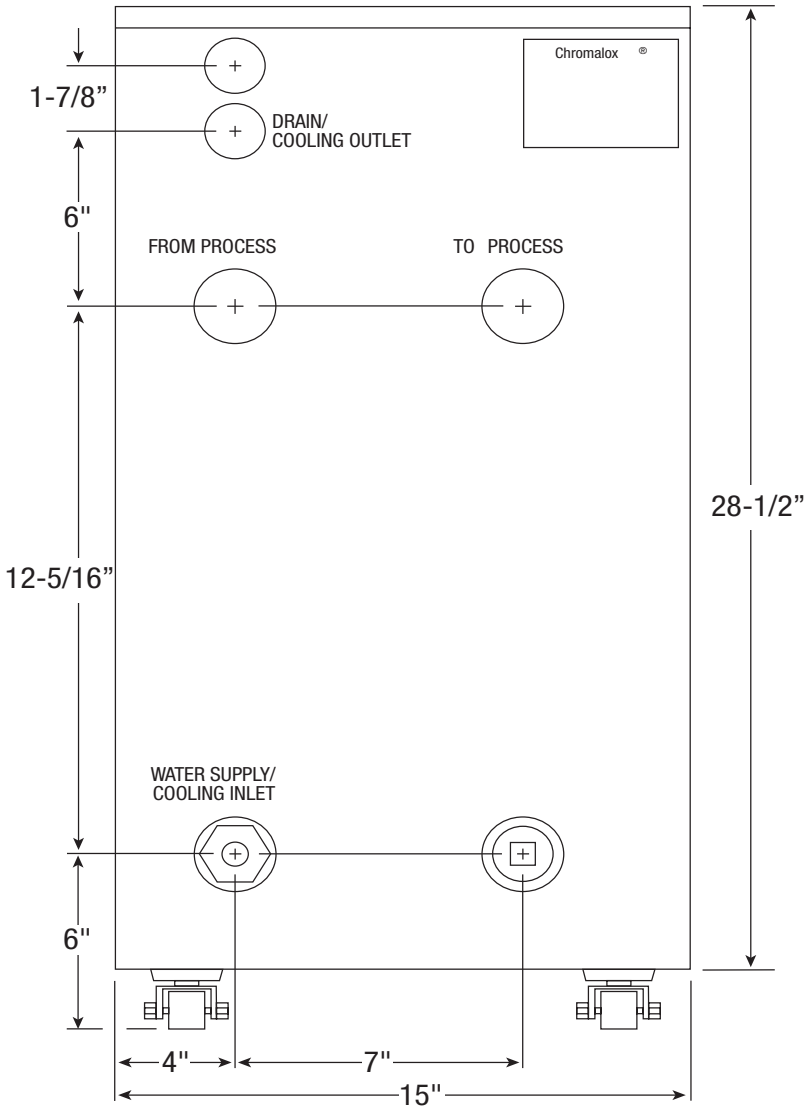


Figure 2.1 Open-Loop System Piping

Figure 2.1 Open-Loop Cooling Piping Connections



Rear View

Note: Dimensions are nominal ± 3/8”

Before Closed-Loop Hydraulic Installation

Before proceeding with the installation of the Closed-loop system, please take note of the following information:

1. Reduced diameter fittings may be used if they do not reduce flow rate and increase pressure drop significantly. Galvanized steel unions are recommended at all connections.
2. If water pressure falls below 20 psi, a pressure switch will interrupt pump motor and heater operation. Use an external water pressure regulator and back pressure relief valve or regulator set at maximum 125 psi (150 psi with 7.5 hp motor) connected in the external fill line, to reduce excessive water pressure. Not provided with CMX-180 models.

⚠WARNING

HAZARD OF EXPLOSION, FIRE AND SCALDING BURNS. To avoid excessive pressures, do not connect any valves or obstructions which could prevent free discharge from relief valve in a safe manner. Route line so water drains completely. Do not allow drain to freeze or corrode shut.

Do not install a check valve on the fill line. The inability of the system to flow back into the fill line can lead to excessive pressure. If back flow preventer or check valve is required, install back pressure regulator rated for 250°F water with a pressure setting of 30 to 80 psi. Back pressure regulator setting must be approximately 10 psi above water supply pressure to minimize water flow directly from supply to drain.

Hydraulic Installation Closed-Loop

1. Locate the unit as close as possible to the controlled process in order to minimize pressure drops. Make sure the unit is sitting on a solid, level foundation.
2. Using 1 1/4” NPT or larger schedule 40 pipe (flexible hose suitable for 150 psi and 250°F minimum service conditions can be used), connect the 1 1/4” NPT “FROM PROCESS” and “TO PROCESS” ports to the mold, mold manifold, or other process.
3. Pipe the entire system to minimize air pockets. Provide air bleed valves at high points and drains at low points.
4. 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.
5. Connect the 1/4” NPT port identified as “COOLING OUTLET” to a cooling water return line or plant drain that contains no valves or obstructions that could impede discharge. Review the condition of potential hot water going down a plant drain. Verify that local codes and materials are acceptable for this service. Temperature of discharge water could reach 250°F and create steam at atmospheric pressure.

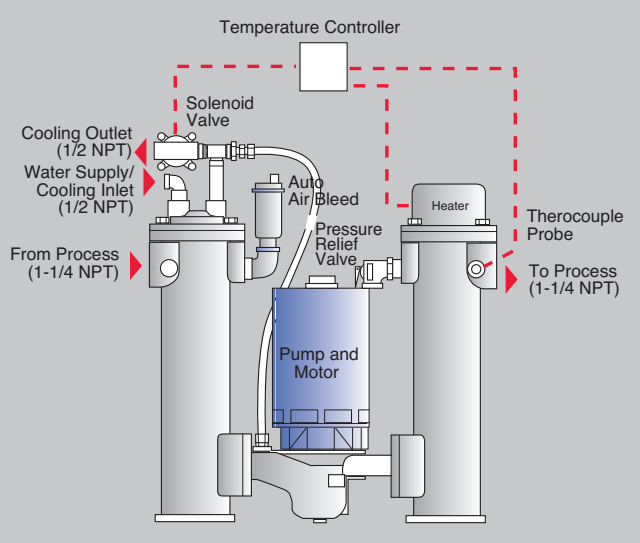


Figure 2.3 Closed-Loop System Piping

Figure 2.1 Open-Loop Cooling Piping Connections

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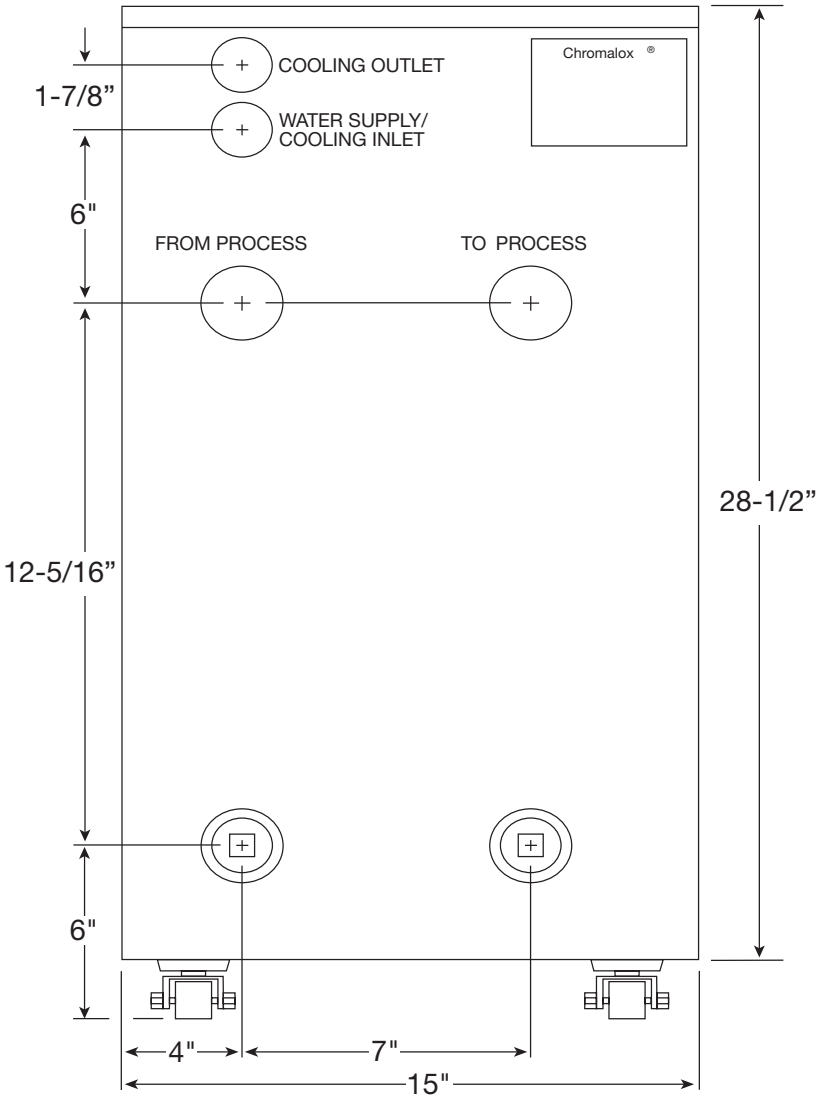


