Sample Specification
Electrical Heat Tracing Cables
English Units

April 2020

ELECTRIC HEAT TRACING CABLES SPECIFICATION

TABLE OF CONTENTS

PAGE

1.0 HEATER CABLES 3

1.1 SELF-REGULATING 3

1.2 FLEXIBLE SERIES RESISTANCE 5

1.3 MINERAL INSULATED (M.I) 6

1.4 METALLIC BRAIDS AND OVERJACKETS 7

2.0 SKIN EFFECT HEAT TRACING 7

1.0 HEATER CABLE

The following heater cables are approved for use on this project. The heat tracing contractor shall be responsible for selecting the type of heating cable to be used for a given application.

1.1 **Self-Regulating Heating Cable**

A. Low Temperature - Self-Regulating Heating Cable

1. Heating cables shall be self-regulating, capable of maintaining process temperatures up to 150°F and a continuous exposure to pipeline temperature of 185°F while de-energized.
2. Cable must be of parallel construction so that it can be cut to length without changing its power output per unit length.
3. The heater cable assembly shall have a monolithic heating core construction consisting of two parallel 16 AWG nickel-plated copper bus conductors with a semiconductive PTC polymer extruded over and between these parallel conductors. A polyethylene dielectric insulating jacket is extruded over the heating element core.
4. The semiconductive heating matrix and primary insulating jacket shall be cross-linked by irradiation.
5. The basic cable will be covered by means of a metallic braid of tinned copper. The braid will provide a nominal coverage of seventy percent (70%) and will exhibit a resistance not exceeding 0.0.0045 ohm/ft.
6. The cable shall be covered with a corrosion resistant overjacket of thermoplastic elastomer (for possible exposure to aqueous solutions, mild acids or bases) or fluoropolymer (for possible exposure to organic chemicals or corrosives).
7. For longer circuit lengths and higher heat loss requirements greater than 10 W/ft @ 50°F, the heating cable shall have 14 AWG nickel-plated copper bus conductors
8. Long term stability shall be established by the thermal performance benchmark test per IEEE 515 Std or IEC/IEEE 60079-30-1:2015 or CSA C22.2 No 130-16

B. Medium/High Temperature Self-Regulating Heating Cables

1. Heating cables shall be self-regulating, capable of maintaining temperatures up to 302°F, 400°F continuous exposure deenergized and withstanding an intermittent pipeline exposure temperature of 482°F energized or de-energized.
2. Cable must be parallel construction so that it can be cut to length without changing its power output per unit length.
3. The heater cable assembly shall be a monolithic construction consisting of two parallel 16 AWG nickel-plated copper bus conductors and a semiconductive PTC polymer heating element. The high temperature fluoropolymer primary dielectric jacket shall be co-extruded over the heating core and be integrally bonded to the heating core.
4. The basic cable will be covered by means of a metallic braid of nickel-plated copper or tinned copper. The braid will provide a nominal coverage of seventy percent (70%) and will exhibit a resistance not exceeding 0.0045 ohm/ft.
5. The cable shall be covered with a fluoropolymer overjacket.
6. Long term stability shall be established by the thermal performance benchmark test per IEEE 515 Std or IEC/IEEE 60079-30-1:2015 or CSA 22.2 No 130-16.

C. High Temperature Self-Regulating Heating Cables

1. Heating cables shall be self-regulating, capable of maintaining temperatures up to 392°F, and withstanding an intermittent pipeline exposure temperature of 482°F energized or de-energized.
2. Cable must be parallel construction so that it can be cut to length without changing its power output per unit length.
3. The heater cable assembly shall be a monolithic construction consisting of two parallel 14 AWG nickel-plated copper bus conductors and a semiconductive PTC polymer heating element. The high temperature fluoropolymer primary dielectric jacket shall be co-extruded over the heating core and be integrally bonded to the heating core.
4. The basic cable will be covered by means of a metallic braid of nickel-plated copper or tinned copper. The braid will provide a

nominal coverage of seventy percent (70%) and will exhibit a resistance not exceeding 0.0045 ohm/ft.

5. The cable shall be covered with a fluoropolymer overjacket.
6. Long term stability shall be established by the thermal performance benchmark test per IEEE 515 Std or IEC/IEEE 60079-30-1:2015 or CSA 22.2 No 130-16.

D. Extreme High Temperature Self-Regulating Heating Cables

1. Heating cables shall be self-regulating, capable of continuous operating temperatures (energized) of 464°F, continuous exposure temperatures (de-energized) of 464°F, and intermittent exposure temperatures (energized or de-energized) of 482°F.
2. Cable must be parallel construction so that it can be cut to length without changing its power output per unit length.
3. The heater cable assembly shall be a monolithic construction consisting of two parallel 16 AWG nickel-plated copper bus conductors and a semiconductive PTC polymer heating element. The high temperature fluoropolymer primary dielectric jacket shall be co-extruded over the heating core and be integrally bonded to the heating core.
4. The basic cable will be covered by means of a metallic braid of nickel-plated copper. The braid will provide a nominal coverage of seventy percent (70%) and will exhibit a resistance not exceeding 0.0045 ohm/ft.
5. The cable shall be covered with a fluoropolymer overjacket.
6. Long term stability shall be established by the thermal performance benchmark test per IEEE 515 Std or IEC/IEEE 60079-30-1:2015 or CSA 22.2 No 130-16.

