Chromalox®

# *Electrical Heat Tracing Troubleshooting Guide*

**1382 Heil Quaker Blvd • Lavergne, TN 37086 • 615-793-3900**
**www.chromaloxheating.com**

# Heating Cable Troubleshooting

***Problem: Heating cable is drawing proper current but the pipe is not staying warm.***

**Possible Causes: Improper voltage, wrong cable, wrong design specs, water contamination in the insulation, improper control placement, not enough cable at heat sinks.**

*WARNING:* All trouble shooting and wiring checks shall be performed by qualified electricians or authorized plant personnel. Disconnect ALL power from circuit before servicing or inspecting circuits.

**Solution #1:** This is a side effect to the above problem. Check the voltage to be sure the proper voltage is applied. For example, applying 208 volts to a circuit that was supposed to be energized on 240 volts causes a power drop of 25%. If the power degradation is severe enough, the cable output may not be high enough to offset heat loss.

**Solution #2:** Check the cable catalog number to ensure the proper cable wattage has been applied. If a lower nominal cable wattage was applied, either replace the heating cable with the proper wattage or apply additional insulation until the applied heating cable can properly offset the revised heat losses.

**Solution #3:** Check specifications to ensure proper insulation type and thickness were used based on the heat loss design. If ambient temperatures have dropped below expected values used in design process, install additional insulation of replace cable with proper wattage.

**Solution #4:** Check for moisture infiltration in the insulation. Although heat trace cable is moisture resistant, wet insulation will wick heat away from the cable. Wet insulation is the leading cause of heat traced pipes not staying warm.

**Solution #5:** Make sure that you are using separate controls for indoor / outdoor legs of circuits. Same holds true for above / below grade circuits and pipes of unequal size. Also use separate controllers for flowing and stagnant lines.

**Solution #6:** Make sure you have applied sufficient heating cable at heat sinks such as pumps, valves, gauges, etc. See General Instructions for Installing Heating Cable Products (PJ438-9) for drawings on how to install cable at various heat sinks. Also cable may have been installed with the wrong pitch, check that the cable has been spiralled around the pipe at the correct pitch to offset heat losses.

**Solution #7:** Cable terminations may be corroded or loose causing a high resistance connection. Remove corrosion and /or tighten connections.

**Note: Be careful not to expose cable to temperatures above its maximum limit. This will cause damage to the semi-conductor core and greatly reduce cable effectiveness.**

# Heating Cable Troubleshooting

***Problem: Heating cable is energized but not drawing full current.***

**Possible Causes: Wrong voltage, damaged cable, self-regulating effect.**

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**Solution #1:** Check the voltage to be sure the proper voltage is applied. For example, applying 208 volts to a circuit that was supposed to be energized on 240 volts causes a power drop of 25%.

**Solution #2:** On parallel construction cables like self-regulating and constant wattage, one of the bus wires may be cut. The cable only produces heat up to the point where damage has occurred. The result is lower power and lower current draw. To determine if a cable has been cut, check the voltage across the buss wires at the end of the circuit. If there is no voltage, the cable has been cut. If voltage is present, see solutions #1 and #3

**Solution #3:** If the cable is self-regulating, the current draw will be dependent on the temperature of the heating cable and the pipe. Cold pipes cause higher current draw. Warm pipes cause lower current draw. If the current is lower than expected on self-regulating circuits, measure the pipe temperature and check the power output versus pipe temperature on the power output graph on the cable data sheet. The power output measured should fall within the tolerance specified on the power output graph for the measured pipe temperature. If the power output is too low see solutions #1 and #2.

# Heating Cable Troubleshooting

***Problem: Pipe temperatures are above normal***

**Possible Causes: Thermostat contacts stuck closed, thermostat out of calibration, improper bulb mounting, mixed control placement.**

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**Solution #1:** Contacts of a thermostat can become stuck closed due to excessive currents, open capillary or bulb corrosion and failure of mechanical parts. Replace or repair thermostat and ensure that the heater circuits are not drawing more than the rated current of the thermostat.

**Solution #2:** See separate instructions on how to calibrate thermostats.

**Solution #3:** Sensing bulb must be in close contact with pipe or vessel wall. The bulb can be secured with high temperature tape, tie wire, metallic tape, stainless steel banding or thermal cement. Also make sure that sensing bulb is located as far away as possible from any heat sinks.