Rear View

Note: Dimensions are nominal ± 3/8"

Electrical Installation

⚠WARNING

HAZARD OF ELECTRIC SHOCK. The heat transfer system must be grounded using grounding means provided in control box and employing wiring by a qualified electrician in accordance with National Electric Code. Failure to comply can result in electrical shock or electrocution.

⚠WARNING

HAZARD OF ELECTRIC SHOCK. Disconnect all power before servicing the heat transfer system. Failure to comply can result in electrical shock or electrocution.

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:

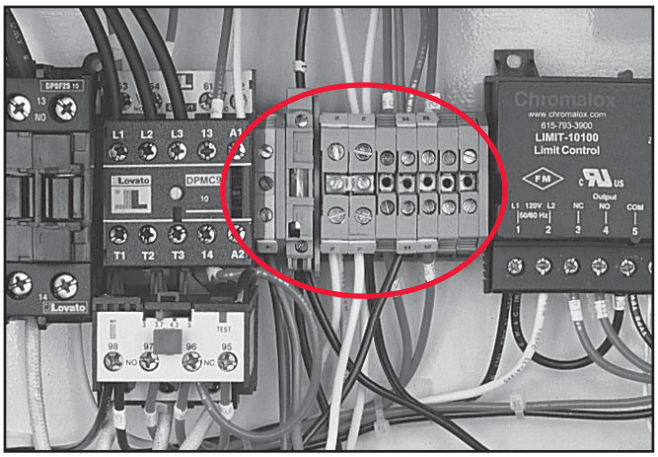


Figure 2.5 Power Connection Terminals

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 2.5.
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. **Pump Rotation Check:** 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.
5. Close the front electrical enclosure door. Pull the top cover off of the heat transfer system and locate the top of the pump motor.
6. With the supply water connected, and adequate pressure present, Press the START and STOP buttons in quick succession. Watch the rotation on the pump motor to insure it matches the label on its top.
7. If rotation is incorrect, disconnect power to the system and swap any two of the supply lines. Repeat rotation check.

⚠WARNING

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 lead to electric shock or electrocution.

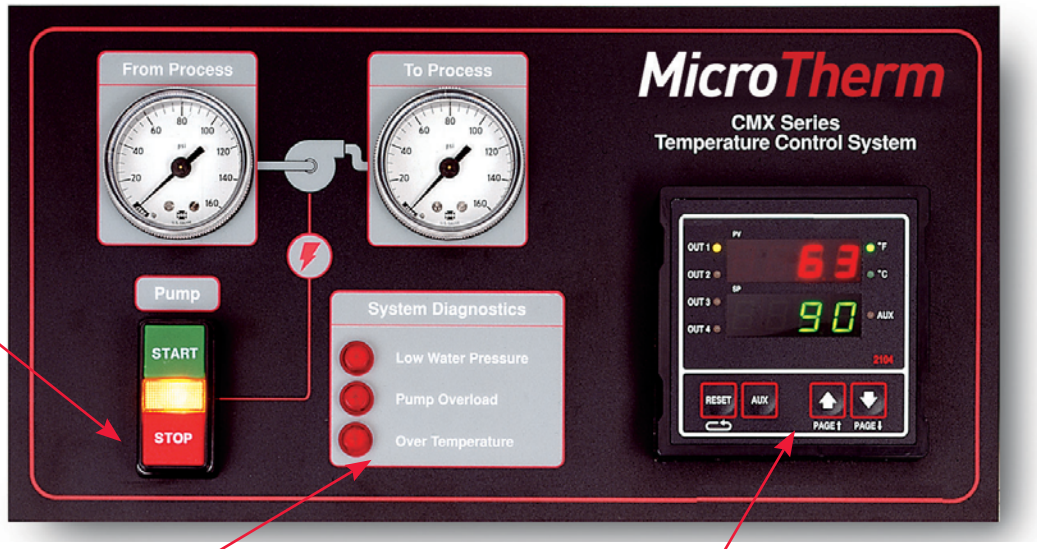
Control Voltage Fusing

Terminal block #1 (see Figure 2.5) 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.

Section 3 – Temperature Control Operations

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.

Low Water Pressure:
- System water pressure is below 20 psi. (Disabled on CMX-180 models)

Pump Overload:
- Pump has drawn too much current.

Over Temperature:
- System temperature has exceeded 260°F.

Temperature Control

Actual controller supplied may vary from picture.

Most CMX units shipped from 1995 through 2018 will have been equipped with a Chromalox model 2104 temperature controller. For these units, please reference 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.

Below is a list of the most common controller setups, with additional details available in Appendix C

CMX-250, Contactor – Dwg. 223-123625-053
CMX-275, Contactor – Dwg. 223-123625-052

CMX-250, SCR – Dwg. 223-123625-055
CMX-275, SCR – Dwg. 223-123625-058

CMX-250, Heat-Only – Dwg. 223-123625-057
CMX-275, Heat-Only – Dwg. 223-123625-059

Section 4 – Operation

⚠CAUTION

On both open Closed-loop systems, turn on water and insure the water supply lines are free of obstructions BEFORE energizing the heater. Such obstructions could prevent the thermal expansion of water from backing up into this line, thereby increasing system pressure until the relief valve opens.

Note: This system is equipped with an ASME safety pressure relief valve (factory preset at 125 psi or 150 psi with 7.5 hp motor).

1. Apply power to the system via the remote disconnect. The temperature controller and "LOW WATER PRESSURE" diagnostics light should illuminate.
2. Open supply-water line and process valving to allow system to fill. Auto air bleed will remove air from the system. Any remote air bleed valves should be opened to remove air from process and associated piping.
3. "LOW WATER PRESSURE" diagnostic light should go out when the system is filled and has reached 20 psi. The system will not start when light is illuminated.
4. Adjust the temperature setpoint to the desired level.
5. Assure that Pump Rotation Check was performed per instructions on page 12.
6. Start the pump by pressing on the front panel. The pump indicator light will illuminate.
7. Once temperature has stabilized at the setpoint level, review controllability of the system. If the temperature is fluctuating at an unacceptable level, consult the temperature control instruction manual for details on tuning the controller.
8. If the system temperature is below the current setpoint, heat will be applied by the controller to the heater elements. If the temperature is above the setpoint, the cooling solenoid will open (open and closed loop) to reduce the system temperature.

⚠WARNING

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.

9. For system shutdown, lower the setpoint to 90°F or lower, Allow the system to cool to this temperature level.
10. Press to de-energize the pump and disable the system.
11. Disconnect power to the unit.

⚠WARNING

Do not leave system unattended in a HOT electrical condition; and do not leave system unattended in HOT environmental conditions.

