

Section 22 05 33 Heat Tracing for Pipe Freeze Protection of Underground Water Piping EasyHeat™ Pipe Trace



PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes a UL Listed and CSA Certified pipe freeze protection of underground piping system that consists of a self-regulating heating cable, connection kits, controller and accessories.
- B. Related Sections
 - 1. Section 22 07 19 – Plumbing Piping Insulation
 - 2. Section 22 08 00 – Commissioning of Plumbing
 - 3. Section 22 09 00 – Instrumentation & Control for Plumbing
 - 4. Section 22 11 00 – Facility Fuel Piping
 - 5. Section 22 13 00 – Facility Sanitary Sewerage
 - 6. Section 22 10 00 – Plumbing Piping
 - 7. Section 23 07 19 – HVAC Piping Insulation
 - 8. Section 23 08 00 – Commissioning of Plumbing
 - 9. Section 23 09 00 – Instrumentation & Control for HVAC
 - 10. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
 - 11. Section 26 05 26 – Grounding and Bonding for Electrical Systems

1.2 REFERENCES

- A. Underwriter's Laboratories (UL)
- B. Canadian Standards Association (CSA)
- C. National Electric Code (NEC)

1.3 SYSTEM DESCRIPTION

- A. System for complete underground water pipe freeze.
- B. System consists of a self-regulating heating cable, connection kits, controller and accessories. **[Select all that apply]**
- C. The heating cable shall have a modified polyolefin (J) jacket or fluoropolymer (-F) jacket. **[Select one]**

1.4 ACTION SUBMITTALS

- A. Product Data
 - 1. Heating cable data sheet
 - 2. UL, CSA approval certificates for freeze protection of underground water piping.
 - 3. Heating Cable Installation and Maintenance Instructions
 - 4. Connection Kit, Controller, and Thermostat Instructions. **[Select all that apply]**
 - 5. Electrical Wiring Diagram of System

1.5 QUALITY ASSURANCE

- A. Manufacturers' Qualifications
 - 1. Manufacturer to show minimum of thirty (30) years of experience in manufacturing self-regulating heating cables.
 - 2. Manufacturer to provide products consistent with IEEE 515.1 and CSA 22.2 No 130-03 requirements.
- B. Installer Qualifications
 - 1. System installer shall have complete understanding of product and product literature from manufacturer or authorized representative prior to installation.
 - 2. Electrical connections shall be performed by a licensed electrician.

- C. Regulatory Requirements and Approvals
 - 1. The heat tracing system shall be UL Listed/CSA Certified
 - 2. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70 and marked for intended use.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Deliver, store and handle products to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.
- B. Delivery and Acceptance Requirements: Deliver products to site in original, unopened containers or packages with intact and legible manufacturers' labels identifying the following:
 - 1. Product and Manufacturer
 - 2. Length/Quantity
 - 3. Lot Number
 - 4. Installation and Maintenance Instructions
- C. Storage and Handling Requirements
 - 1. Store the heating cable in a clean, dry location with a temperature range -40°F to 140°F (-40°C to 60°C).
 - 2. Protect products from mechanical damage and water ingress.

1.7 WARRANTY

- A. Extended Warranty
 - 1. Manufacturer shall make available a minimum two (2) year warranty for heating cable and connection kits. Provide one (1) year warranty for all heat trace controllers and thermostats.
 - 2. Contractor shall submit to owner the results of all installation tests required by the manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Contract Documents are based on manufacturer and products named below to establish a standard of quality.
- B. Manufacturer
 - 1. Manufacturer shall be Emerson – EasyHeat
 - 2. Manufacturer to show minimum of thirty (30) years of experience in manufacturing self-regulating heating cables.
 - 3. Manufacturer shall provide UL and CSA approval certificates.

2.2 MATERIALS

A. Heating Cables – EasyHeat SR Trace and/or TSR **[Select all that apply]**

Heating Cables				
		SR Trace	TSR	
Catalogue No.	Over Jacket	Polyolefin (J)	Polyolefin (J)	Fluoropolymer (-F)
	120 VAC – 3 W/ft @ 50°F	SR31J	TSR31J	TSR31-F
	120 VAC – 5 W/ft @ 50°F	SR51J	TSR51J	TSR51-F
	120 VAC – 8 W/ft @ 50°F	SR81J	TSR81J	TSR81-F
	120 VAC – 10 W/ft @ 50°F	Unavailable	TSR101J	TSR101-F
	240 VAC – 3 W/ft @ 50°F	SR32J	TSR32J	TSR32-F
	240 VAC – 5 W/ft @ 50°F	SR52J	TSR52J	TSR52-F
	240 VAC – 8 W/ft @ 50°F	SR82J	TSR82J	TSR82-F
	240 VAC – 10 W/ft @ 50°F	Unavailable	TSR102J	TSR102-F
Max. Rated Voltage		277 VAC	277 VAC	
Max. Exposure Temperature		85°C (185°F)	85°C (185°F)	
Bus Wire Size		18 Gauge	16 Gauge	