E. High Temperature Power Limiting Heating Cables

1. Power Limiting heating cables shall be used to maintain temperatures to 410°F and a continuous exposure to pipeline temperature of 500°F when the cable is de-energized.
2. Power limiting heating cables shall consist of two 12 AWG nickel-plated copper bus conductors, individually insulated with a high temperature fluoropolymer. The bus conductors will be

alternately exposed for connection to the heating element at regular intervals.

3. A PTC (Positive Temperature Coefficient) conductor shall be spirally wrapped around a fiberglass carrier strand to form a coiled resistor heating element. This coiled resistor element shall be helically wrapped around the insulated voltage supply bus wires making electrical contact with alternate bus wires at regular intervals to complete the heating circuit.
4. There shall be a fiberglass composite between the heating element and primary dielectric jacket.
5. The basic cable will be covered by means of a metallic braid of nickel-plated copper. The braid will provide a nominal coverage of seventy percent (70%) and will exhibit a resistance not exceeding 0.0018 ohm/ft.
6. For applications subject to corrosive atmospheres, cable shall be covered with a high temperature fluoropolymer overjacket.
7. Long term stability shall be established by the thermal performance benchmark test per IEEE 515 Std or IEC/IEEE 60079-30-1:2015 or CSA 22.2 No. 130-16

1.2 Flexible Series Resistance Heat Tracing

A. Flexible Series Resistance Heating Cables shall be in two or three conductor configurations. Conductor type shall be nickel-plated copper and available in various sizes, ranging from 16 AWG to 10 AWG to ensure required circuit resistance can be designed.

B. Electrical insulation shall be fluoropolymer rated for 600 Vac, with a capability of withstanding continuous exposure to temperatures up to 500°F when the circuit is de-energized. For temperature exposures greater than 400°F the cable shall have a fiberglass composite between the conductor and jacket. The insulated conductors shall then be connected to approved cold lead and end termination assemblies.

1.3 Mineral Insulated (MI) Heating Cable

A. MI cables shall be capable of continuous exposure to temperatures of 1112°F when the cable is de-energized.

B. MI heating cable shall be one or two heating conductors with magnesium oxide insulation and an Alloy 825 sheath. Cable voltage rating shall be either 300 Vac or 600 Vac. The complete heater assembly shall be approved for the area it will be installed.

C. The MI cable shall be of seamless construction.

D. Each MI heater shall be factory fabricated to required length with a cold lead for connection to power or where splices are required. Cold leads shall be 4 ft. or 7 ft. long. Cold leads shall have a gland type fitting for termination in threaded hub junction boxes. Cables shall be factory terminated and sealed.

E. Each MI cable shall have a metallic tag attached to the cold lead. The tag shall show the heat tracing circuit number and heater characteristics such as length, voltage, current, watts, cold lead length, and catalog number.

1.4 Metallic Braids and Overjackets

All heating cables, except M.I. type, shall have a metallic braid for use as a ground path. An overjacket shall also be required for all heating cables. For low temperature heating cables, the overjacket material shall meet the requirements in the application as defined below:

A. For low temperature heating cables, a polyolefin overjacket shall be used in moderately corrosive areas and where exposure to aqueous inorganic compounds are expected. A fluoropolymer overjacket shall be used over the metallic braid in severely corrosive areas where exposure to hydrocarbon based chemical solutions or vapors is expected.

B. For medium to extreme high temperature heating cables a fluoropolymer overjacket shall be used over the metallic braid in severely corrosive areas where exposure to hydrocarbon based chemical solutions or vapors is expected.

2.0 SKIN-EFFECT HEAT TRACING

A. Low/Medium Temperature - Skin Effect Heat Tracing

1. Skin effect conductors shall be insulated with special grade HDPE insulation. The conductors shall be stranded, Class H, nickel-plated copper or tinned copper. The conductors shall be insulated with polyolefin with a temperature rating of 250°F with minimal airspace between the conductor strands and extruded dielectric. There shall be outer scuff HDPE jacket extruded over the primary polyolefin jacket.
2. The skin effect conductors shall meet the type test requirements in the IEEE 844 Std-2000.

B. High Temperature - Skin Effect Heat Tracing

1. Skin effect conductors shall be stranded, Class H, nickel-plated copper. The conductors shall be insulated with a high temperature fluoropolymer dielectric with a minimum temperature rating of 400°F with minimal airspace between the conductor strands and extruded dielectric. There shall be an outer scuff fluoropolymer jacket extruded over the primary fluoropolymer jacket.

2. The skin effect conductors shall meet the type test requirements in the IEEE 844 Std-2000.