Section 5 – Diagnostics

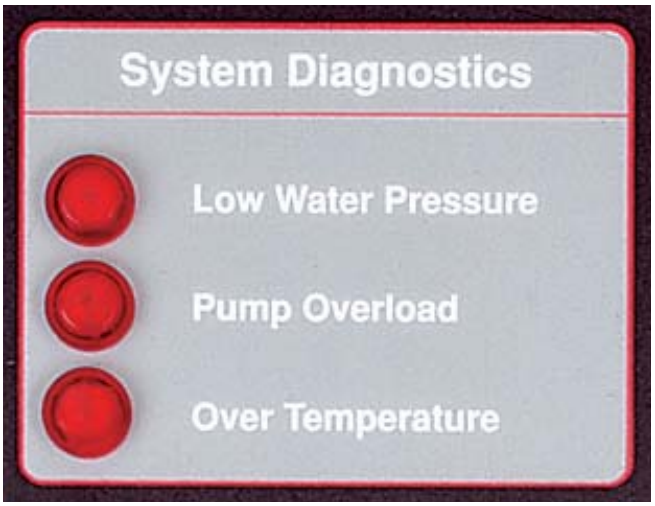


Figure 5.1 Diagnostic Indicators

Diagnostic Functions

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

Low Water Pressure Indicators

The pump, heater, and cooling will not operate while the pressure is low. The Low Water Pressure Indicator will illuminate when the system pressure is below 20 psi. This warning system is designed to reduce the possibility of pump cavitation and boiling on the heater element at higher operating temperatures. Disabled on CMX-180 models.

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

HAZARD OF ELECTRIC SHOCK. Disconnect system power, if the Pump Overload Indicator is illuminated. Hazard of electric shock or electrocution. Disconnect all power and piping to the system.

After the system power is disconnected, solve the electrical current problem. To put the pump back online, open the front electrical enclosure and press the pump reset switch (See Figure 5.2, Overload Switch).

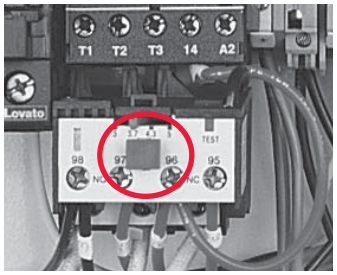


Figure 5.2 Pump Reset Switch

⚠WARNING

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 lead to electric shock or electrocution.

Over Temperature Indicator

If the system temperature exceeds 260°F (127°C), the Over Temperature Indicator will illuminate. When the system temperature drops below 260°F*, press **RESET** on the controller face. The controller will not reset until the temperature is below 260°F*.

*190°F on CMX-180 model(s)

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.

Shut Down

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. Carefully bleed pressure from the system by loosening a pipe fitting.

⚠WARNING

System may be pressurized. Use extreme care while removing piping. Disconnect water supply, drain and process connections.

6. Drain all water from the system.

Draining

Drain the unit before taking it out of service for a period of time, or if it is exposed to freezing temperatures while out of service.

1. To drain the unit completely, move it to an inclined position with the front of the system raised.
2. Remove the lower plugs on cast chambers (see Figure 6.1, Chamber Photo).

Figure 6.1 Chamber Photo

Heater Removal/Replacement

⚠WARNING

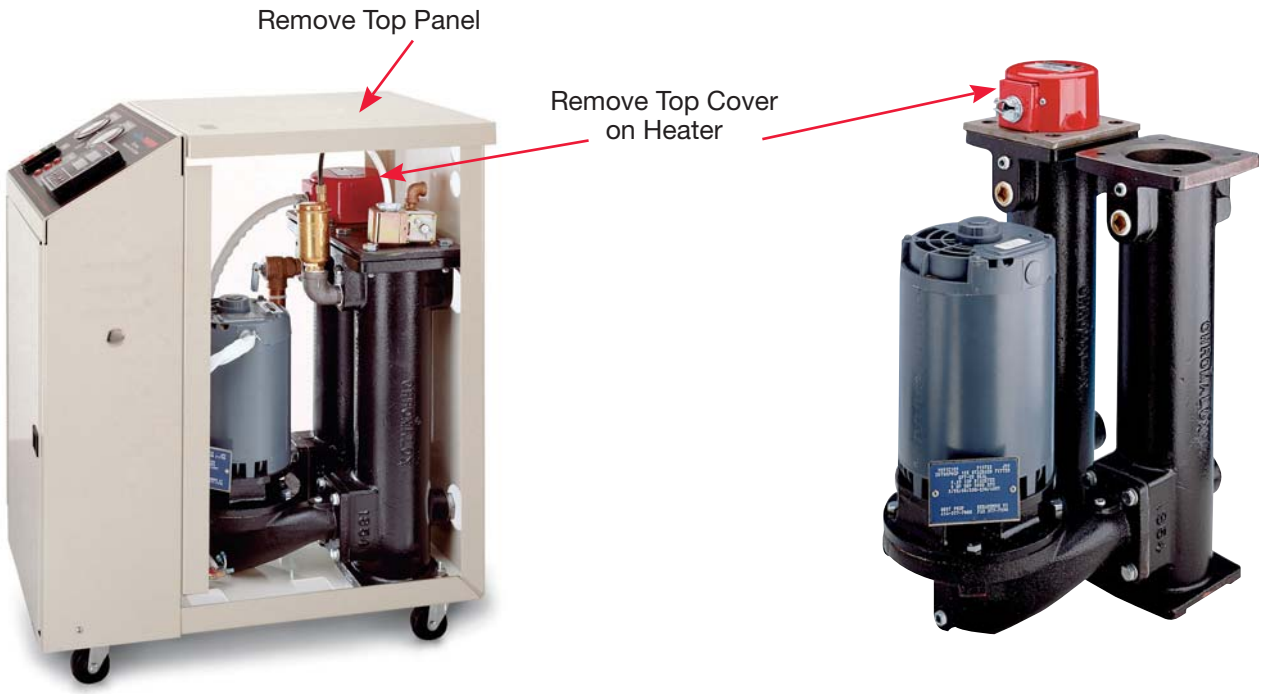
HAZARD OF ELECTRIC SHOCK. Disconnect all power and piping to system.

1. Disconnect all power to the system.
2. Bleed pressure and drain all water from the system.
3. Remove top panel.
4. Remove red top cover on the heater (see Figure 6.2, Heater/Chamber Photo).
5. Note location of wires on the heater, then remove wires (L1, L2, L3).
6. Loosen compression fitting on the heater power supply cable.
7. Remove cable from the heater.
8. Unbolt the heater (4 bolts) and remove.
9. Remove Bussing from old heater and re-install on replacement heater, using the same orientation.
10. Replace heater and reverse procedure.

⚠WARNING

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 lead to electric shock or electrocution.

Figure 6.2 Heater/Chamber Photo



Pump Removal/Replacement

⚠WARNING

HAZARD OF ELECTRIC SHOCK. Disconnect all power and piping to system.

1. Disconnect all power to the system.
2. Bleed pressure and drain all water from the system.
3. Remove top and side panels.
4. Remove pump motor wiring cover panel (2 screws).
5. Note location of pump motor wires and remove.
6. Loosen and remove vent line (see Figure 6.3, Motor Vent Line).
7. Remove bolts holding pump motor to the casting (4 bolts), and lift motor out of casting.
8. Remove impeller and install new mechanical seal and impeller on the new motor.
9. Place new motor in system and bolt down.
10. Replace vent line and tighten.
11. Reconnect wires and replace wiring cover and side panels.
12. Reconnect the system.
13. Perform Pump Rotation Check (see Section 2, page 12).
14. Replace top panel.

⚠WARNING

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 lead to electric shock or electrocution.