1. SR Trace Heating Cable

- a. Shall be a self-regulating heater cable with a parallel circuit electric heater strip.
- b. Shall feature an irradiation cross-linked conductive polymer core material that is extruded over the multi-stranded, tin-plated, 18-gauge copper bus wires.
- c. The conductive core material shall increase or decrease its heat output in response to temperature changes.
- d. Max. rated service voltage shall be 277 VAC.
- e. Shall feature a thermoplastic elastomer inner jacket extruded over the conductive core material that provides dielectric strength, moisture resistance, and protection from impact and abrasion damage.
- f. A stranded copper braid shall be installed over the inner jacket, providing a continuous ground path.
- g. A modified polyolefin over jacket shall cover the braid for added dielectric strength, moisture resistance, and protection from impact and abrasion damage.

2. TSR Heating Cable

- a. Shall be a self-regulating heater cable with a parallel circuit electric heater strip.
- b. Shall feature an irradiation cross-linked conductive polymer core material that is extruded over the multi-stranded, tin-plated, 16-gauge copper bus wires.
- c. The conductive core material shall increase or decrease its heat output in response to temperature changes.
- d. Max. rated service voltage shall be 277 VAC.
- e. Two inner thermoplastic jackets shall be extruded over and bonded to the core material for extra dielectric strength, moisture resistance, and protection from impact and abrasion damage.
- f. A modified polyolefin or fluoropolymer **[select one]** over jacket shall cover the braid for added dielectric strength, moisture resistance, and protection from impact and abrasion damage.

B. Connection Kits – EasyHeat TSRP, TSRS, TSRT, or TSRL **[Select all that apply]**

1. TSRP Power Connection Kit

- a. Shall be suitable for connecting up to two heating cables to customer supplied power wiring.

2. TSRS Splice Connection Kit
 - a. Shall be suitable for connecting two heating cables in an in-line splice configuration.
3. TSRT Tee Connection Kit
 - a. Shall be suitable for connecting three heating cables in a tee splice configuration.
4. TSRL Lighted Connection Kit
 - a. Shall feature an end-of circuit indicating light assembly utilizing a low-temperature LED lamp.
 - b. Shall operate in 120-277 VAC service voltage.
- C. Thermostats – EasyHeat T4XA, T4XC and/or C4XC **[Select all that apply]**
 1. T4XA Thermostat
 - a. Shall be used for ambient temperature control and offers the following features:
 - i. Enclosure: Die Cast Aluminum
 - ii. Classifications: NEMA Type 4X IP66
 - iii. Temperature Range: -9°C to +60°C (+15°F to +140°F)
 - iv. Exposure: -40°C to +71°C (-40 to +160°F)
 - v. Capillary:
 - Material: Stainless Steel
 - Maximum Bulb Temperature: +71°C (+160°F)
 - vi. Electrical Data:
 - CSA Rating: 22 amp resistance 480 Vac
 - UL Rating: 22 amp resistance 480 Vac
 - vii. Calibration Accuracy: +1.1°C (+2°F)
 - viii. Switch Type: Single Pole Double Throw
 2. T4XC Thermostat
 - a. Shall be used for controlling heat tracing systems and offers the following features:
 - i. Enclosure: Die Cast Aluminum
 - ii. Classifications: NEMA Type 4X IP66
 - iii. Temperature Range: -4°C to +163°C (+25°F to +325°F)
 - iv. Exposure: -40°C to +71°C (-40 to +160°F)
 - v. Capillary:
 - Length: 3 m (10 ft)
 - Material: Stainless Steel
 - Maximum Bulb Temperature: +215°C (+420°F)
 - vi. Electrical Data:
 - CSA Rating: 22 amp resistance 480 Vac
 - UL Rating: 22 amp resistance 480 Vac
 - vii. Calibration Accuracy: +1.6°C (+3°F)
 - viii. Switch Type: Single Pole Double Throw
 3. C4XC Thermostat
 - a. Shall be used for controlling heat tracing systems and offers the following features:
 - i. Suitable for indoor/outdoor locations having hostile, non-hazardous environments.
 - ii. Can be used in ambient sensing mode or line sensing mode.
 - iii. Enclosure: NEMA 4x polycarbonate plastic
 - iv. Fixed temperature: +40° F (+4.4° C)

- v. Maximum exposure temperature: +140° F (+60° C)
- vi. Capillary length: 2.5 ft (0.762 m)
- vii. Current: 22 Amps
- viii. Voltage: 120, 240 or 480 Vac
- ix. Calibration accuracy: ±4° F (±2.2° C)