**Solution #4:** A thermostat bulb placed on the outdoor leg of the heater circuit can cause higher than normal temperatures on the indoor section of pipe (winter). Same holds true for pipes of unequal size. Use separate controls in such cases.

# Heating Cable Troubleshooting

***Problem: When the circuit breaker is turned ON, the breaker trips within a few seconds.***

**Possible Cause: Start up current is exceeding the breaker capacity. Use an appropriately sized ammeter to read the current draw when the breaker is first energized. Take the last measurable reading and the length of time the breaker was energized before tripping.**

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**Solution #1:** If ampere draw is exceeding the breaker ampacity for absorbing start-up current by a narrow margin, try swapping breakers. Thermal breakers are subject to some manufacturing variation.

**Solution #2:** If the ampere draw is exceeding the breaker ampacity for absorbing start-up current by a wide-margin, the breaker may need to be replaced with a higher rated breaker. Be sure to follow all national and local codes when upgrading circuit ampacities. Supply wires and conduit sizes may also require upgrading.

**Solution #3:** Multiple circuits on one breaker may be drawing too much current. Energize the circuits one at a time to confirm they are drawing the proper amount of current. If necessary, split multiple circuits onto additional breakers.

**Solution #4:** Cable length and the circuit breaker capacity are at their maximum ratings and the ambient air temperature has dropped below that used in design. The cable circuit must be shortened.

# Heating Cable Troubleshooting

***Problem: When the circuit breaker is turned ON, the breaker trips instantaneously.***

**Possible Cause: There is a dead short in the system. To diagnose where the problem is, disconnect the power supply wires from the heating cable at the power connection box. Attach one lead of a megohm device to one bus wire and the other lead to the ground braid.**

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**Solution #1:** If the megohm device does not register a short circuit, megohm the supply wires. The short probably lies in the power supply to the cable. Repair ground problem in supply wiring.

**Solution #2**: If the short occurs in the heating cable, check these locations in the following order: (1) Power connection box – make sure ground braid is not in contact with bus wires or heater matrix if the cable is self-regulating (2) End seals – pull back just enough thermal insulation to visually inspect the end seal. If the ground braid terminates inside the end seal, remove end seal to determine if ground braid is in contact with the buss wires or heater element (matrix) (3) Splice and/or Tee kits – inspect for ground braid contact with bus wires or heater element. Repair as needed. (4) Physical signs of damage to thermal insulation – The cable may have been damaged as a result of an accident with pipe and cable. While checking the above locations also make sure that there is not excessive moisture in the connection boxes or splices. This can also cause circuit breakers to trip.

# Heating Cable Troubleshooting

***Problem: Heating cable does not operate.***

**Possible Causes: Defective circuit breaker, Open circuit, Undersized distribution wiring, Short circuit**

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Solution #1: Circuit breaker may be defective. Replace circuit beaker and re-power circuit.

Solution #2: Corrosion may have caused poor power terminal electrical connections or connection may be loose. Remove corrosion and / or tighten connection. Buss wires near the power terminal may burn open if the cable is longer than the recommended maximum design length and the ambient air temperature has dropped below the lowest expected used in the design. Shorten the circuit to limit inrush and operating current.

Solution #3: Undersized distribution wiring may have been installed. Check to ensure that distribution wiring is capable of carrying the heater inrush current.

Solution #4: Cable may have been incorrectly terminated at either the power end or hot end. Make sure cable has been correctly terminated so that there are no buss wires touching each other. Buss wires may also become fused together near the power terminal from excessive current. This can occur if the maximum recommended design length is exceeded or the cable is at its maximum and the ambient temperature has dropped below the lowest expected used in the design. Shorten the cable to decrease the inrush and operating current.

# Heating Cable Troubleshooting

***Problem: A freeze protection circuit with an ambient sensing thermostat is not energizing when temperature drops below 40 ° F***

**Possible Cause: Thermostat set point or incorrect wiring.**

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**Solution #1:** Verify the set point of the controller is set correctly. Otherwise the thermostat will not energize at the proper temperature. Also, check the thermostat to verify that the thermostat is calibrated. Details on calibration are included in the thermostat installation instruction sheet.

**Solution #2:** The thermostat may be wired incorrectly. The two terminals that should be used are COMMON (COM) and NORMALLY CLOSED (NC). Wired with the COM and NC, the heating cable will turn on as temperature falls. In some cases, customers have wired thermostats using COMMON and NORMALLY OPEN which causes the heating cable to TURN OFF when the temperature falls.