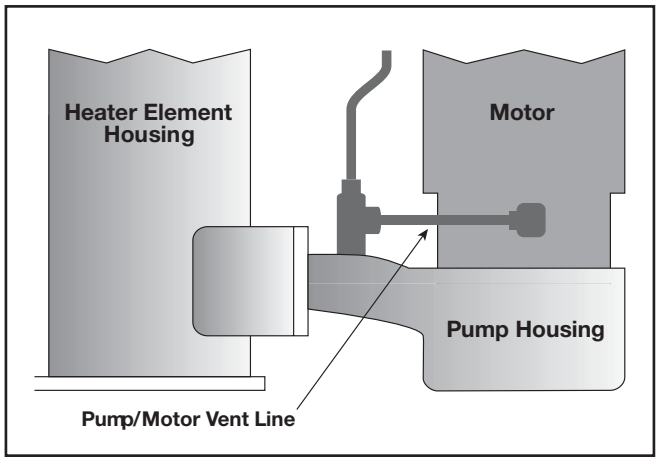


Figure 6.3 Motor Vent Line

Heat Exchanger Removal/Replacement (Closed loop system)

1. Disconnect all power to the system.
2. Bleed pressure and drain all water from the system.
3. Remove top panel.
4. Remove cover on the cooling solenoid (see Figure 6.4, Heat Exchanger).
5. Disconnect “COOLING INLET” and “COOLING OUTLET” piping.
6. Disconnect copper tubing connected to the heat exchanger.
7. Unbolt the heat exchanger and remove (4 bolts).
8. Place new heat exchanger in system and bolt down.
9. Reconnect “COOLING INLET” and “COOLING OUTLET” piping.
10. Reconnect wires to the cooling solenoid.
11. Reconnect copper tubing.
12. Replace cover on cooling solenoid and top panel.
13. Replace system water and reconnect the system.

⚠WARNING

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 lead to electric shock or electrocution.

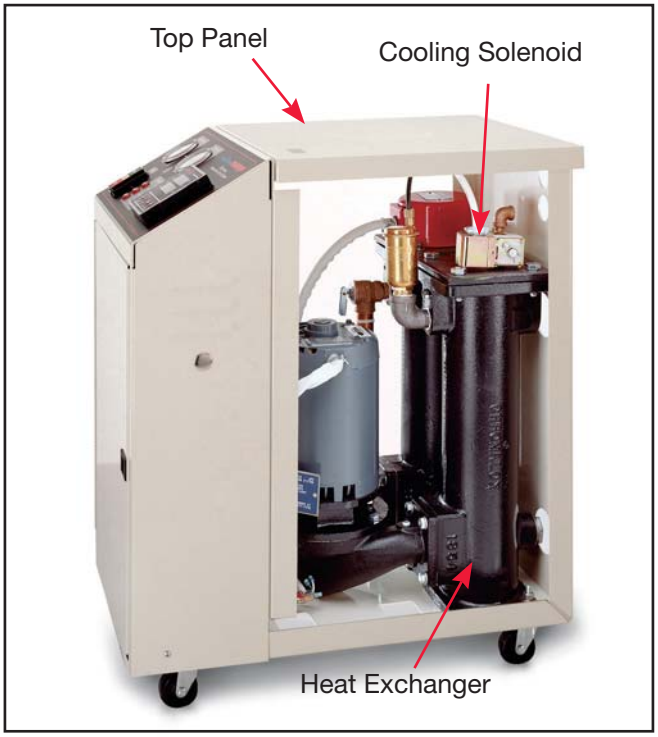


Figure 6.4 Heat Exchanger

Replacement Heating Elements and Contactors

MicroTHERM Model Replacement Parts

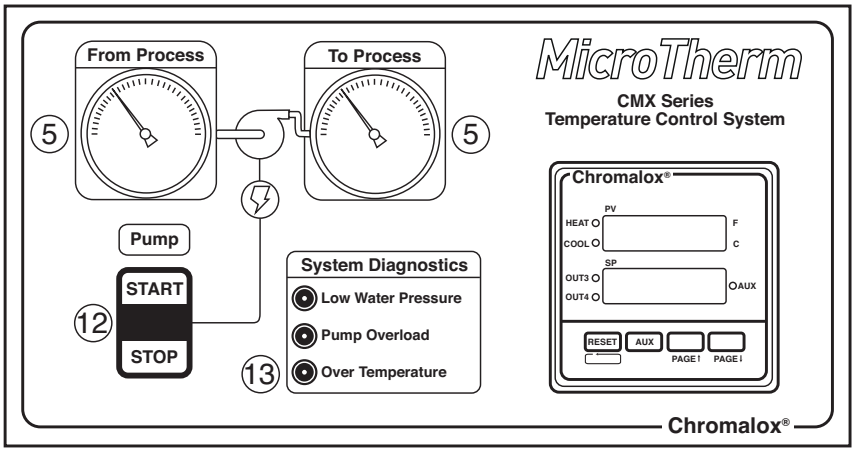
Open Loop	Closed Loop	Voltage	Heating Element	Heater Contactor
CMX-4	CMX-4C	240	155-554807-523	072-057576-050
CMX-4	CMX-4C	480	155-554807-523	072-057576-050
CMX-9	CMX-9C	240	155-554807-512	072-057576-050
CMX-9	CMX-9C	480	155-554807-512	072-057576-050
CMX-12	CMX-12C	240	155-554807-524	072-057576-050
CMX-12	CMX-12C	480	155-554807-524	072-057576-050
CMX-18	CMX-18C	240	155-554807-519	072-057576-051
CMX-18	CMX-18C	480	155-554807-519	072-057576-050
CMX-24	CMX-24C	240	155-554807-515	072-057576-051
CMX-24	CMX-24C	480	155-554807-515	072-057576-050