D. Controller – EasyHeat EGPC [**Select if applicable**]

1. Shall be a micro-processor based digital controller specifically designed for wall mounted electric heat tracing applications.
2. Shall provide temperature control of an individual heater segment with sensor monitoring, remote alarm contacts, and ground fault leakage detection.
3. Shall offer the following features:
 - i. Ground Fault Trip function
 - A fixed 30mA trip level is provided for circuit integrity eliminating the need for separate EPD branch circuit breakers.
 - ii. Temperature Input:
 - Range: 0°C to +218°C (32°F to +425°F)
 - Accuracy: +/- 1°C
 - Repeatability: +/- 1°C
 - RTD: 100-ohm platinum, 3-wire, (lead compensated up to 20 ohms)
 - iii. Voltage Range: 100 Vac to 277 Vac
 - iv. Heater Switching
 - Configuration: Two-pole, EMR
 - Ratings: 100-277 Vac, 30A continuous (resistive load only)
 - Line Frequency: 50 or 60 Hz
 - v. Control Power
 - Power Requirement: Control power from heater voltage, 110-277 VAc, 12 VA max
 - vi. User Interface
 - Display: 4-character LCD Alphanumeric display
 - Panel Indicators:
 - Actual Temp LED
 - Setpoint Temp LED
 - Alarm LED
 - Keypad:
 - 4 buttons, glass-reinforced epoxy laminate faceplate
 - Next, Up, Down, Menu
 - vii. Environment
 - Ambient Temperature: -40°C to +55°C Starting at -20°C (-4°F)
 - Conformal Coating: Boards conformal coated for hostile environments
 - viii. Enclosure
 - Type: NEMA Type 4X Fiberglass reinforced, carbon impregnated, UV resistant polymer
 - Size: 6.5"H x 6.5" W x 4.0" D
 - Features: Captive cover screws
 - ix. Alarm Output
 - Alarm: EMR Form C

- Alarm Rating: EMR Version 24-277 Vac @ 2.0A Max, 12-30Vdc
- Alarm Output: LED Indication
- x. Alarm Function
 - High Temperature Alarm
 - Low Temperature Alarm
 - Sensor Failure
 - Ground Fault Trip
- xi. User-Definable Options
 - Deadband: Adjustable 1°C to 6°C (2°F to 10°F)
 - Alarm Contacts: NO or NC operation

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions
 - 1. Prior to installation of heating cable system, verify that all piping which will be heat trace has passed all hydrostatic/pressure test and is signed off by plumbing inspector.
- B. Preinstalling Testing
 - 1. Prior to installing heating cable on the piping an insulation resistance test shall be performed by the installing contractor to ensure integrity of heating cable as describe in the installation & maintenance manual.

3.3 INSTALLATION

- A. Acceptable Installers
 - 1. Subject to compliance with requirements of Contract Documents, installer shall be familiar with installing pipe trace cables and equipment.
- B. The process pipe freeze protection installation shall conform to all local building codes including but limited to NFPA70, IEEE 515 industrial Heat Tracing Applications.
- C. The installer shall layout heating cable per approved shop drawings.
- D. Grounding of the Process Pipe Freeze Protection System shall be in accordance with section 26 05 26 “Grounding & Bonding for Electrical Systems”
- E. Connections of all electrical wiring shall be in accordance with section 26 05 19 “Low-Voltage Electrical Systems”
- F. Comply with the following manufacturer’s recommendations:
 - 1. SR Trace Cable Instruction Sheet (14120-001) and/or TSR Cable Instruction Sheet (40252-001). **[Select all that apply]**
 - 2. TSRP Power Connection Kit Instructions (14036-001).
 - 3. TSRS Splice Connection Kit Instructions (14037-001). **[Select if applicable]**
 - 4. TSRT Tee Connection Kit Instructions (14038-001). **[Select if applicable]**
 - 5. TSRL Series End of Circuit Light Kit Instructions (14032-001). **[Select if applicable]**
 - 6. T4XA Thermostat Installation/Specification (14026-001). **[Select if applicable]**
 - 7. T4XC Thermostat Installation/Specification (14029-001). **[Select if applicable]**
 - 8. C4XC Thermostat Installation/Specification (14027-001). **[Select if applicable]**
 - 9. EGPC Installation and Operating Instructions (14251-002). **[Select if applicable]**

3.4 FIELD QUALITY CONTROL

- A. Initial start-up and field testing (commissioning) of the system shall be performed by factory technician or factory representative per the owner's requirements.
- B. Field Tests and Inspections in accordance with the cable instructions, recorded and included in submittals to owner:
 - 1. The following test shall be performed before the heat cable has been installed:
 - a. Continuity test on reel
 - b. Insulation resistance on reel – 2500 VDC
 - 2. The following test shall be performed after the heat cable has been installed but before the insulation and after insulating the piping:
 - a. Continuity test
 - b. Insulation resistance – 2500 VDC, 5 megaohm minimum
 - 3. The technician shall verify that the T4XA, T4XC, C4XC and/or EGPC [**Select all that apply**] parameters are set to the application requirements.

3.5 MAINTENANCE

- A. Maintenance Service
 - 1. Comply with manufacturer's recommendations in the applicable Installation and Maintenance Instructions.

END OF SECTION