

Chromalox

Model Specification: SRF Freeze Protection System

Part 1 - GENERAL

Furnish a complete UL Listed, CSA Certified, or FM Approved system of heating cables, components, and controls in ordinary areas to (choose one: prevent pipes from freezing, provide vessel freeze protection).

Part 2 - MATERIALS

- 2.1 The self-regulating cable shall consist of two (2) 16 AWG nickel-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heating cable to be cut to length in the field. A modified polyolefin dielectric jacket shall cover the heating cable. To provide a ground path and to enhance the heating cable's ruggedness, the heating cable shall have a braid of tinned copper (-C), as required per section 427-23 of the NEC-1996. An optional outer jacket composed of modified polyolefin (-CR) may be provided. For installation on plastic piping, the heating cable shall be applied using aluminum tape (AT-1).
- 2.2 In order to provide rapid heat-up, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:

Heating Cable	S.R. Index (W/°F)	S.R. Index (W/°C)
3 W/ft	-0.020	-0.036
5 W/ft	-0.045	-0.080
8 W/ft	-0.058	-0.104

- 2.3 In order to facilitate longer circuit lengths and smaller breaker sizing. The heating cable shall have the following maximum inrush current at 50°F (10°C).

Heating Cable	Maximum Inrush @ time = 1 sec	Maximum Inrush @ time = 10 sec	Maximum Inrush @ time = 300 sec
3 W/ft, 120V	58 mA/ft	54 mA/ft	41 mA/ft
5 W/ft, 120V	155 mA/ft	128 mA/ft	66 mA/ft
8 W/ft, 120V	210 mA/ft	180 mA/ft	83 mA/ft
3 W/ft, 240V	38 mA/ft	36 mA/ft	20 mA/ft
5 W/ft, 240V	92 mA/ft	80 mA/ft	33 mA/ft
8 W/ft, 240V	127 mA/ft	106 mA/ft	41 mA/ft

- 2.4 The heating cable shall operate on line voltages of (select 120, 208, 220, 240, or 277) volts without the use of transformers.
- 2.5 The heating cable for metal-pipe freeze protection shall be sized according to the table below. The required heating cable output rating is in watts per foot at 50°F. (Heating cable selection is based on 1 inch of fiberglass insulation.)

Pipe size (in)	0°F Minimum Ambient Temperature	-20°F Minimum Ambient Temperature
3 or less	5 watts	8 watts
4	5 watts	8 watts
6	8 watts	2 runs - 5 watts
8	2 runs - 5 watts	2 runs - 8 watts
10	2 runs - 8 watts	2 runs - 8 watts

- 2.6 The heating cable shall be SRF cable as manufactured by Chromalox.
- 2.7 Power connection, end seal, splice, and tee kit components shall be applied in the field.
- 2.8 A ground-fault device for equipment protection shall protect heating cable circuit. This requirement is in accordance with section 427-22 of the NEC-1996.

Part 3 - COMPONENTS

All heating cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to (choose one: prevent pipes from freezing, provide vessel freeze protection). Component enclosures shall be rated NEMA 4X to prevent water ingress and corrosion. In order to ensure the most reliable electrical connection and to simplify the maintenance and troubleshooting of freeze protection systems only terminal block connections are acceptable.

Part 4 - SYSTEM CONTROL

Option 1: Manual Control

The system shall be controlled by a switch, either directly or through an appropriate contactor.

Option 2: Thermostatic Control - Ambient Sensing

The system shall be controlled by a 0-255°F adjustable ambient sensing thermostat. The thermostat shall be supplied with a 40°F setting from the factory. The thermostat shall be type RTAS as supplied by Chromalox. Where the heat tracing circuit current exceeds thermostat or switch rating, Contactor type CONT as supplied by Chromalox shall be used. Contactor enclosure type NEMA 4 shall be used.

Option 3: Thermostatic Control - Line Sensing

The system shall be controlled by a 0-400°F adjustable line sensing thermostat. The thermostat shall be supplied with a 200°F setting from the factory. The thermostat shall be type RTBC as supplied by Chromalox. Where the heat tracing circuit current exceeds thermostat or switch rating, Contactor type CONT as supplied by Chromalox shall be used. Contactor enclosure type NEMA 4 shall be used.