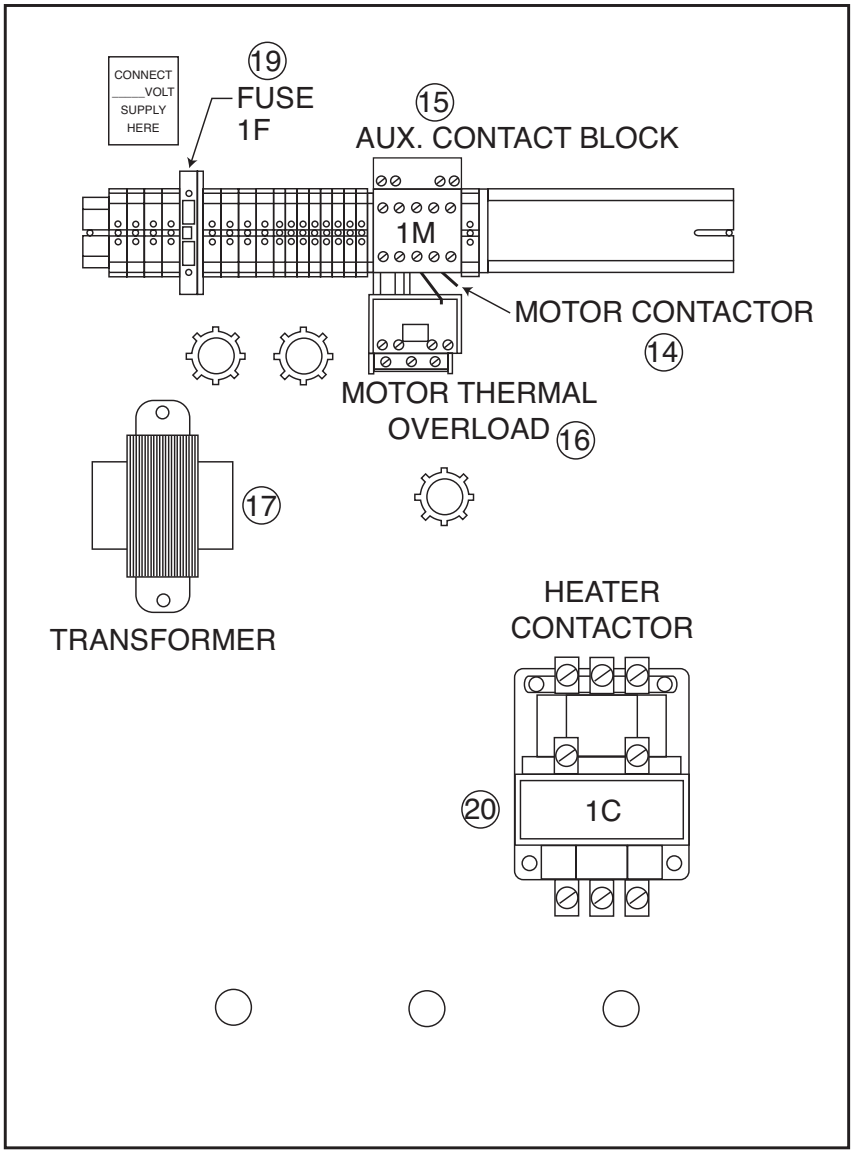
Replacement Parts Common to All Models

Identification #	Part Name	Part Number
1	3/4 HP Motor 240V/480V	193-121843-227
2	Solenoid Valve	344-121780-012
3	Pressure Relief Valve	344-048419-004
4	Automatic Air vent	344-053181-001
5	Pressure Gauge	130-118661-021
6	Pressure Switch	292-121927-028
7	Pump Mechanical Seal	251-121946-019
8	Heat Exchanger Bundle (Closed Loop)	353-123367-002
9	Heater/Cooling Gasket (2 total)	132-146012-020
10	Thermocouple	309-121759-063
11	Switch, Start/Stop Switch Indicator Bulb	292-122882-043 213-122066-034
12	Diagnostic Indicator Light (3 total)	213-122066-041
13	Motor Contactor 240/480V	072-123534-064
14	Auxillary Motor Contact Block	071-122886-055
15	Motor Thermal Overload 240V Motor Thermal Overload 480V	359-122078-096 359-122078-095
16	Transformer 240/480V	315-303786-001
17	Caster (4 total)	375-123425-003
18	Control Voltage Fuse	128-123445-005
19	Heater Contactor	See table above

These parts may vary for non-catalog items.
Please consult your local Chromalox representative. (800-443-2640 or www.chromalox.com)

Figure 6.6 Replacement Parts Identification





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 & unit's rated voltage.
Control display lights, unit will not start	1. Cooling water off, or below 20 psi. (CMX-250 models only)	1. Open cooling water valve, check to assure pressure is above 30psi
	2. Pump Motor Overload	2. Determine problem and press pump reset.
	3. System above temperature limit of 260°F. (190°F on CMX-180 Models)	3. Allow unit to cool below 260°F and press **RESET**.
Unit stops while running	1. Cooling water drops below 20 psi	1. Check cooling water valve, check to assure above 30 psi
	2. Pump motor overload	2. Determine problem and press pump reset.
	3. System exceeds temperature limit of 260°F (190°F on CMX-180 Models)	3. Allow unit to cool below 260°F and press **RESET**.
Low Water Pressure Indicator Illuminated	1. Cooling water drops below 20 psi (CMX-180 models)	1. Check that pressure is above 30 psi
Pump Overload Indicator illuminated	1. Pump motor overload	1. Determine the 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.
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.		

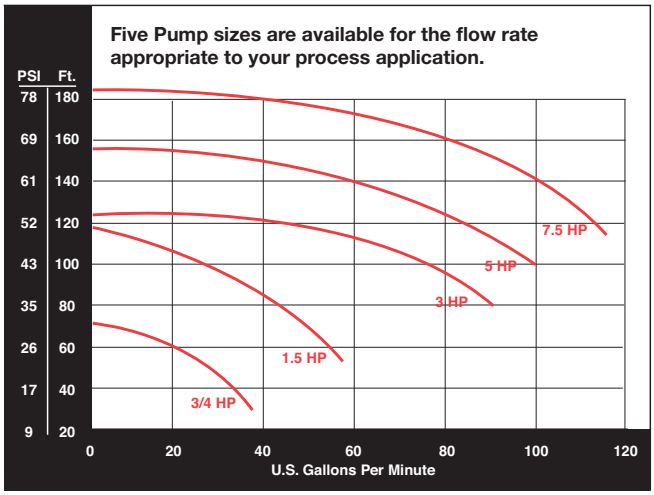
Section 8 – Specifications

Standard 3/4 HP Pump

Pump Size (HP)	Nominal Flow (gpm)	Heating Capacity (kW)	Standard Voltages	Process Connection dia. (Inches)	Drain/Supply dia. (Inches)	Approximate Dimensions (Inches)
3/4	30	4.5	240 or 480	1-1/4 NPT	1/4 NPT	29 height
3/4	30	9	240 or 480	1-1/4 NPT	1/4 NPT	29 height
3/4	30	12	240 or 480	1-1/4 NPT	1/4 NPT	25 depth
3/4	30	18	240 or 480	1-1/4 NPT	1/4 NPT	15 width
3/4	30	24	240 or 480	1-1/4 NPT	1/4 NPT	15 width

Optional Pump Sizes

Optional Pump Sizes (HP)	Nominal Flow (gpm)
1.5	40
3	50
5	60
7.5	80



Pump Capacity

Figure 8.1 - Pump Capacity

Optional Options

- Alternate Voltages: 208, 380, 575 VAC, 3 phase
- Expanded Open Loop Cooling: increased cooling water flow
- Expanded Closed Loop Cooling: 6.3 sq. ft. heat exchanger
- Solid State Power Control: SCR heater switching
- Surge Reduction valve: reduces water pressure spikes
- Door Interlock: prevents operation with service door open
- Digital Communications: for interface with ChromaSoft or remote PC/PLC systems
- IEC Style Contactor: for dry contact power switching
- Isolation Valve Kit: 1” ball valve for system isolation

Appendix A

microTHERM CMX Closed Loop to Open Loop Cooling Conversion

Note: All warnings and cautions denoted throughout this user's manual also apply to the modifications listed below. General instructions and specifications referring to the open and closed loop systems apply to the field-modified units below.

This sheet details the steps taken and material required to convert a Chromalox CMX microTHERM hot water system from closed loop cooling to open loop cooling. The basic operation involves removing the heat exchanger bundle and replacing it with a flat plate. Please contact the Chromalox Customer Service department for more information and to order the necessary materials.

New Material Required

1.	1/4" NPT Pipe Plug	1 piece	218-075439-036
2.	1/4" NPT x 1-1/2" Nipple	1 piece	198-122817-013
3.	1/4" NPT Elbow	1 piece	107-122815-001
4.	1/4" NPT Close Nipple	1 piece	198-122817-002
5.	1x1/2" NPT Reducer	1 piece	032-120942-019
6.	Open loop cooling flange	1 piece	121-510702-017

Replacement Steps

Figures 1 and 2 show the layout of the cooling configuration for both closed and open loop cooling. These parts are located on the top of the cooling chamber. Use pipe tape or other sealing compound when attaching threaded connections.

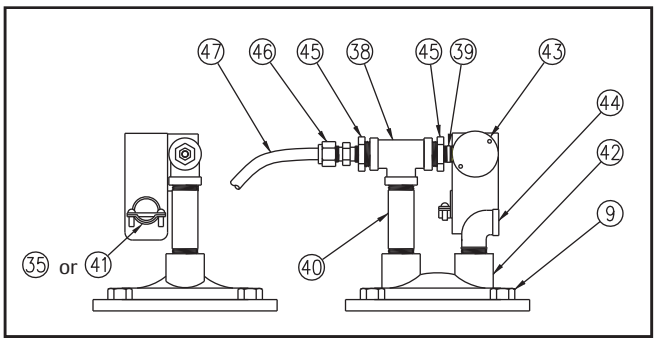


Figure A1 - Closed Loop Cooling

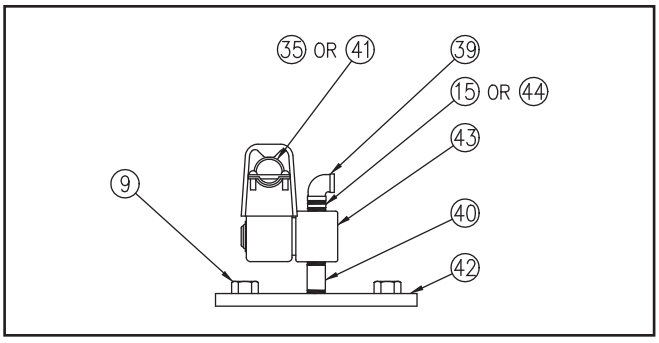


Figure A2 - Open Loop Cooling

Note: Refer to Figures 3 and 4 for location of components.

1. Remove (47) 3/8" copper tube and compression fittings from heat exchanger and tee above pump inlet.
2. Place 1/4" pipe plug into tee above pump inlet where copper tube was connected.
3. Pop magnetic coil from top of (43) solenoid valve and leave wired to system.
4. Remove (43) solenoid valve from top of heat exchanger and keep for reinstallation.
5. Remove four (9) bolts and lift (42) heat exchanger from cooling chamber.
6. Reuse rubber gasket and (9) bolts to attach new (42) cooling flange to cooling chamber.
7. Attach new (40) 1-1/2" nipple to flange.
8. Attach (43) solenoid and magnetic coil to nipple.
9. Attach new (15) close nipple and new (39) elbow to solenoid.
10. Replace 1" pipe plug from lower cooling chamber port with 1 x 1/2" reducer.
11. Lower cooling chamber port becomes the new cooling inlet.

Appendix B

microTHERM CMX Open Loop to Closed Loop Cooling Conversion

Note: All warnings and cautions denoted throughout this user's manual also apply to the modifications listed below. General instructions and specifications referring to the open and closed loop systems apply to the field-modified units below.

This sheet details the steps taken and material required to convert a Chromalox CMX microTHERM hot water system from open loop cooling to closed loop cooling. The basic operation involves removing the flat plate and replacing it with a heat exchanger bundle. Please contact the Chromalox Customer Service department (1-800-368-2493) for more information and to order the necessary materials.

New Material Required

1.	1/4" NPT Tee	1 piece	299-122818-001
2.	1/2" NPT Tee	1 piece	299-122818-003
3.	1/4" NPT x 7/8" Nipple	1 piece	198-122817-002
4.	1/2" NPT x 3" Nipple	1 piece	198-122817-090
5.	1/2" NPT Street Elbow	1 piece	107-114567-005
6.	Bush Reducer 1/2" x 1/4"NPT	2 pieces	032-121003-005
7.	Compression Fitting, 1/4" NPT x 3/8" tube	2 pieces	119-114570-001
8.	Tubing 3/8" copper	2 Feet	318-511965-001
9.	Gasket	1 piece	132-146012-020
10.	Heat Exchanger Tube Bundle	1 piece	353-123367-002
11.	1" NPT Pipe Plug	1 piece	218-075439-066
12.	Labels	1 piece	170-122103-040

Replacement Steps

Figures 1, 2, 3 and 4 show the layout of the cooling configuration for both closed and open loop cooling. These parts are located on the top of the cooling chamber. Use pipe tape or other sealing compound when attaching threaded connections.

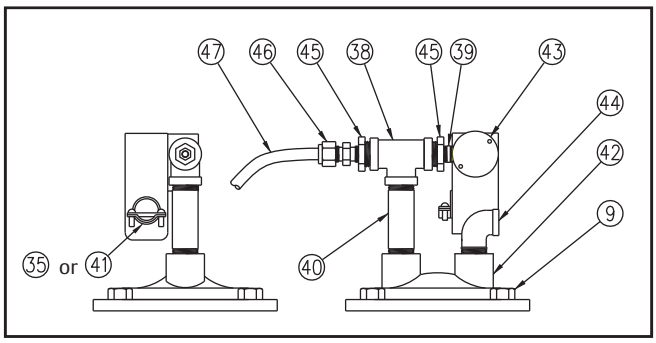


Figure B1 - Closed Loop Cooling

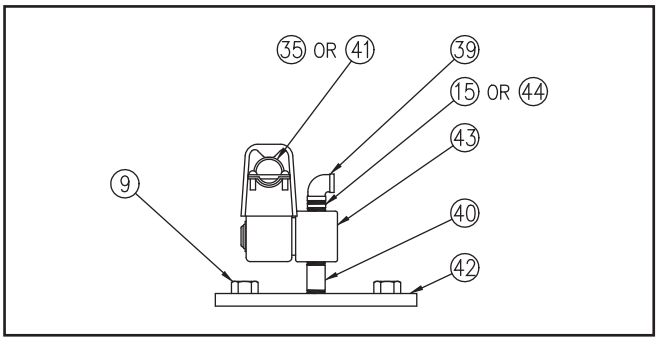


Figure B2 - Open Loop Cooling

Note: Refer to Figures 3 and 4 for location of components.