Option 4: Control, Monitoring and Power Distribution Systems

- A) For single loop applications, a UL listed microprocessor based temperature control, monitoring and power distribution system shall be used. The controller shall accept universal sensor inputs. The system shall be compatible with self-regulating and MI cables and shall have the following features.
 - 1) NEMA 4X fiberglass enclosure
 - 2) Supply voltage: (select: 120, 240 or 277 Vac single phase).
 - 3) Field power connection terminal block must accept universal sensor input for one circuit.
 - 4) Control must operate in 32-120°F (0-40°C) environments.
 - 5) Solid state relay rated 30A at 120°F (40°C) output.
 - 6) Optional RS-485 MODBUS® communications capable with interfacing with personal computers and PLC's.
 - 7) Low current alarm: 0-30A in 1A increments.
 - 8) Optional 5-100mA ground fault alarm trip.
 - 9) Process, deviation, band, high/low and latching/non-latching (manual/automatic reset) programmable temperature alarms.
 - 10) On/Off and PID control modes. PID mode must have one touch self-tuning feature such as Chromalox, 1600 series SMART button feature.
 - 11) Programmable Soft-Start-Timed Output Power Limit on Start-Up.
- B) For multi-loop applications, a UL listed microprocessor based temperature control, monitoring and power distribution system shall be used. The sensors shall be of the type resistance temperature detector RTD (0 – 500 C/32 – 900 F) and shall be wired to the panel. The system shall be compatible with self-regulating and MI cables and shall have the following features.

- 1) NEMA 4/12 enclosure.
 - 2) Supply voltage: (select: 120, 240 or 277 Vac single phase).
 - 3) The system must have a color touch screen operator interface.
 - 4) Field power connection terminal block and RTD input connection terminal block for (select: 8, 12 or 24 circuits).
 - 5) Select (32-120°F (0-40°C) operating environment without Cabinet Heater) (-40 – 120 F with Optional Cabinet heater).
 - 6) Mechanical Two-Pole Output Relays for each circuit rated 30 Amps .
 - 7) Select (Optional RS-485 MODBUS® communications for interfacing with personal computers and PLC's).
 - 8) The system must be capable of checking cable continuity without use of a monitor wire.
 - 9) Ground fault alarm must be adjustable between (25 – 500 mA).
 - 10) The system must have selectable capability for ground fault alarm only or ground fault and trip.
 - 11) The system must have Non-Latching, High/low programmable temperature alarms.
 - 12) The system must have Open Sensor Alarm with Programmable Open Sensor Output Setting (0 – 100%).
 - 13) The System must have capability to graphically display circuit currents.
 - 14) The system must have load managing start-up capability.
 - 15) The system must have programmable self-test capability from 0 to 720 hours with full system alarm capability including ground fault, high/low temp and continuity
 - 16) On/Off Control with adjustable Deadband (1 – 10)
 - 17) The system must be field programmable for °F or °C.
 - 18) The system must have capability for global programming of all setpoints and alarms.
 - 19) The system must have capability for graphic displays of Loop Status, Alarm conditions, Process Temperature, Setpoints, and Currents.
 - 20) The system must have one set of dry alarm contacts.
 - 21) The system must have selectable Hand/Off/Auto control modes.
 - 22) The system must have a control Loop Enable/Disable Feature.
 - 23) All features including temperature control, contactors, and power distribution must be contained in one enclosure.
 - 24) The system must be modular in-design, such that individual components can be replaced in the field if necessary.
 - 25) The system must be cUL approved.
- C) Control, Monitoring and Power Distribution Systems shall be IntelliTrace HTLS /HTAS as supplied by Chromalox.

Part 5 - EXECUTION

5.1 Installation

- A) The system shall be installed per manufacturer's recommendations
- B) Apply the heating cable linearly on the pipe after piping has been successfully pressure-tested. Secure the heating cable to piping with cable ties or fiberglass tape.
- C) Apply "Caution Electrical Heat Tracing" labels to the outside of the thermal insulation.

5.2 Tests

After installation and before and after installing the thermal insulation, subject heating cable to testing using a 2500-Vdc meggar, minimum insulation resistance shall be 10 megohms or greater.