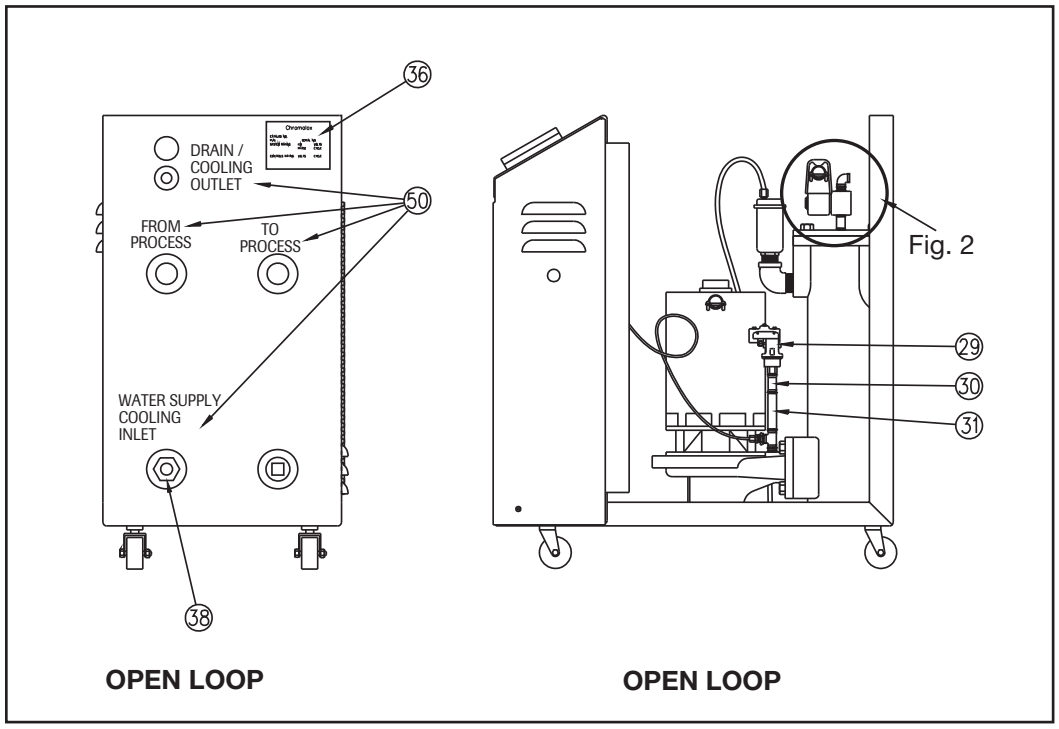


Figure B3 - Open Loop Cooling

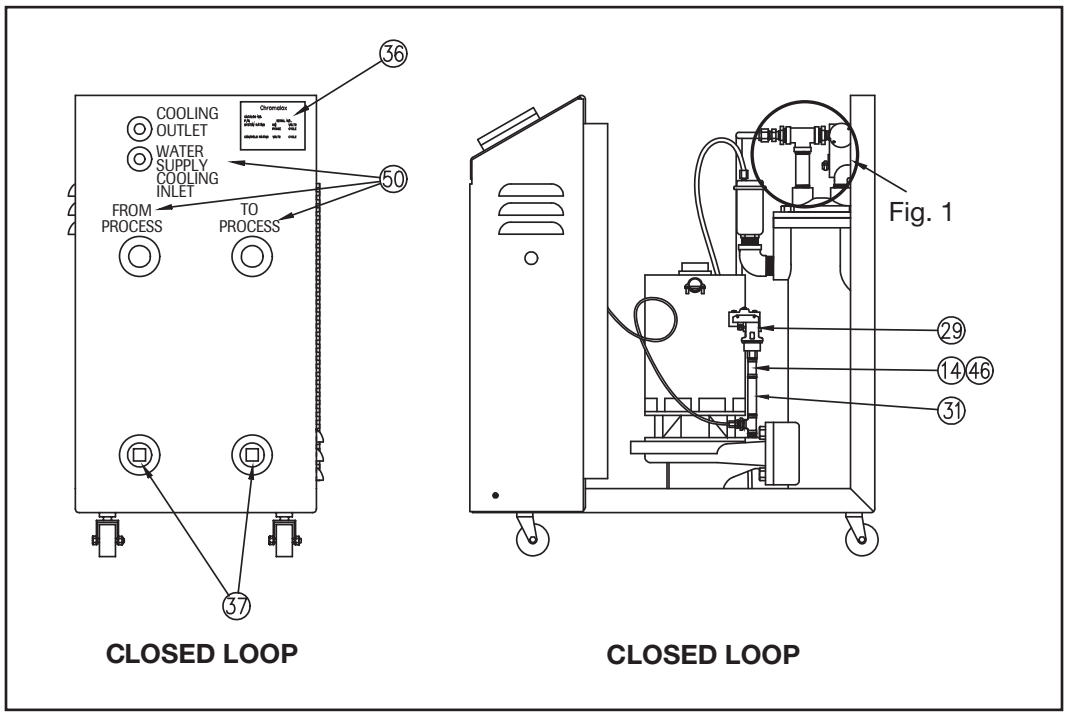


Figure B4 - Closed Loop Cooling

Installation Steps

1. Drain fluid from system and disconnect all power.
2. Fig. 2: Remove 1/4” NPT elbow (39), nipple (15) and nipple (40) from solenoid valve and keep solenoid valve for reinstallation.
3. Fig. 2: Remove flange (42).
4. Fig. 3: Remove 1/4” coupling (30) from pump inlet nipple (31) and remove coupling from pressure switch (29). Keep pressure switch for reinstallation.
5. Fig. 4: Install 1/4” NPT tee (14) on pump inlet nipple (31), install compression fitting (46) in 1/4” NPT tee (14). Reinstall pressure switch (29) into top of 1/4” NPT tee (14).
6. Fig. 1: Install heat exchanger (42) using new gasket and existing bolts.
7. Fig. 1: Install the following items onto the heat exchanger:
   - 1/2” NPT street elbow (44)
   - 1/2” NPT x 3” nipple (40)
   - 1/2” NPT tee (38)
   - 1/2” x 1/4” NPT bush reducers (45)
   - 1/4” NPT x 7/8” nipple (39)
   - compression fitting (46)
   - solenoid valve (43) removed earlier
8. Fig. 1: Install 3/8” copper tubing (47) in compression fitting (46). Route tubing to compression fitting (46) near pump inlet shown in Fig. 4. Do not kink tubing.
9. Fig. 3: Remove the 1” x 1/2” NPT bush reducer (38) from the bottom port on the inlet chamber.
10. Fig. 4: Install 1” NPT pipe plug (37) in bottom port of the inlet chamber.
11. Fig. 3: Remove the following labels from the CMX back panel:
    - “Water Supply / Cooling Inlet” from bottom port on inlet chamber
    - “Drain / Cooling Outlet” from bottom heat exchanger opening
12. Fig. 4: Apply new labels (50) to CMX back panel:
    - “Cooling Outlet” to top heat exchanger opening.
    - “Water Supply / Cooling Inlet” to bottom heat exchanger opening.
13. Test all connections for leaks

Appendix C

CMX-250, Heat Only 4081 Controller

Configuration Menu	
Lock Code	10
Input Configuration	Input 1 setup
Input Type	J Thermocouple
Engineering Units	˚F
Decimal Point Position	1234
Scaled Input Lower Limit	32˚F
Scaled Input Upper Limit	260 °F
Cold Junction Compensation	Enabled
Input Filter Time	2.0 sec

Control Configuration	
Control Select	Control Standard
Control Enable/Disable	Control Enabled
Select Auto/Manual Control	Automatic Control
Control Type	SINGLE
Primary Control Action	Reverse
PID set Use	PID set 1
Set 1 Primary Pb	15°F
Set 1 Secondary Pb	10˚F
Set 11ntegral	0.01 s
Set 1 Derivative	20.0s
Set 1 overlap/deadband	5˚F
Manual Reset	0%
Anti windup limit	100
Primary Cycle Time	30.0 s
Secondary Cycle Time	10.0 s
Primary Power Lower Limi	0.00%
Primary Power Upper Limit	100.00%
Secondary Power Lower Limit	0.00%
Secondary Power Upper Limit	100.00%
Sensor Break	Off
Set Point Lower Limit	32˚F
Set Point Upper Limit	250˚F
Set Point Ramp Rate	Off
Main setpoint source	Local Set point
Alternate Set Point Source	Not Used
Main Set Point	250°F

Output Configuration	
Output 1 Usage	Unused
Output 2 Usage	Primary
Output 3 Usage	OR alarm-events reverse
OPR3 OR selection	Alarms 1v
Output 3 Latch enable	Enabled
Output 4 Usage	UNUSED

Alarm Configuration	Alarm 1
Alarm 1 Type	Process High
Alarm 1 source	universal input 1
Process High Alarm Value	260˚F
Process High Alarm Hysteresis	1˚F
Minimum Duration	15 sec
Power-Up Inhibit Alarm 1	Uninhibited

Communication Configuration	
Modbus RTU Parity	None
Modbus RTU Data Rate	19200
Serial Communication	Enabled

CMX-275, High Temperature 4081 Controller, Heat Only

Configuration Menu	
Lock Code	10
Input Configuration	Input 1 setup
Input Type	J Thermocouple
Engineering Units	˚F
Decimal Point Position	1234
Scaled Input Lower Limit	32˚F
Scaled Input Upper Limit	285˚F
Cold Junction Compensation	Enabled
Input Filter Time	2.0 sec

Control Configuration	
Control Select	Control Standard
Control Enable/Disable	Control Enabled
Select Auto/Manual Control	Automatic Control
Control Type	SINGLE
Primary Control Action	Reverse
PID set	Use PID set 1
Set 1 Primary Pb	15˚F
Set 1 Secondary Pb	10˚F
Set 11ntegral	0.01 s
Set 1 Derivative	20.0s
Set 1 overlap/deadband	5˚F
Manual Reset	0%
Anti-windup limit	100
Primary Cycle Time	30.0 s
Secondary Cycle Time	10.0 s
Primary Power Lower Limit	0.00%
Primary Power Upper Limit	100.00%
Secondary Power Lower Limit	0.00%
Secondary Power Upper Limit	100.00%
Sensor Break	Off
Set Point Lower Limit	32˚F
Set Point Upper Limit	275˚F
Set Point Ramp Rate	Off
Main setpoint source	Local Set point
Alternate Set Point Source	Not Used
Main Set Point	275˚F

Output Configuration	
Output 1 Usage	Unused
Output 2 Usage	Primary
Output 3 Usage	OR alarm-events reverse
OPR3 OR selection	Alarms 1v
Output 3 Latch enable	Enabled
Output 4 Usage	Unused

Alarm Configuration	Alarm 1
Alarm 1 Type	Process High
Alarm 1 source	universal input 1
Process High Alarm Value	285˚F
Process High Alarm Hysteresis	1˚F
Minimum Duration	15 sec
Power-Up Inhibit Alarm 1	Uninhibited

Communication Configuration	
Modbus RTU Parity	None
Modbus RTU Data Rate	19200
Serial Communication	Enabled

CMX-275, High Temperature 4081 Controller with SCR

Configuration Menu	
Lock Code	10
Input Configuration	Input 1 setup
Input Type	J Thermocouple
Engineering Units	˚F
Decimal Point Position	1234
Scaled Input Lower Limit	32˚F
Scaled Input Upper Limit	285˚F
Cold Junction Compensation	Enabled
Input Filter Time	2.0 sec

Control Configuration	
Control Select	Control Standard
Control Enable/Disable	Control Enabled
Select Auto/Manual Control	Automatic Control
Control Type	DUAL
Primary Control Action	Reverse
PID set	Use PID set 1
Set 1 Primary Pb	15˚F
Set 1 Secondary Pb	10˚F
Set 11ntegral	0.01 s
Set 1 Derivative	20.0s
Set 1 overlap/deadband	5˚F
Manual Reset	0%
Anti-windup limit	100
Primary Cycle Time	1 s
Secondary Cycle Time	10.0 s
Primary Power Lower Limit	0.00%
Primary Power Upper Limit	100.00%
Secondary Power Lower Limit	0.00%
Secondary Power Upper Limit	100.00%
Sensor Break	Off
Set Point Lower Limit	32˚F
Set Point Upper Limit	275˚F
Set Point Ramp Rate	Off
Main setpoint source	Local Set point
Alternate Set Point Source	Not Used
Main Set Point	275˚F

Output Configuration	
Output 1 Usage	Primary
Output 2 Usage	Unused
Output 3 Usage	OR alarm-events reverse
OPR3 OR selection	Alarms 1v
Output 3 Latch enable	Enabled
Output 4 Usage	Secondary

Alarm Configuration	Alarm 1
Alarm 1 Type	Process High
Alarm 1 source	universal input 1
Process High Alarm Value	285˚F
Process High Alarm Hysteresis	1˚F
Minimum Duration	15 sec
Power-Up Inhibit Alarm 1	Uninhibited

Communication Configuration	
Modbus RTU Parity	None
Modbus RTU Data Rate	19200
Serial Communication	Enabled

CMX-275, High Temperature 4081 Controller

Configuration Menu	
Lock Code	10
Input Configuration	Input 1 setup
Input Type	J Thermocouple
Engineering Units	˚F
Decimal Point Position	1234
Scaled Input Lower Limit	32˚F
Scaled Input Upper Limit	285˚F
Cold Junction Compensation	Enabled
Input Filter Time	2.0 sec

Control Configuration	
Control Select	Control Standard
Control Enable/Disable	Control Enabled
Select Auto/Manual Control	Automatic Control
Control Type	DUAL
Primary Control Action	Reverse
PID set	Use PID set 1
Set 1 Primary Pb	15˚F
Set 1 Secondary Pb	10˚F
Set 11ntegral	0.01 s
Set 1 Derivative	20.0s
Set 1 overlap/deadband	5˚F
Manual Reset	0%
Anti-windup limit	100
Primary Cycle Time	30.0 s
Secondary Cycle Time	10.0 s
Primary Power Lower Limit	0.00%
Primary Power Upper Limit	100.00%
Secondary Power Lower Limit	0.00%
Secondary Power Upper Limit	100.00%
Sensor Break	Off
Set Point Lower Limit	32˚F
Set Point Upper Limit	275˚F
Set Point Ramp Rate	Off
Main setpoint source	Local Set point
Alternate Set Point Source	Not Used
Main Set Point	275˚F

Output Configuration	
Output 1 Usage	Unused
Output 2 Usage	Primary
Output 3 Usage	OR alarm-events reverse
OPR3 OR selection	Alarms 1v
Output 3 Latch enable	Enabled
Output 4 Usage	Secondary

Alarm Configuration	Alarm 1
Alarm 1 Type	Process High
Alarm 1 source	universal input 1
Process High Alarm Value	285˚F
Process High Alarm Hysteresis	1˚F
Minimum Duration	15 sec
Power-Up Inhibit Alarm 1	Uninhibited

Communication Configuration	
Modbus RTU Parity	None
Modbus RTU Data Rate	19200
Serial Communication	Enabled

CMX-250 STD Heat/Cool 4081/4082 Controller with SCR

Configuration Menu	
Lock Code	10
Input Configuration	Input 1 setup
Input Type	J Thermocouple
Engineering Units	˚F
Decimal Point Position	1234
Scaled Input Lower Limit	32˚F
Scaled Input Upper Limit	260 °F
Cold Junction Compensation	Enabled
Input Filter Time	2.0 sec

Control Configuration	
Control Select	Control Standard
Control Enable/Disable	Control Enabled
Select Auto/Manual Control	Automatic Control
Control Type	DUAL
Primary Control Action	Reverse
PID set Use	PID set 1
Set 1 Primary Pb	15°F
Set 1 Secondary Pb	10˚F
Set 11ntegral	0.01 s
Set 1 Derivative	20.0s
Set 1 overlap/deadband	5˚F
Manual Reset	0%
Anti windup limit	100
Primary Cycle Time	1 s
Secondary Cycle Time	10 s
Primary Power Lower Limi	0.00%
Primary Power Upper Limit	100.00%
Secondary Power Lower Limit	0.00%
Secondary Power Upper Limit	100.00%
Sensor Break	Off
Set Point Lower Limit	32˚F
Set Point Upper Limit	250˚F
Set Point Ramp Rate	Off
Main setpoint source	Local Set point
Alternate Set Point Source	Not Used
Main Set Point	250°F

Output Configuration	
Output 1 Usage	Primary
Output 2 Usage	Unused
Output 3 Usage	OR alarm-events reverse
OPR3 OR selection	Alarms 1v
Output 3 Latch enable	Enabled
Output 4 Usage	Secondary

Alarm Configuration	Alarm 1
Alarm 1 Type	Process High
Alarm 1 source	universal input 1
Process High Alarm Value	260˚F
Process High Alarm Hysteresis	1˚F
Minimum Duration	15 sec
Power-Up Inhibit Alarm 1	Uninhibited

Communication Configuration	
Modbus RTU Parity	None
Modbus RTU Data Rate	19200
Serial Communication	Enabled

CMX-250 Stnadard, Heat/Cool 4081 Controller

Configuration Menu	
Lock Code	10
Input Configuration	Input 1 setup
Input Type	J Thermocouple
Engineering Units	˚F
Decimal Point Position	1234
Scaled Input Lower Limit	32˚F
Scaled Input Upper Limit	260˚F
Cold Junction Compensation	Enabled
Input Filter Time	2.0 sec

Control Configuration	
Control Select	Control Standard
Control Enable/Disable	Control Enabled
Select Auto/Manual Control	Automatic Control
Control Type	DUAL
Primary Control Action	Reverse
PID set	Use PID set 1
Set 1 Primary Pb	15˚F
Set 1 Secondary Pb	10˚F
Set 11ntegral	0.01 s
Set 1 Derivative	20.0s
Set 1 overlap/deadband	5˚F
Manual Reset	0%
Anti-windup limit	100
Primary Cycle Time	30.0 s
Secondary Cycle Time	10.0 s
Primary Power Lower Limit	0.00%
Primary Power Upper Limit	100.00%
Secondary Power Lower Limit	0.00%
Secondary Power Upper Limit	100.00%
Sensor Break	Off
Set Point Lower Limit	32˚F
Set Point Upper Limit	250˚F
Set Point Ramp Rate	Off
Main setpoint source	Local Set point
Alternate Set Point Source	Not Used
Main Set Point	250˚F

Output Configuration	
Output 1 Usage	Unused
Output 2 Usage	Primary
Output 3 Usage	OR alarm-events reverse
OPR3 OR selection	Alarms 1v
Output 3 Latch enable	Enabled
Output 4 Usage	Secondary

Alarm Configuration	Alarm 1
Alarm 1 Type	Process High
Alarm 1 source	universal input 1
Process High Alarm Value	260˚F
Process High Alarm Hysteresis	1˚F
Minimum Duration	15 sec
Power-Up Inhibit Alarm 1	Uninhibited

Communication Configuration	
Modbus RTU Parity	None
Modbus RTU Data Rate	19200
Serial Communication	Enabled

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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